

warehouse, classed and skirted, and then shipped to Liverpool, whether destined for the English or United States markets. Sorting being too expensive in Buenos Aires, and also somewhat unreliable, is usually done in England. The buying season is from October to March, and the total clip of each season is usually sold within that period.

There is one general feature of marketing wool in South America which differs from the custom of other wool-producing countries. Elsewhere, wools sold in the grease are bought with regard to their probable net yield after scouring, and buyers exercise their own judgment and bid accordingly. South American wools, with few exceptions, are dealt with on a different basis. The sellers take the whole responsibility for the scoured yield. Buyers order grease wool at such a price as will bring the net scoured wool in at a stated cost, and the sellers invoice the greasy wool at the price per pound which they estimate will produce the desired result. So long as they get their net wool at the bargained cost, the invoiced price per pound is a matter of indifference. Large firms in Buenos Aires and Montevideo, which deal on this basis, are prepared to guarantee the net yield under certain conditions. The contracts of the various firms in the chief centers differ in some details, but the form of contract drawn up by the British Association of Wool Buyers, and approved by that body, is the one in general use.

93. Canadian Wool Situation.—Canada, with its millions of acres of rich farming lands, does not maintain enough sheep to supply its home demands for mutton and wool. At present the number of sheep in Canada slightly exceeds 2,750,000. For 1913 and 1914 the importations of sheep averaged annually 170,000 head, and the annual wool importations for the same period averaged 9,000,000 pounds.

In the Maritime Provinces and Ontario, only mutton sheep are found. The long-wool breeds are extremely popular and are as numerous as the down breeds. The Province of Ontario is noted for the quality of its sheep, and a specialty is made of raising

high-grade breeding stock. Most of the pure-bred stock offered for sale is purchased by American sheep owners for the improvement of their flocks. Half of the total number of sheep in Canada are to be found in Ontario. The climate during seven months of the year is especially suitable for sheep raising, and is somewhat similar to that of Great Britain. The land is hilly and grass is abundant in Eastern Canada, where the sheep are raised under farming conditions. West of the Province of Ontario to the Pacific Coast, comparatively few sheep are found. In this section, where sheep are maintained, they run the open range, and the methods employed are similar to those used in the Inter-mountain States of this country. Shelter and winter feeding are a necessity in all parts of Canada, as the winters are severe.

Most of the Western Canadian wool is produced by crossbred Merino sheep in southern Alberta and southwestern Saskatchewan. This district is gradually being taken away from the sheepmen by the heavy influx of settlers. Most of Western Canada is devoted entirely to the production of grains on a large scale. This method of farming is not conducive to the establishment of a sheep industry such as is found where general farming is practiced. Practically no fine wool is produced in Canada. Most of the shortage in mutton is west of Ontario.

In Eastern Canada the shearing is done with common hand shears. The Canadian Government, through the Livestock Branch of the Department of Agriculture, is making a determined effort to increase and improve the mutton and wool production of Canada. The Department has published and widely distributed excellent literature treating all phases of the sheep industry. A staff of wool experts has been sent throughout the country showing the necessity for the better preparation of wool, and demonstrating the proper methods to employ. Their duties furthermore were to visit farmers and ranchers and to instruct them in selection of breeding stock, with the object of improving the breeds. In spite of the extensive educational program, there has been no decided increase in the production of Canadian

wools. There has been an improvement in the preparation of the wool for the market, especially the range wools. Canadian wools contain an excessive amount of vegetable matter, due to careless feeding methods in winter.

In the East practically all the wool is sold by the farmers to local storekeepers, who in turn sell direct to the mills. In some cases manufacturers buy direct from the farmer for cash or woolen goods in exchange. The Western wools are mostly sold through wool growers' co-operative associations. The members send their wool to the association's warehouse, where it is usually graded by experts assigned by the Livestock Branch. In this manner, desirable lots are secured which attract the attention of large buyers. The wool is usually sold at auction, and for a number of years several large wool merchants in Boston have purchased the bulk of the West Canadian wools.

94. Essential Requirements for Manufacturing.—A number of important points must be given consideration when the manufacturer purchases wool for the mill. The field of selection is limited by the price the mill can afford to pay for the wool, and this in turn is largely governed by the selling price of the manufactured product. A wool must be chosen within a certain price limit, and it must possess the correct properties to be manufactured into the desired fabric. The essential requirements which the wool should possess are listed below.

1.—The wool should be fine enough to spin to the required counts or numbers of worsted or woolen yarn, and make a strong, smooth and elastic yarn, which will stand up during warping and weaving.

2.—It must be strong enough to withstand the strains imposed on the fiber in the various operations of yarn manufacture, and should not make an excessive amount of noils and waste.

3.—The staple length should be such that the proper finish on the fabric will be possible.

4.—The wool should possess the proper degree of softness or harshness to give the desired feel and handle to the finished fabric.

5.—It should have the proper felting qualities if the fabric is to be fulled in finishing to furnish the desired shrinkage, appearance and handle in the finished goods

6.—Where white is desired for white fabrics or blending with colors to form mixtures, the wool must scour out a clean white.

7.—If dyed, the wool should possess sufficient luster to give brilliancy to the colors.

8.—In conclusion, the wool should possess the general working properties necessary to produce the desired fabric, and to successfully undergo all the processes required for its manufacture with a minimum amount of waste.

CHAPTER IV

GRADING AND SORTING

95. Necessity for Grading.—Grading is usually performed at the warehouses in this country. The fleeces are taken from the bags and divided into classes, without untying the fleeces, according to the fineness of the wool constituting the greatest bulk of the fleece, and also the length of staple. The latter classification represents the combing and clothing divisions. Off-grades are made where fleeces contain an unusual amount of chaff, burrs, straws, or seeds, and are often indicated by the term “unmerchantable.” Such wools are of inferior value, and in many cases must be carbonized to be of use. Other causes for off-grades would be cotted fleeces, patches of black, gray or brown wool, tenderness, kemp, and fleeces with a vile odor shorn from diseased sheep, or decaying carcasses. These last are often known as “rejects.”

When the special properties, necessary in wools to make them adaptable for the various fabrics to be manufactured, are borne in mind, the necessity for grading wool can be readily understood. If wools were not graded a worsted mill would probably secure a large quantity of short staple clothing fleeces, which it could not use, in every purchase. The uncertainty as to what a lot contained would make buying even more difficult.

96. Definition of and Necessity of Sorting.—Wool sorting is the classification and division of the wool fibers in a fleece into various groups or sorts, according to fineness, length, soundness, elasticity, color, spinning and felting properties. This places all the fibers of a certain grade or fineness, length and general character in one group, and enables that wool to be given processing in the making of the fabrics for which it is best adapted. This would be impossible at times if other grades were mixed with it.

Classing by the wool grower and grading and “standardizing”

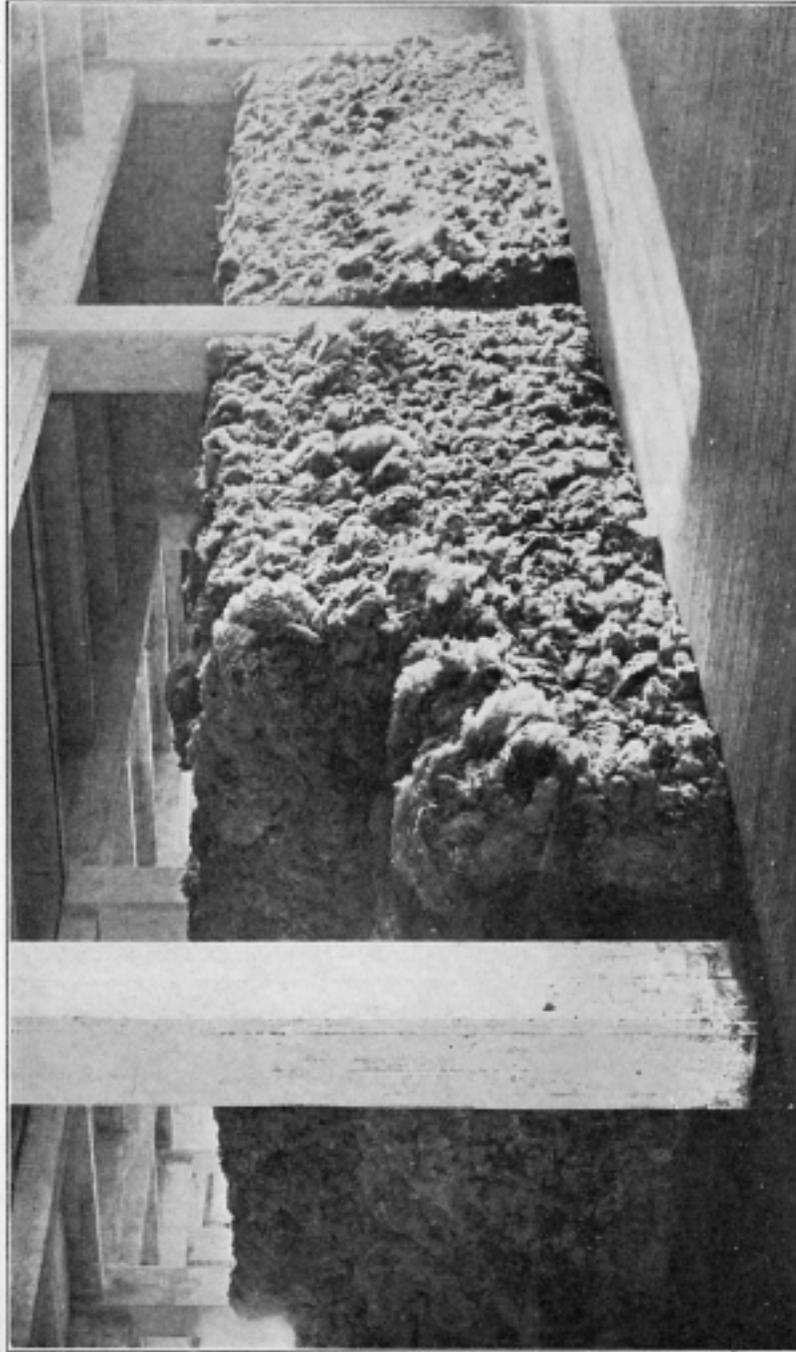


FIG. 54.—Graded Wool Ready for Sale.

by the wool merchant must not be confused with sorting at the mill. Sorting is absolutely necessary, owing to the great variation in the wool grown on different parts of the fleece. This variation is far more marked in the wool of British breeds of sheep than in any other established breeds. This is especially true in long-wools, lusters and crossbred types. Merino

crossbred wools show less variation, while pure Merinos vary so little that they can almost be used in an unsorted condition after being graded and skirted.

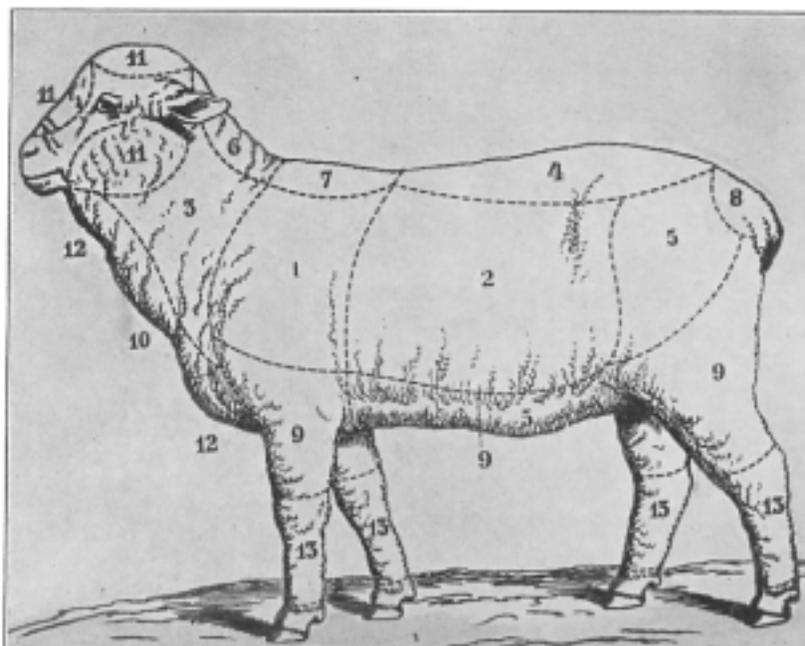
If fleeces were used in their natural state, faulty yarns would result, and the woven cloth would always be imperfect and often unsightly, owing to the impossibility of suiting the subsequent mechanical processes to the various types of wool present in the same lot of stock. Correct sorting yields a profitable series of qualities and enables the maximum value to be obtained from each fleece.

Wool sorting is performed by men, and sometimes women, who are skilled in handling and judging wools by long practice and experience. They determine the sorts by eyesight and the sense of touch. It is possible to sort any fleece into a large number of sorts, and twenty years ago it was not unusual to make a dozen sorts from Merino fleeces. In recent years the tendency has been to make only two, three or four sorts. The number of sorts to be made will depend on the range and character of fabrics made by the mill. In nearly all cases, the sorting is performed at the mill spinning the wool into yarn.

97. Location of Sorts in Fleece.—The different parts of the sheep grow wool which varies considerably in fineness and length, and what would grade as $\frac{1}{2}$ blood fleece often contains every sort from $\frac{3}{4}$ blood to common. The shoulder furnishes the best wool



FIG. 55.—Fibers of Lincoln Wool. The two fine fibers were taken from shoulder and the two coarse fibers from the britch.



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FIG. 56.—Illustrating the Many Sorts Possible from One Fleece.

for fineness, strength and length. The sides grow the next best wool, and as the hindquarters are approached the quality decreases considerably until the britch of the sheep is reached, and here the coarsest wool in the fleece is always found. This wool is called "britch." The wool from the back of the sheep follows that from the sides. It is usually a trifle shorter, and particularly in domestic wools often contains chaff and hayseeds. The belly wool is irregular in quality, always short, and frequently uneven and tender. It is often badly stained with urine and contains tags or manure locks. The wool from the head and legs is short, uneven and coarse. In the black-faced breeds the wool from the head is liable to contain some black fibers.

When all these variations and numerous qualities are considered it will be realized that wool sorting is not only a highly intricate and skillful operation, but absolutely necessary for profitable and satisfactory manufacture. The importance of careful classing by the wool grower, and of grading by the wool merchant,



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FIG. 57.—Sorting Wool.

must not be overlooked, as these operations greatly facilitate correct and successful sorting in the mills.

98. Method of Sorting.—The sorting is done over a table placed by a light window facing the north if possible. This table has a slatted or wire mesh top, through which dirt, sand, straw, chaff and seeds will fall into a box below when the fleece is shaken by the sorter. A bag of wool is opened, and the strings are cut from twenty or thirty fleeces. The sorter then takes a fleece at a time on the table, shaking it well. The off and low sorts are first removed by tearing them from the rest of the fleece by hand. This is called “skirting” the fleece. These skirtings are placed in a convenient bin or basket alongside the table, and the sorter continues to tear the fleece apart into the required number of sorts, placing each sort in a separate receptacle until the fleece is completed. The main sort varies from 40 per cent. to 80 per cent., according to the requirements of the mill.

99. Practical Examples of Mill Sorting.—For the first illustration, a lot of $\frac{3}{8}$ blood Ohio combing for a worsted mill running exclusively on $\frac{2}{36}$ knitting yarn might only be skirted. In that case, the main sort might represent 85 per cent., and the skirting might be divided into a number of sorts, such as britch, shorts and tags, which would be of no use in manufacturing worsted, and would be sold through a dealer or direct to a woolen mill.

Another example is a lot of $\frac{1}{2}$ blood clothing wool. A number of sorts would be made from the skirting. Assume the mill to be running on a wide variety of fabrics from broadcloths to cloakings. The main part of the fleece might sort as follows: Sort No. 1, shoulders, $\frac{3}{4}$ blood; Sort No. 2, sides near shoulder, high $\frac{1}{2}$ blood; Sort No. 3, middle sides, front and middle back, $\frac{1}{2}$ blood; Sort No. 4, sides and back near hindquarters, $\frac{3}{8}$ blood. The fine wool is capable of spinning much finer yarn than coarser wools.

Two sorts are frequently made from the same grade of wool on difference in length only, the longer staple going into warp yarn and the shorter into filling, where less strength is required.



FIG. 58.—Skirting Fleeces at Shearing Sheds, Burrawong, New South Wales, Australia.
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100. **Skirting.**—The wools of Australia, New Zealand, South Africa and a considerable quantity from South America are skirted and graded as soon as the fleeces are sheared from the sheep. From the edges of the fleece the britch and stained or coarse locks which grow on the belly, legs and neck are removed. Naturally skirted fleeces are more valuable than unskirted ones, and in many mills such skirted fleeces are used entirely as received without sorting, as the bulk of the fleece does not vary enough to require sorting for the yarns and fabrics desired. Our wools, with a few exceptions, come to the market both ungraded and unskirted. Merino fleeces are very uniform in quality, and skirting is about all the sorting usually considered necessary. Coarse fleeces usually show a much wider variation within the fleece.

101. **Mill Methods of Designating Sorts.**—The mills use various numbers and letters to designate the different sorts made in their mills. The following is one of the most common systems for designating quality in worsted mills, the usual equivalent grade term is also given for comparison: 10's is equivalent to $\frac{3}{4}$ blood; 8's equals $\frac{1}{2}$ blood; 6's equals $\frac{3}{8}$ blood, and 4's equals $\frac{1}{4}$ blood. In designating yarn qualities these terms are used after the count, for example, 2/28/4's, 1/30/6's, 2/40/8's and 2/50/10's.

102. **Illustrating Sorts in Fleece.**—The two diagrams, 59 and 60, represent a domestic fleece grading $\frac{3}{8}$ blood. Figure 60 shows

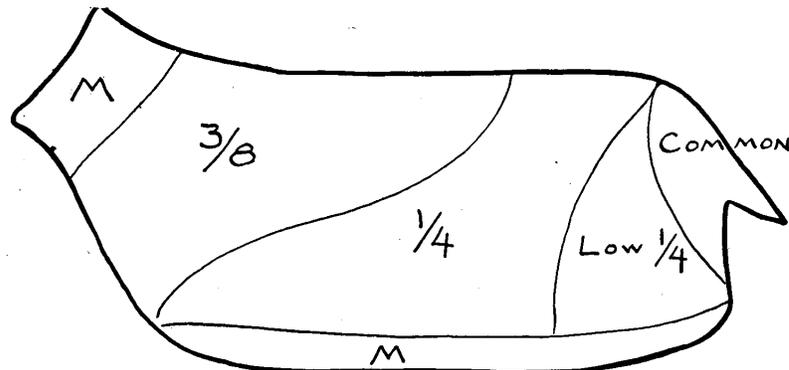
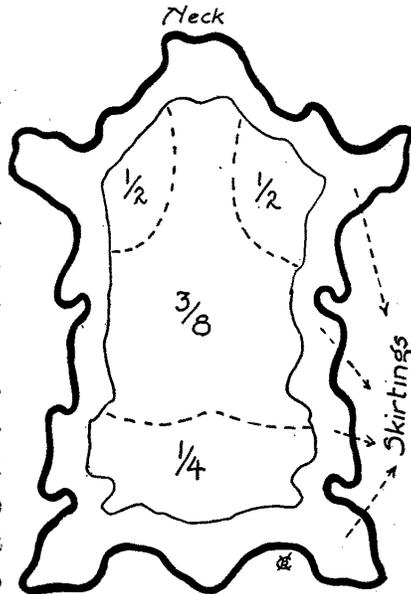


FIG. 59.—Location of Sorts, Side View of Sheep.

the fleece opened out and marked to show the various qualities present. Figure 59 shows a side view of the same fleece as it grows on the sheep.

Figures 61 and 62 at the bottom of this page show the usual main sorts in $\frac{3}{8}$ blood crossbred and Corriedale fleeces.

103. Wool Grades—Foreign System.—The terms used to designate the quality or grade of wool are unfortunately not the same throughout the world. The most widely known is the foreign top makers' system, which is supposed to classify the wool according to the count, number or hank of



Britch
 $\frac{3}{8}$ CROSSBRED

FIG. 60.—Location of Sorts, same as Fig. 59, with Fleece Spread.

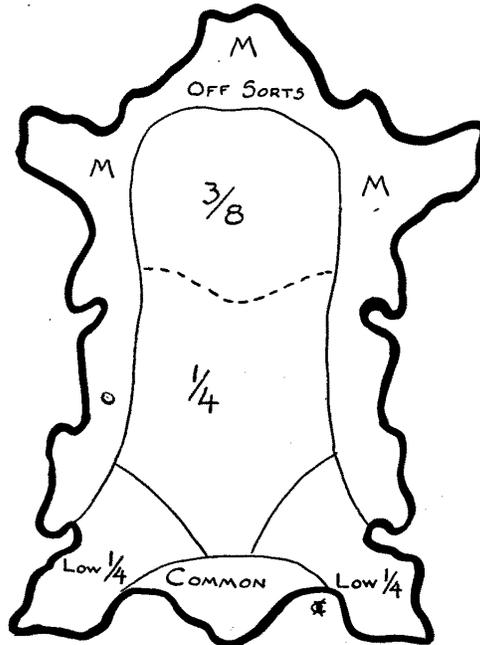
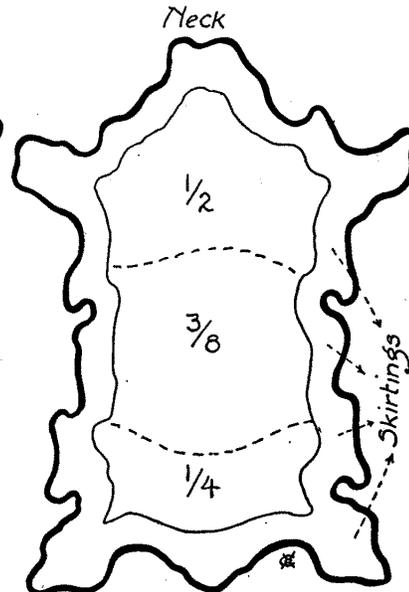


FIG. 61.—Main Sorts in Three-eighths Crossbred Fleece.



Britch.
CORRIEDALE

FIG. 62.—Main Sorts in Corriedale Fleece.

worsted yarn, which could be spun from the wool. For example, 50s quality crossbred wool could be spun to a single 50s worsted yarn, which means that one pound of the yarn would contain 50 times 560 yards, a worsted hank, or 28,000 yards. This system is used in Great Britain, Continental Europe, Australia, New Zealand, South Africa and South America. The numbers are misleading, as the higher numbers spin finer than the designated number, and the lower ones will not spin up to their number. Owing to climatic conditions, the same quality tops can be spun a few numbers finer in England than in America.

104. Wool Grades—American System.—The American classification was originally based on the wool from a full-blooded Merino sheep as the standard of fineness, and the other grades arranged according to the amount of Merino blood present. In this method, the wool from a half-blood sheep would be twice as coarse as the wool from a full-blood Merino sheep. While the grade terms are still retained they do not carry the former meaning. The grade terms, “ $\frac{1}{2}$ blood,” “ $\frac{3}{8}$ blood,” etc., simply indicate the relative fineness or diameter of the fibers, and bear no relationship to the amount of Merino blood present in the sheep producing the wool. Many $\frac{1}{2}$ blood, $\frac{3}{8}$ blood and $\frac{1}{4}$ blood wools are grown by sheep containing no trace of Merino blood.

There is no fixed measure to determine the grades, such as a foot-rule for length and scales for weight. The grades are established by custom and experience, and very often what one sorter calls a $\frac{3}{8}$ blood wool would be a low $\frac{1}{2}$ blood to another sorter. One familiar with wools has the relative fineness of each grade pictured in his mind, and often finds wool which is just short of his requirement for a straight grade, or a little above it. In such cases, the wool would be graded as low or high $\frac{1}{2}$ blood or whatever may be the nearest straight grade. The requirements of each grade vary slightly in different wool centers. Boston is known as the highest grading wool market in the world. In other words, the Boston ideas of a grade are slightly higher or finer than the requirements of other wool centers.

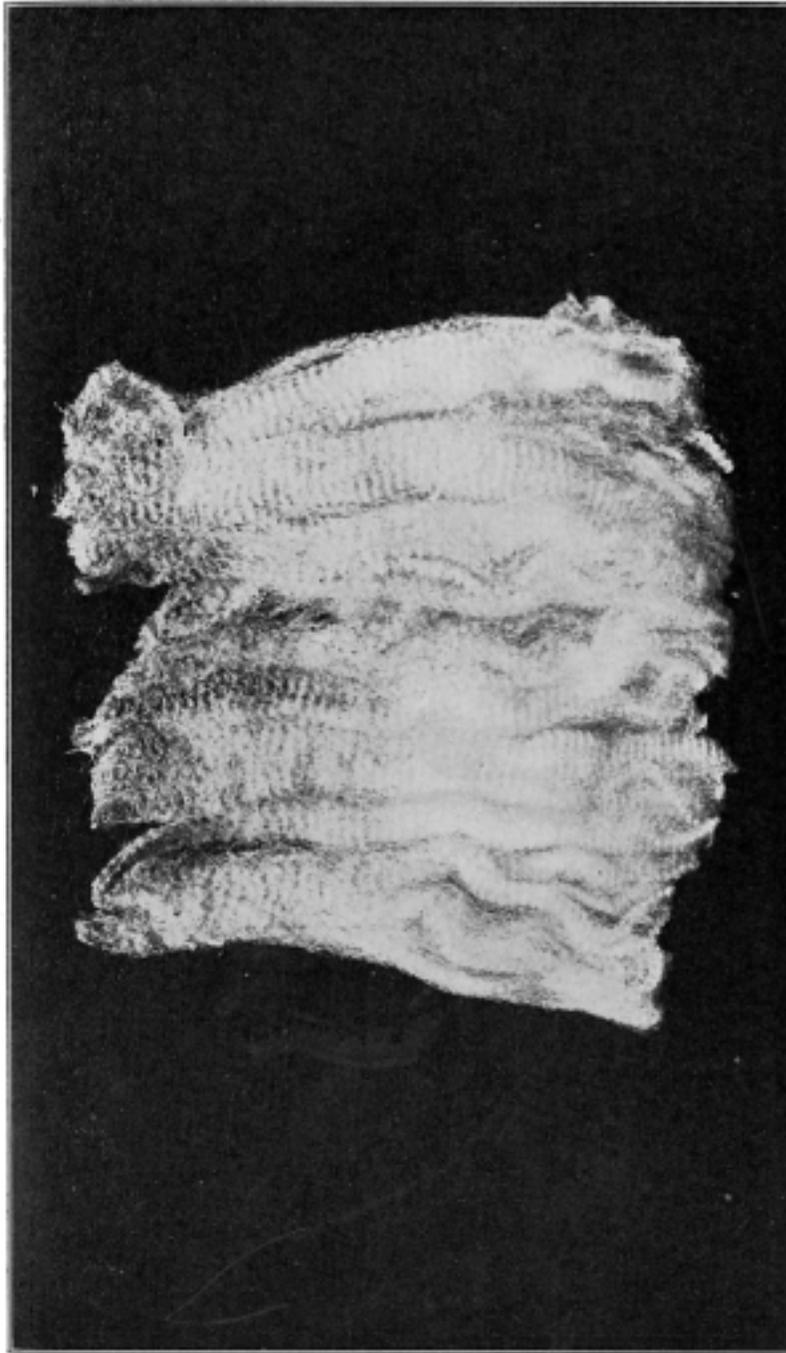


FIG. 63.—XX Combing Wool.

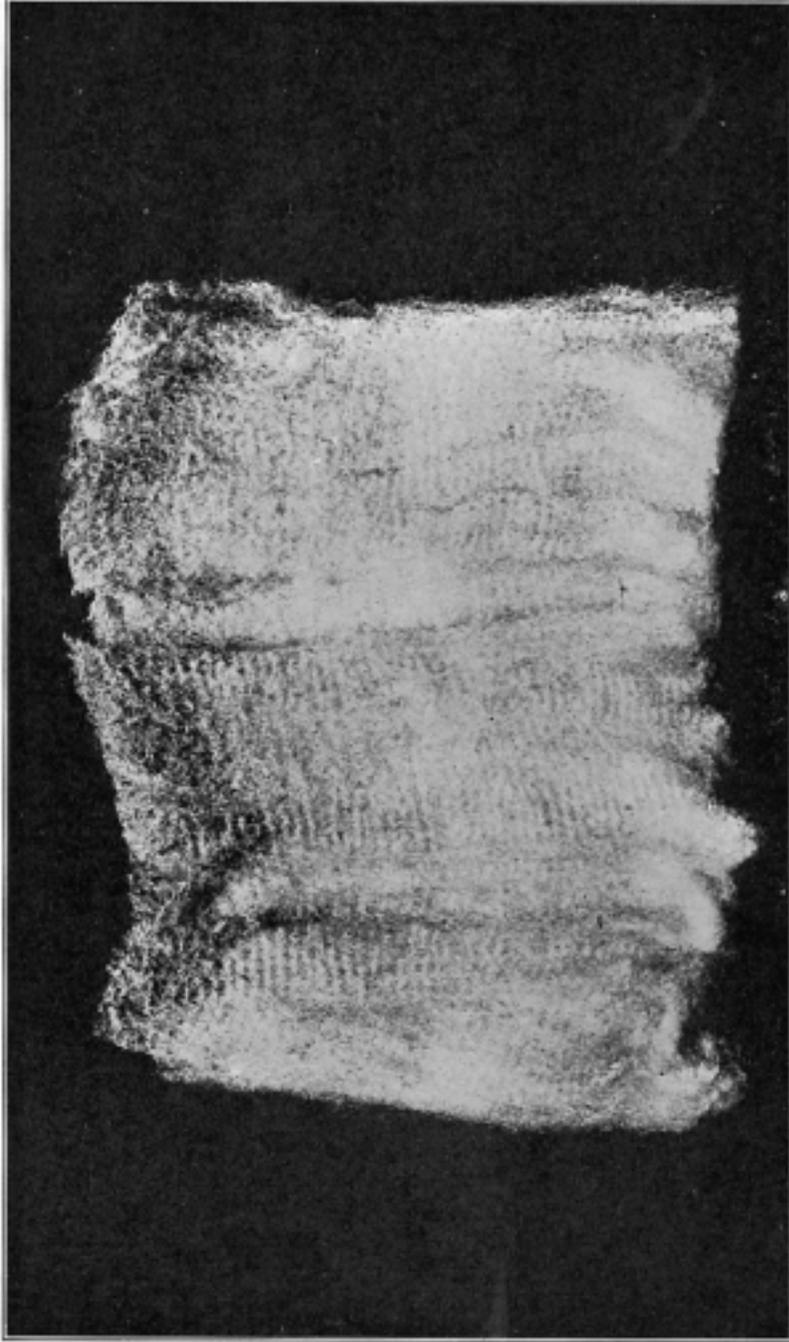


FIG. 64.—Half Blood Combing Wool.

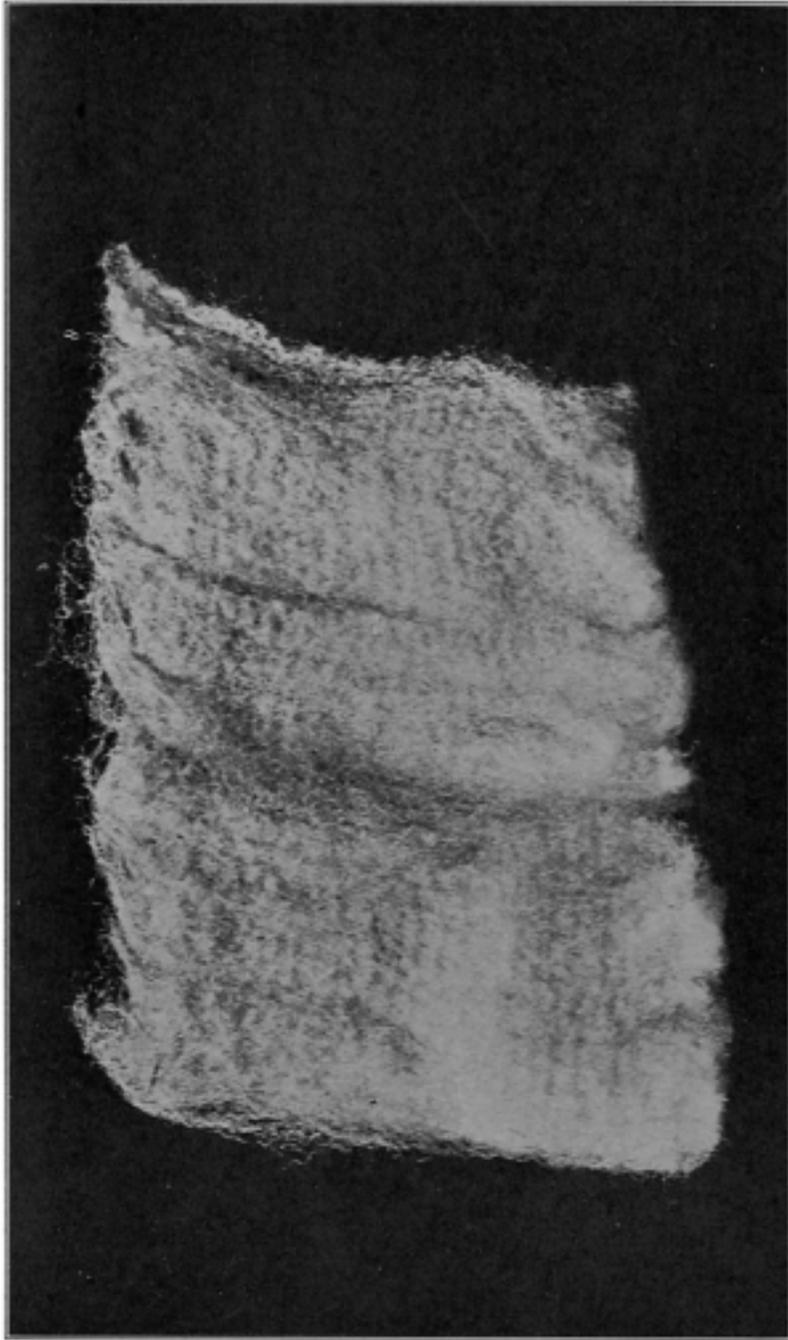


Fig. 65.—Three-eighths Blood Combing Wool.

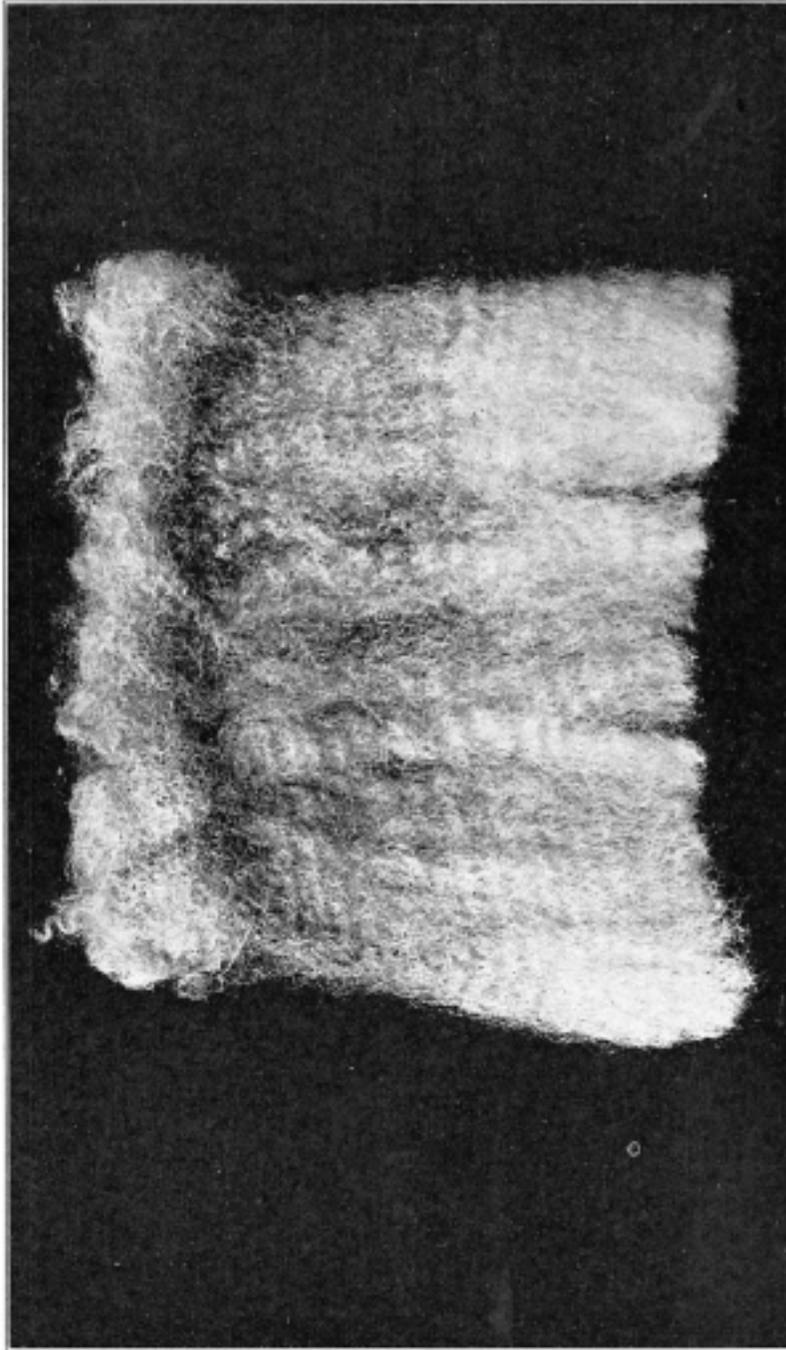


FIG. 66.—Quarter Blood Combing Wool.

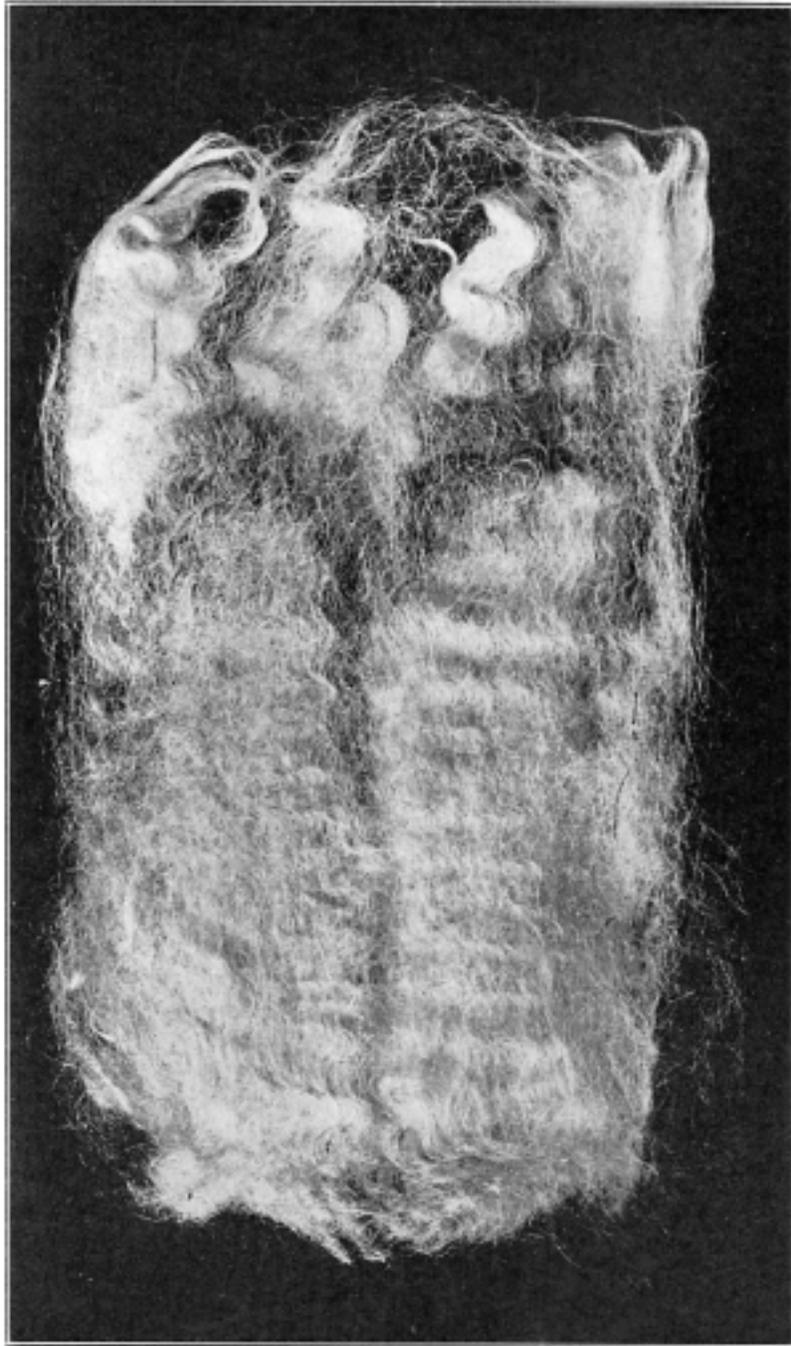


FIG. 67.—Common Combing Wool.

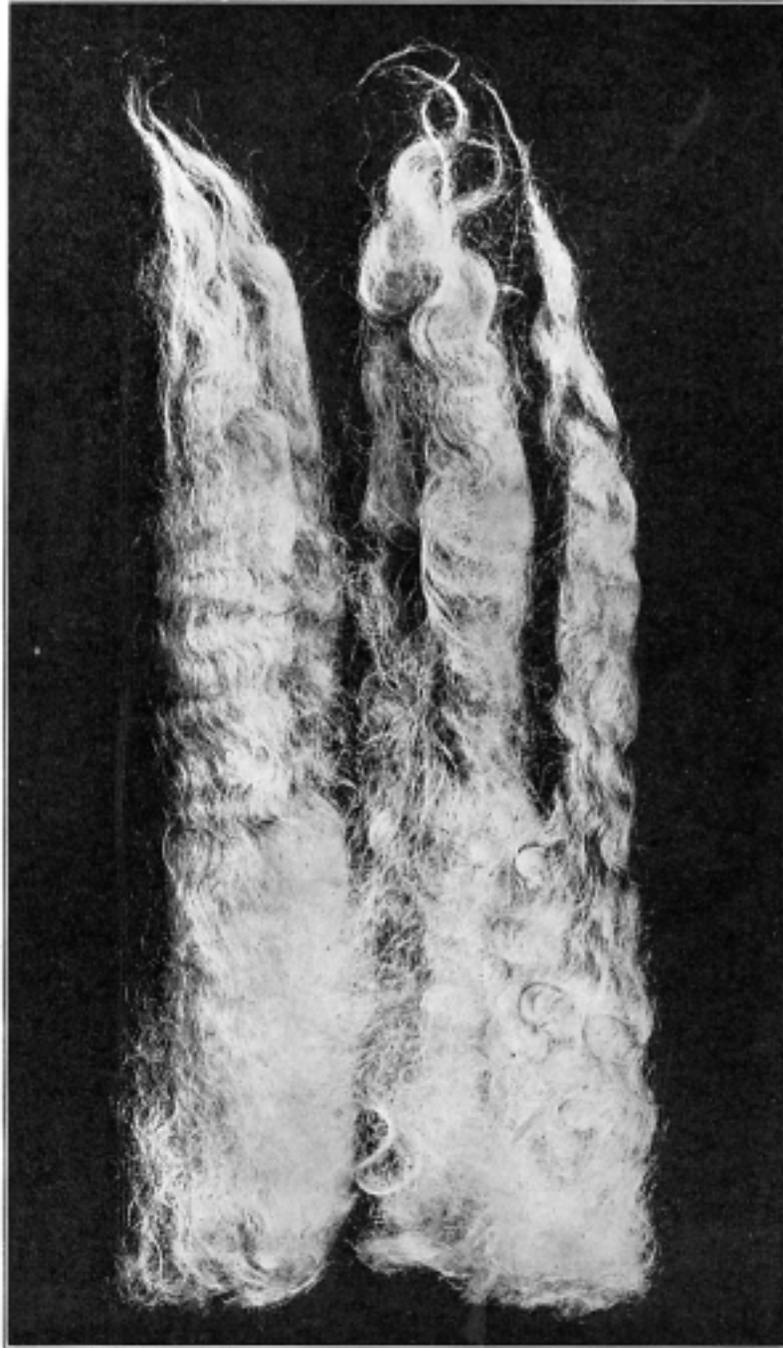


FIG. 68.—Braid Wool.

The lower grades of domestic and territory wools are named alike, but the finer grades carry different names in the two classes. Pulled wools, which are obtained from the pelts of slaughtered sheep, are graded by letters, and cannot be sorted as closely as fleece wools.

105. Comparative Grades.—The following table shows the American domestic grades, together with the equivalent territory, pulled wool, Canadian, and foreign grades, with the counts usually spun from the foreign top makers' grades in the United States. Both combing and clothing wools grade the same; the terms "combing" and "clothing" are used with the grade term to distinguish them. There is a more marked distinction between the low grades than the fine grades.

An important distinction also exists between lambs' wool and that from sheep two or more years old. The lambs' wool is naturally pointed at the end, as it has never been clipped, and a number of fibers are usually grouped in a pointed lock at their tips. The first fleece clipped from a sheep is also known as hog, hogget or teg wool, and it will spin finer than other fleece wools of similar quality.

U. S. Domestic	U. S. Territory	U. S. Pulled Wool	Foreign	Counts Spun in U. S.
Full blood (XX)	Fine	AA	66s-74s	60s
Three-quarter blood (X) ...	Fine medium	AA	60s-66s	50s
One-half blood	Medium	A	54s-60s	40s
Three-eighths blood	Three-eighths blood	B	48s-54s	36s
One-quarter blood	One-quarter blood	B	44s-48s	32s
Low one-quarter blood.....	Low ¼ blood	C	40s-44s	20s
Common	Common	C	36s-40s	16s
Braid	Braid	C	32s-36s	16s

Oregon wools are divided into Eastern and Valley, and the grades No. 1, No. 2 and No. 3 are equivalent respectively to ½, ⅔ and ¼ blood for the Valley wools which are grown in Western Oregon. Most of the Oregon wool is produced in the eastern part of the State, and is typical territory wool with heavy shrinkage. Eastern No. 1, No. 2 and No. 3 correspond with the territory grade terms fine, fine medium and medium, respectively.

106. Estimated Percentage of Various United States Wools.
—The estimated percentages of the various qualities of wool grown in the United States are shown below:

United States	Fine and Fine Medium	Half Blood Wools	$\frac{3}{8}$ Blood and Below
Entire country	52 per cent.	17 per cent.	31 per cent.
Territory wools	66 per cent.	22 per cent.	12 per cent.
Domestic wools	23 per cent.	8 per cent.	69 per cent.

107. Market Quotations.—A list of typical market quotations will be found in the appendix, on pages 228-230. An excellent idea can be obtained as to the descriptions and grades usually quoted as well as comparative values.

108. Sorting Tests.—A lot of $\frac{3}{8}$ blood territory clothing (Wyoming) weighed 810 pounds net, and yielded three sorts according to the requirements of the mill.

No. 1 Sort, main sort, $\frac{3}{8}$ blood.....	606 lbs.	74.8%
No. 2 Sort, high $\frac{3}{8}$ blood	35 lbs.	4.3%
No. 3 Sort, low sort, $\frac{1}{4}$ blood and common.....	125 lbs.	15.5%
Loss in sorting (sand, etc.)	44 lbs.	5.4%
Total	810 lbs.	100%

Lot No. 2.—A mixed lot of territory wool weighing 3577 pounds net was sorted in the following manner:

No. 1 Sort, first main sort, $\frac{3}{8}$ blood staple.....	914 lbs.	25.5%
No. 2 Sort, second main sort, $\frac{3}{8}$ blood clothing.....	1,531 lbs.	42.8%
No. 3 Sort, $\frac{1}{4}$ blood clothing	358 lbs.	10.0%
No. 4 Sort, shorts, low $\frac{1}{4}$ blood clothing.....	381 lbs.	10.7%
No. 5 Sort, skirtings, low and irregular	265 lbs.	7.5%
Loss in sorting (sand, etc.)	128 lbs.	3.5%
Total	3,577 lbs.	100%

Lot No. 3.—Two bales of $\frac{3}{8}$ blood Australian crossbred combing wool (skirted) weighed 570 pounds net:

No. 1 Sort, $\frac{1}{2}$ blood combing	9 lbs.	1.60%
No. 2 Sort, $\frac{3}{8}$ blood combing	553 lbs.	97.00%
No. 3 Sort, $\frac{1}{4}$ blood combing	2 lbs.	.35%
No. 4 Sort, shorts	1 lb.	.17%
Loss in sorting	5 lbs.	.88%
Total	570 lbs.	100%

Lot No. 4.—Close sorting of a bag of Montana wool, grading as $\frac{1}{2}$ blood staple, resulted in a greater number of sorts. The gross weight was 245 pounds; weight of bag 4.5 pounds; net weight of wool 240.75 pounds.

Regular Sorts	Weight—Pounds	Percentage	Value Per Lb. in Cents Spring, 1914
X or three-quarter blood staple.	11.21	4.66	21.0
One-half blood staple	88.69	36.84	22.7
One-half blood clothing	12.90	5.36	21.6
Three-eighths blood staple	64.76	26.90	23.0
Three-eighths blood clothing	24.33	10.11	20.0
One-quarter blood staple	12.90	5.36	19.0
One-quarter blood clothing	4.55	1.89	17.0
Low one-quarter blood staple . . . . .	.55	.23	16.0
Off Sorts			
Stained and gray . . . . .	.55	.23	14.0
Shorts	3.90	1.62	10.0
Fribs	3.32	1.38	5.0
Tags and clips	2.76	1.15	1.0
String	1.37	.57	.5
Loss in sorting	8.90	3.70	...
Total	240.75 lbs.	100%	



FIG. 69.—Range Scene, Wyoming.

109. **Grades of Wool from Various Breeds of Sheep.**—While it is impossible to assign a fleece to a particular grade solely upon the basis of the breeding of the sheep, nevertheless in a general way the various breeds grow wools of a definite quality. In the mutton breeds particularly there are wide variations within a single breed and within flocks. The following list shows in a general way how fleeces from the various breeds would grade:

Breed	Usual Grade of Wool Produced
Merino (domestic)	XX and X clothing and combing
Merino (Delaine)	XX and X combing
Merino (territory)	Fine and fine medium clothing and staple
Merino (Rambouillet)	XX and X combing and clothing and a small amount of $\frac{1}{2}$ blood
Crossbred: Longwool on Merino	$\frac{1}{2}$, $\frac{3}{8}$ and $\frac{1}{4}$ blood combing
Crossbred: Medium wool on Merino	$\frac{3}{4}$, $\frac{1}{2}$ and $\frac{3}{8}$ blood combing or clothing
Lincoln	Low $\frac{1}{4}$ blood combing or braid
Leicester	Low $\frac{1}{4}$ blood combing or braid
Cotswold	Low $\frac{1}{4}$ blood combing or braid
Romney	Low $\frac{1}{4}$ blood combing or braid
Roscommon	Low $\frac{1}{4}$ blood combing or braid
Corriedale	$\frac{3}{8}$ blood combing
Southdown	$\frac{1}{2}$ and $\frac{3}{8}$ blood clothing
Shropshire	Mostly $\frac{3}{8}$ blood, some $\frac{1}{4}$ blood combing or clothing
Hampshire	$\frac{3}{8}$ and $\frac{1}{4}$ blood clothing
Oxford	$\frac{1}{4}$ and low $\frac{1}{4}$ blood combing
Dorset Horn	$\frac{3}{8}$ and $\frac{1}{4}$ blood clothing
Cheviot	$\frac{1}{4}$ blood combing
Tunis	Low $\frac{1}{4}$ blood combing

OFFICIAL STANDARD WOOL GRADES

After several years of work, officials of the Bureau of Agricultural Economics submitted to the Secretary of Agriculture under date of May 7, standard grades of wool which, if he approved, he had the right to establish and promulgate as the official wool standards. This he did on July 13, after approving them on May 18, to be effective as of July 1, 1923. The various grades are defined under eight sections, as follows:

Section 1. Grade fine.—Fine shall be wool which in diameter of fiber is not greater than the sample marked "fine" of a series of samples in the custody of the United States Department of

Agriculture in the District of Columbia in a container marked "original official wool standards of the United States, grades."

Section 2. Grade one-half blood.—One-half blood shall be wool which in diameter of fiber is greater than the sample marked "fine" but not greater than the sample marked "one-half blood" of a series of samples in the custody of the United States Department of Agriculture in the District of Columbia in a container marked "original official wool standards of the United States, grades."

Section 3. Grade three-eighths blood.—Three-eighths blood shall be wool which in diameter of fiber is greater than the sample marked "one-half blood" but not greater than the sample marked "three-eighths blood" of a series of samples in the custody of the United States Department of Agriculture in the District of Columbia in a container marked "original official wool standards of the United States, grades."

Section 4. Grade one-fourth blood.—One-fourth blood shall be wool which in diameter of fiber is greater than the sample marked "three-eighths blood" but not greater than the sample marked "one-fourth blood" of a series of samples in the custody of the United States Department of Agriculture in the District of Columbia in a container marked "original official wool standards of the United States, grades."

Section 5. Grade low one-fourth blood.—Low one-fourth blood shall be wool which in diameter of fiber is greater than the sample marked "one-fourth blood" but not greater than the sample marked "low one-fourth blood" of a series of samples in the custody of the United States Department of Agriculture in the District of Columbia in a container marked "original official wool standards of the United States, grades."

Section 6. Grade common.—Common shall be wool which in diameter of fiber is greater than the sample marked "low one-fourth" but not greater than the sample marked "common" of a

series of samples in the custody of the United States Department of Agriculture in the District of Columbia in a container marked "original official wool standards of the United States, grades."

Section 7. Grade braid.—Braid shall be wool which in diameter of fiber is greater than the sample marked "common" and which approximates the sample marked "braid" of a series of samples in the custody of the United States Department of Agriculture in the District of Columbia in a container marked "original official wool standards of the United States," grades.

Section 8. For the purposes of grading. —Wool in the fleece shall be designated by the grade of the largest proportion of the fibers of the fleece.

CHAPTER V

SHRINKAGE

110. **Cause of Shrinkage.**—Before wool can be processed into yarn it is necessary to remove, by scouring, the grease and foreign matter present. The grease and foreign matter represent the loss or shrinkage, and have been described in detail in the first chapter under the heading "Grease and Foreign Matter." The question of shrinkage is one of the most important phases connected with the buying and manufacture of wool. The amount of loss or shrinkage is figured as a certain percentage of the original grease weight of the wool. For example, a shrinkage of 60 per cent. would mean that 100 pounds of grease wool would only yield 40 pounds of clean or scoured wool.

There is a wide variation, ranging from 25 per cent. to 80 per cent., in the shrinkage of various wools grown in this country. As a general rule, the fine grades are the heaviest shrinking. Short wools shrink from 2 per cent. to 3 per cent. more than longer wools of similar character. The main factors influencing the amount of shrinkage are, first, the breed of sheep, which in turn largely governs the grade of wool grown; second, the character of the soil; third, climatic conditions, and fourth, the care given the flocks.

111. **Shrinkage Affects Value.**—After determining the quality of the wool under consideration the buyer estimates the shrinkage, and while the wool is bought at a certain price per grease pound, this price is determined from the price at which the buyer values the scoured wool. The shrinkage is a total loss to the mill, except where the solvent process is used (see Paragraph 27), and the mill must figure the cost of its finished product on the cost of the scoured wool. In most cases the wool buyer has to depend solely on his judgment, after carefully examining and

handling the wool, as to the amount of shrinkage. In addition to examining the wool the buyer is aided in estimating the shrinkage by knowing the average amount of shrinkage for the section for a number of years back, also the weather conditions, such as an open or severe winter, sand storms, drought, etc., and something of the breeding of the sheep producing the wool under consideration, as well as the care given the sheep by the owner. It is the business of the buyer to possess this information, which guides him in estimating the shrinkage. As a rule, wool buyers become so proficient in this respect that they usually come within 1 per cent. of their estimated shrinkage.

112. Sample Lots Scoured to Ascertain Yield.—After the wool is received at the warehouses and graded the dealers frequently have sample lots scoured at a custom scouring plant in order to check up the estimated shrinkage. In many cases before buying from dealers the mills scour a sample lot consisting of one or more bags, as a test to determine the shrinkage, so the scoured cost of the wool will be definitely known.



FIG. 70.—Wool Scouring Machinery.

Tests on the same lot of wool often vary from 1 to 3 per cent. One test lot may not be thoroughly cleaned. The principal cause of difference, however, is the condition of the wool when weighed after drying. If the scoured wool is weighed immediately after drying it will naturally weigh less than the same lot after standing several hours and regaining moisture. The first is known as a "hot test" and the latter as a "cold test." Naturally the shrinkage figures higher with a hot test.

113. Practical Illustrations.—As practical illustrations showing the variation in shrinkage for different grades and wools some of the "sorting tests" from the preceding chapter are given below. All the sorts were allowed to stand overnight after drying in order to furnish cold tests.

Test Lot No. 1.—810 pounds sorted (loss in sorting 44 pounds):

% Blood Territory Clothing (Wyoming)	Grease Weight	Scoured Weight	Per Cent. Shrinkage
No. 1 Sort, main sort, $\frac{3}{8}$ blood.....	606 lbs.	316 lbs.	47.9%
No. 2 Sort, high $\frac{3}{8}$ blood	35 lbs.	15 lbs.	57.1%
No. 3 Sort, low sort, $\frac{1}{4}$ blood and common.	125 lbs.	70 lbs.	44.0%
Total	766 lbs.	401 lbs.	50.5%*

* Average percentage.

810 lbs. total grease weight.

401 lbs. total clean weight.

409 lbs. total loss in sorting and scouring.

409 of 100% = 50.5% average shrinkage from bag.

810

In order to find the clean cost per pound of the main sort a value must be estimated for the minor sorts. In placing a value on lots of this kind care must be taken not to place too high a figure on them, and by so doing cause the main sort to figure at a much lower cost than it should. It is far safer to be conservative and undervalue the minor sorts.

Consider the cost of the original wool at 35 cents per pound. The total cost of the wool amounts to $\$.35 \times 810 = \283.50 .

the total weight of the scoured wool makes the clean cost per pound \$.669.

When the percentage of shrinkage and grease cost per pound are known, the quickest and easiest method of finding the clean cost per pound is to deduct the percentage of shrinkage from 100 per cent., the remainder being the percentage of scoured wool. Next divide this percentage into the grease cost per pound, and this multiplied by 100 per cent. gives the clean cost per pound. It is self-evident that a 25-cent wool shrinking 50 per cent. will cost 50 cents scoured. The five-sort lot above, with an average shrinkage of 52.2 per cent., and costing 32 cents per pound in the grease, makes a better illustration of the method; 100 per cent., less 52.2 per cent. shrinkage, gives 47.8 per cent. clean wool or yield; \$.32 divided by the 47.8 per cent. and multiplied by 100 per cent. makes the clean cost per pound \$.669. This is the same cost as found by the first method, which divided the total cost by the total scoured weight.

In other words, the original grease pound has been reduced to .478 pound and therefore the original cost of \$.32 now represents .478 pound. It takes 2.09 + grease pounds to make one scoured pound; $$.32 \times 2.09 +$ gives \$.669 again as the clean cost per pound.

Test Lot No. 3.—The 570-pound test lot of $\frac{3}{8}$ blood Australian crossbred combing cost 47 cents per pound and the sorts scoured as follows:

	Grease Weight	Scoured Weight	Per Cent. Shrinkage
No. 1 Sort, $\frac{1}{2}$ blood combing	9 lbs.	5.20 lbs.	42.2%
No. 2 Sort, $\frac{3}{8}$ blood combing	553 lbs.	350.00 lbs.	36.7%
No. 3 Sort, $\frac{1}{4}$ blood combing	2 lbs.	1.32 lbs.	34.0%
No. 4 Sort, shorts	1 lb.	.52 lb.	48.0%
Total	565 lbs.	357.04 lbs.	37.36%*

* Average percentage.

The average shrinkage from the bale was 37.36 per cent. and the clean cost \$.7505 per pound.

114. **Table Giving Grease and Scoured Price Per Pound.**—The following table clearly shows the influence of shrinkage on prices. The prices at the top represent the cost per pound of scoured wool, and range from 40 to 70 cents covering all ordinary cases. The first column to the left gives the percentages of shrinkage, running from 55 per cent. to 75 per cent. This will cover practically all wools grown in the United States. To find the grease cost of a wool shrinking 60 per cent. and valued at 48 cents per scoured pound, follow the 60 per cent. line to the 48-cent column, and the grease price per pound is found to be 19.2 cents. On the other hand, if the grease value and shrinkage are known, the clean value can be found just as quickly.

SHRINKAGE TABLES

Clean Values on Top Line, Shrinkages at Right and Left, Grease Price Opposite Shrinkage

Clean	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	%
Price	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
55	18.0	18.4	18.9	19.3	19.8	20.2	20.7	21.1	21.6	22.0	22.5	22.9	23.4	23.8	24.3	24.7	55	
56	17.6	18.0	18.5	18.9	19.4	19.8	20.2	20.7	21.1	21.6	22.0	22.4	22.9	23.3	23.8	24.2	56	
57	17.2	17.6	18.1	18.5	18.9	19.3	19.8	20.2	20.6	21.1	21.5	21.9	22.4	22.8	23.2	23.7	57	
58	16.8	17.2	17.6	18.1	18.5	18.9	19.3	19.7	20.2	20.6	21.0	21.4	21.8	22.3	22.7	23.1	58	
59	16.4	16.8	17.2	17.6	18.0	18.4	18.9	19.3	19.7	20.1	20.5	20.9	21.3	21.7	22.1	22.6	59	
60	16.0	16.4	16.8	17.2	17.6	18.0	18.4	18.8	19.2	19.6	20.0	20.4	20.8	21.2	21.6	22.0	60	
61	15.6	16.0	16.4	16.8	17.2	17.5	17.9	18.3	18.7	19.1	19.5	19.9	20.3	20.7	21.1	21.5	61	
62	15.2	15.6	16.0	16.3	16.7	17.1	17.5	17.9	18.2	18.6	19.0	19.4	19.8	20.1	20.5	20.9	62	
63	14.8	15.2	15.5	15.9	16.3	16.6	17.0	17.4	17.8	18.1	18.5	18.9	19.2	19.6	20.0	20.3	63	
64	14.4	14.8	15.1	15.5	15.8	16.2	16.6	16.9	17.3	17.6	18.0	18.4	18.7	19.1	19.4	19.8	64	
65	14.0	14.3	14.7	15.1	15.4	15.7	16.1	16.4	16.8	17.1	17.5	17.9	18.2	18.6	18.9	19.3	65	
66	13.6	13.9	14.3	14.6	15.0	15.3	15.6	16.0	16.3	16.7	17.0	17.3	17.7	18.0	18.3	18.7	66	
67	13.2	13.5	13.9	14.2	14.5	14.8	15.2	15.5	15.8	16.2	16.5	16.8	17.2	17.5	17.8	18.2	67	
68	12.8	13.1	13.4	13.7	14.1	14.4	14.7	15.0	15.4	15.7	16.0	16.3	16.6	17.0	17.3	17.6	68	
69	12.4	12.7	13.0	13.3	13.6	13.9	14.3	14.6	14.9	15.2	15.5	15.8	16.1	16.4	16.7	17.1	69	
70	12.0	12.3	12.6	12.9	13.2	13.5	13.8	14.1	14.4	14.7	15.0	15.3	15.6	15.9	16.2	16.5	70	
71	11.6	11.9	12.2	12.5	12.8	13.0	13.3	13.6	13.9	14.2	14.5	14.8	15.1	15.4	15.7	16.0	71	
72	11.2	11.5	11.8	12.0	12.2	12.6	12.9	13.1	13.4	13.7	14.0	14.3	14.6	14.8	15.1	15.4	72	
73	10.8	11.0	11.3	11.6	11.9	12.1	12.4	12.7	13.0	13.2	13.5	13.8	14.0	14.3	14.6	14.9	73	
74	10.4	10.6	10.9	11.2	11.4	11.7	11.9	12.2	12.5	12.7	13.0	13.3	13.5	13.8	14.0	14.3	74	
75	10.0	10.2	10.5	10.7	11.0	11.2	11.5	11.8	12.0	12.2	12.5	12.8	13.0	13.2	13.5	13.8	75	

NOTE: Higher prices may be found as multiples of the figures in this table.

SHRINKAGE TABLES—Continued

Clean c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	%
Price	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71			
55	25.2	25.6	26.1	26.5	27.0	27.4	27.9	28.3	28.8	29.2	29.7	30.1	30.6	31.0	31.5	31.9			55
56	24.6	25.1	25.5	26.0	26.4	26.8	27.3	27.7	28.2	28.6	29.0	29.4	30.0	30.4	30.8	31.2			56
57	24.1	24.5	24.9	25.4	25.8	26.2	26.7	27.1	27.5	28.0	28.4	28.8	29.2	29.7	30.1	30.5			57
58	23.5	23.9	24.4	24.8	25.2	25.6	26.0	26.5	26.9	27.3	27.7	28.1	28.6	29.0	29.4	29.8			58
59	23.0	23.4	23.8	24.2	24.6	25.0	25.4	25.8	26.2	26.7	27.1	27.5	27.9	28.3	28.7	29.1			59
60	22.4	22.8	23.2	23.6	24.0	24.4	24.8	25.2	25.6	26.0	26.4	26.8	27.2	27.6	28.0	28.4			60
61	21.8	22.2	22.6	23.0	23.4	23.8	24.2	24.6	25.0	25.4	25.7	26.1	26.5	26.9	27.3	27.6			61
62	21.3	21.7	22.0	22.4	22.8	23.2	23.6	23.9	24.3	24.7	25.1	25.5	25.8	26.2	26.6	26.9			62
63	20.7	21.1	21.5	21.8	22.2	22.6	22.9	23.3	23.7	24.0	24.4	24.8	25.2	25.5	25.9	26.2			63
64	20.2	20.5	20.9	21.2	21.6	22.0	22.3	22.7	23.0	23.4	23.8	24.1	24.5	24.8	25.2	25.5			64
65	19.6	20.0	20.3	20.7	21.0	21.4	21.7	22.1	22.4	22.8	23.1	23.5	23.8	24.2	24.5	24.8			65
66	19.0	19.4	19.7	20.1	20.4	20.7	21.1	21.4	21.8	22.1	22.4	22.8	23.1	23.5	23.8	24.1			66
67	18.5	18.8	19.1	19.5	19.8	20.1	20.5	20.8	21.1	21.5	21.8	22.1	22.4	22.8	23.1	23.4			67
68	17.9	18.2	18.6	18.9	19.2	19.5	19.8	20.2	20.5	20.8	21.1	21.4	21.8	22.1	22.4	22.7			68
69	17.4	17.7	18.0	18.3	18.6	18.9	19.2	19.5	19.8	20.2	20.5	20.8	21.1	21.4	21.7	22.0			69
70	16.8	17.1	17.4	17.7	18.0	18.3	18.6	18.9	19.2	19.5	19.8	20.1	20.4	20.7	21.0	21.3			70
71	16.2	16.5	16.8	17.1	17.4	17.7	18.0	18.3	18.6	18.9	19.1	19.4	19.7	20.0	20.3	20.6			71
72	15.7	16.0	16.2	16.5	16.8	17.1	17.4	17.6	17.9	18.2	18.5	18.8	19.0	19.3	19.6	20.1			72
73	15.1	15.4	15.7	15.9	16.2	16.5	16.7	17.0	17.3	17.6	17.8	18.1	18.4	18.6	18.9	19.2			73
74	14.6	14.8	15.1	15.3	15.6	15.9	16.1	16.4	16.6	16.9	17.2	17.4	17.7	17.9	18.2	18.4			74
75	14.0	14.3	14.5	14.8	15.0	15.3	15.5	15.8	16.0	16.3	16.5	16.8	17.0	17.3	17.5	17.8			75

115. *Approximate Shrinkages of Various Wools.*—Preceding explanations have shown the reasons and conditions causing the wide range of shrinkages in various wools; and also account for different shrinkages from year to year in wools of the same grade and character from the same district. However, changes of the latter kind are never radical, and the average shrinkages for the various wools listed below afford a good relative comparison. It has been estimated that the average shrinkage of all United States wools is 55 per cent. The average shrinkage of our fine domestic fleeces has been estimated at 60 per cent. and the lower grade domestic wools average about 45 per cent. Fine territory wools average about 65 per cent. and the lower grades between 50 and 60 per cent. It is a well-known fact that territory wools, when shipped east, usually gain from 1 to 3 per cent. in weight, owing to the air near the seaboard being more humid. Some wools from river bottom lands in the Mississippi and Ohio Valleys lose weight on shipment to the seaboard.

The average shrinkage of foreign wools has been estimated as follows: Australia, 49 per cent.; South Africa, 58 per cent.; South America, 51 per cent. These estimates are made on the wool in bulk, and not on the net condition after skirting, which is the usual condition of these wools as they come on the market. Skirting reduces the total shrinkage from 5 to 20 per cent. It must be remembered that the "average shrinkage" here mentioned includes the total production with the variations in grade which accompany it. The wools of Great Britain and Europe are estimated to shrink at 25 per cent. and 34 per cent. respectively, but these wools are fleece washed, which reduces the shrinkage from 15 per cent. to 20 per cent. Fleece washing is seldom practiced in this country. It is accomplished by submerging the sheep previous to shearing in a tank of water. Foreign matter, such as dirt and sand, and suint are thus removed from the wool, but the yolk remains and must be scoured out.

116. Approximate Shrinkages of United States Wools (Bulk).

DOMESTIC		TERRITORY	
Grade	Shrinkage	Grade	Shrinkage
Full blood and $\frac{3}{4}$ blood	60%	Fine and fine medium	67%
One-half blood	52%	Medium	62%
Three-eighths blood	46%	Three-eighths blood	54%
One-quarter blood	43%	One-quarter blood	48%
Common	38%	Common	43%

117. Approximate Shrinkages of Choice Australian, South African, South American and New Zealand Skirted Wools (Net).

Grade	Geelong Riverina Port Phillip Victoria	Queensland Sydney New South Wales	West Aust. Adelaide South Australia	South America	Cape of Good Hope South Africa	New Zealand
66-74s (XX)	48%	50%	55%	58%	60%	55%
60-66s (X)	47%	49%	53%	56%	58%	52%
54-60s ($\frac{1}{2}$ blood)	40%	40%	44%	48%	54%	40%
48-54s ($\frac{3}{8}$ blood)	36%	37%	40%	40%	50%	35%
44-48s ($\frac{1}{4}$ blood)	32%	34%	38%	38%	46%	30%
40-44s (low $\frac{1}{4}$)	29%	31%	36%	35%	44%	26%
36-40s (common)	26%	28%	31%	32%	40%	23%

118. Approximate Shrinkages of Important British Fleece Washed Wools (Net).

Lincoln	20%	Shropshire	25%
Leicester	20%	Hampshire	30%
Cotswold	20%	Oxford	25%
Romney	20%	Dorset Horn	30%
Irish	18%	Cheviot	25%
Southdown	35%		

119. Shrinkage of Various United States Wools.—A good idea of the character of wool grown and average shrinkage in various States can be obtained from the following list:

	Shrinkage
Pennsylvania, West Virginia and Ohio, XX and X	56-62%
Indiana, $\frac{1}{4}$ and $\frac{3}{8}$ blood	38-43%
Illinois, $\frac{1}{4}$ and $\frac{3}{8}$ blood	45-47%
Missouri, $\frac{1}{4}$ and $\frac{3}{8}$ blood	43-45%
Northern California, medium and $\frac{3}{8}$ blood	55%
Southern California, fine and fine medium	72%
Texas Fall, fine and fine medium	58-64%
Texas Spring, fine and fine medium	64-72%
Idaho, medium and $\frac{3}{8}$ blood	50-56%
Wyoming, fine and fine medium	65-72%
Montana, fine and fine medium	63-69%
Montana, medium	57-60%
Arizona and New Mexico, fine to medium	60-73%
Washington, fine and fine medium	76-80%
Oregon Valley, braid to $\frac{1}{2}$ blood	40-55%
Oregon, Eastern, fine, fine medium and medium	60-70%
Kentucky, braid	35-40%
Virginia, braid	35-40%

CHAPTER VI

PULLED WOOLS

120. Source of Supply.—Pulled wool is obtained from the skins of slaughtered sheep. It is a by-product of the slaughtering and meat-packing industries. The large slaughtering houses also conduct the pulleries in most cases. In the United States the most important wool-pulling establishments are located in Chicago, St. Louis, New York City, St. Joseph, Mo., and Kansas City, and are conducted by such well-known meat packers as Swift & Co., Armour and Co., Morris & Co., Wilson & Co. and others. The four large firms mentioned slaughtered in their various main plants and branches a combined total estimated at about 7,963,590 sheep in 1923. There are about forty pulleries in this country, with an annual production ranging between 40,000,000 and 50,000,000 pounds. About 25 per cent. of the total pulled wools produced in the United States are eastern pulled.

Pulled wool is also known under numerous other names. The most common are skin wool, tanners' wool, glovers' wool and butchers' wool.

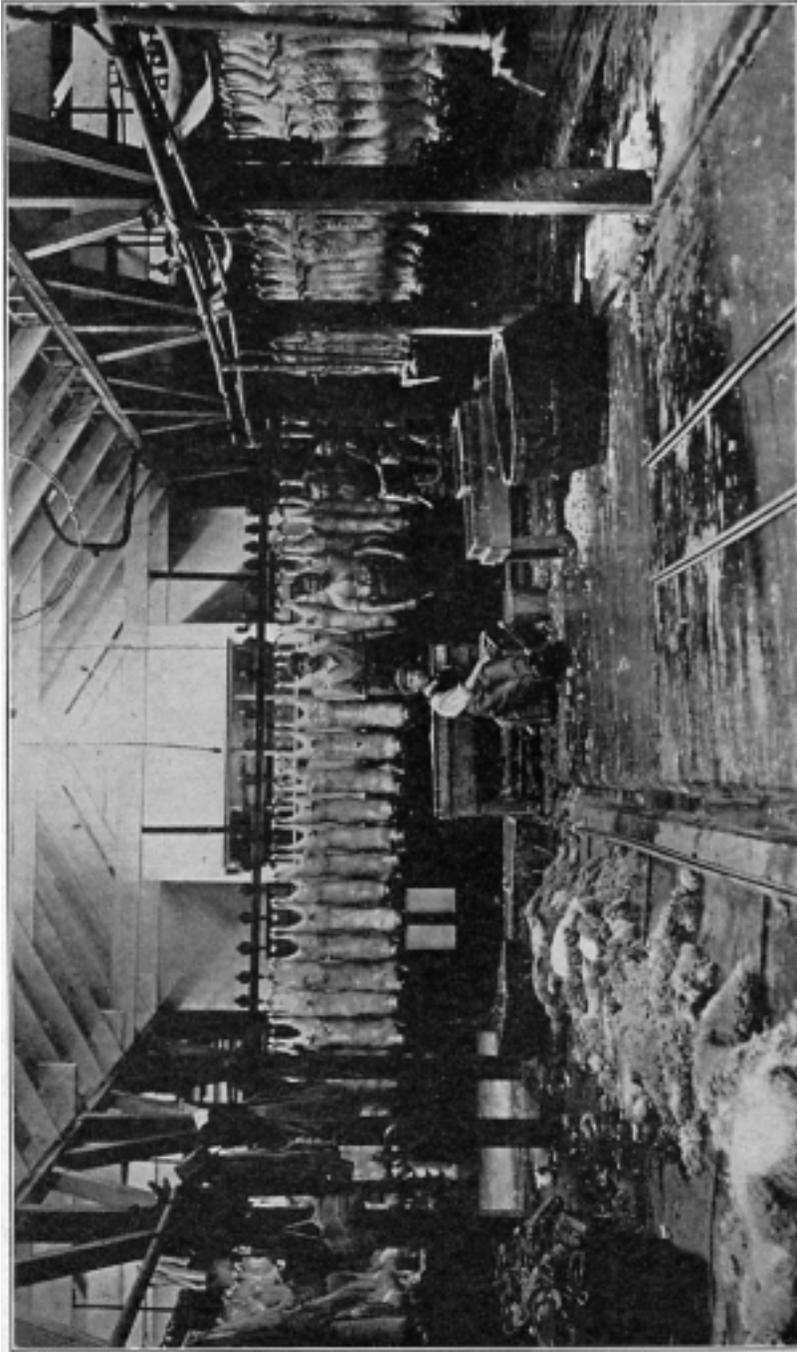
121. Three Methods of Pulling.—After the sheep have been slaughtered the skins are stripped from the bodies and the pelts are taken from the slaughter house to the wool-pulling establishment. When the wool has been removed from the skin, the latter is tanned and the leather is used for shoe linings, hat bands, book covers, roller leather and numerous novelties. The skin is more valuable than the wool, but before the skin is tanned it is necessary to remove all the wool. An exception to this is when the pelt is to be used for sheepskin coats, robes and rugs.

The three principal methods of pulling wool are the sweating, lime and depilatory processes.

122. Sweating Process.—The wool skins are hung on racks in a warm room with the atmosphere artificially moistened. The action of the heat and moisture on the skin loosens the roots of the wool so that it can be easily pulled out by the handful. Great care must be exercised when using this process, as the skins rot and decompose if left hanging too long. The sweating process is only slightly used in the United States. It is employed on inferior skin wools when the skin is of small value.

123. The Industry at Mazamet.—The most important center of the world's wool-pulling industry is Mazamet, a small city in the Department of Tarn, France. The sweating process is used at Mazamet, and the industry has been developed to a high point, employing over 2000 persons. The bulk of the fleeces is imported through the ports of Bordeaux and Marseilles. The establishment of the frozen-mutton industries of Australia and South America created increased quantities of wool skins, and caused pulled wool to become a considerable factor in the world's wool supply. There are a number of wool-pulling establishments in Australia and Argentina, but the bulk of the wool skins is shipped to Mazamet. In 1910 Mazamet received pelts which totaled 124,462,000 pounds. The source of origin follows: From the River Platte, 81,790,000 pounds; from Australia and New Zealand, 34,207,000 pounds; from South and North Africa, France, Spain and all others, 8,465,000 pounds. These figures represent the gross weight, which includes both skin and wool. The following quantities of pulled wool were shipped from Mazamet in 1910: 43,940,000 pounds of washed wool and 11,782,000 pounds of scoured wool. England purchases about 65 per cent. of the washed wool prepared at Mazamet.

Germany and Austria also prepare considerable pulled wool. German pulleries are unusually severe on the wool, which is usually from unimproved sheep and very inferior. The bulk of the sheepskins are purchased in Russia, Turkey, the Balkans, India and China. The lime process is used in Austria, and in addition to the domestic pelts the Austrian pulleries receive the bulk of



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Fig. 71.—The Source of Pulled Wools, Sheep Slaughter House, Canterbury, New Zealand.

the skins produced in Servia and Asia Minor. The Austrian pulled wools are superior in quality to the German skin wools.

124. Lime Process.—The wool skins coming from the slaughter house are thrown into tanks of water and allowed to soak overnight to remove suint, dirt and other foreign matter in the wool. The pelts are taken from the water tanks to scrubbing machines, which further cleanse the wool, but the natural grease remains untouched. This process is better known as brushing, and practically all pulled wools undergo it. The machine has a revolving steel cylinder placed over a lattice feeding apron. The cylinder has a spiral knife or edge with about a two-inch pitch covering its entire working surface similar to a screw thread. In front of the cylinder is a perforated water pipe, which operates under 90 pounds pressure and throws the cold water on the fleece side of the pelt as the apron carries it to the cylinder. The working edges of the cylinder are blunt, do not cut the wool, but give a scrubbing action, and are very effective in removing burrs. The next step is to remove any pieces of fat and flesh adhering to the pelts. The pelts are then ready for "painting," which is the most important operation in the process. The skins are turned with the flesh side up and are carefully painted with slack lime, which opens the skin pores and loosens the wool roots. The lime remains on the skins overnight. It is then cleaned off, and the skins are taken to the pulling room.

The lime process succeeded the sweating process and was the method employed in the United States and Australia until recent years, when it was largely superseded by the depilatory process. Pulled wools obtained by the lime process are also known as "slipe" wools.

125. Depilatory Process.—This process is the same as the lime process, with one exception. In the painting room, sodium sulphide, sulphuric acid and oyster shells form the compound, which is applied to the flesh side of the skins instead of lime,



Fig. 72.—Painting Room, Applying Depilatory to Flesh Side of Pelts.

and allowed to stand about ten hours. It is the most satisfactory process, causing the least damage to both wool and skin.

126. Inferior Qualities of Pulled Wools.—All pulled wools are inferior to fleece wools of equal grade and origin. They are especially deficient in spinning properties. The fibers do not adhere so closely, and will not take twist so readily as fleece wool. Yarns made from pulled wool are more open and loftier than yarn of even grade made from fleece wool. They are also harsh, brittle and lack elasticity compared with fleece wools. The characteristics of pulled wools can be expressed by the term “dead fiber” as compared with “live fibered” virgin wools.

Pulled wools are extremely hard to dye satisfactorily, due to the action of the painting preparation. This is especially true of wools prepared by the lime process, in which solid insoluble particles of lime stop up the medulla and the end pores of the cortical layer and the scale joints. This causes the fiber to resist impregnation by solutions. As a consequence the fibers do not absorb the dyestuff and unevenness results. Another factor which also adds to the above difficulty is the retention of the root, which is rounded off and closed by the hardening of the juices in the hair follicle. Neither end of the fiber in pulled wool is freshly cut, causing another difficulty in absorbing solutions.

127. Grading and Sorting.—When the wool skins reach the pulling room they are first graded according to the fineness and length of the wool. All kinds and breeds of sheep are slaughtered, and the pelts carry the widest range of wools imaginable. The length of fiber in pulled wools is governed principally by the length of time which has elapsed between shearing and slaughtering. The wools from the Merino breeds are classed as clothing, while the wools from the medium and long-wool breeds are long enough for combing after about six months' growth. Practically all the wools pulled from June to October inclusive are carding wools.

The pelts are ready for pulling and sorting after being graded. The puller throws the pelt on a table, fleece side up, and quickly

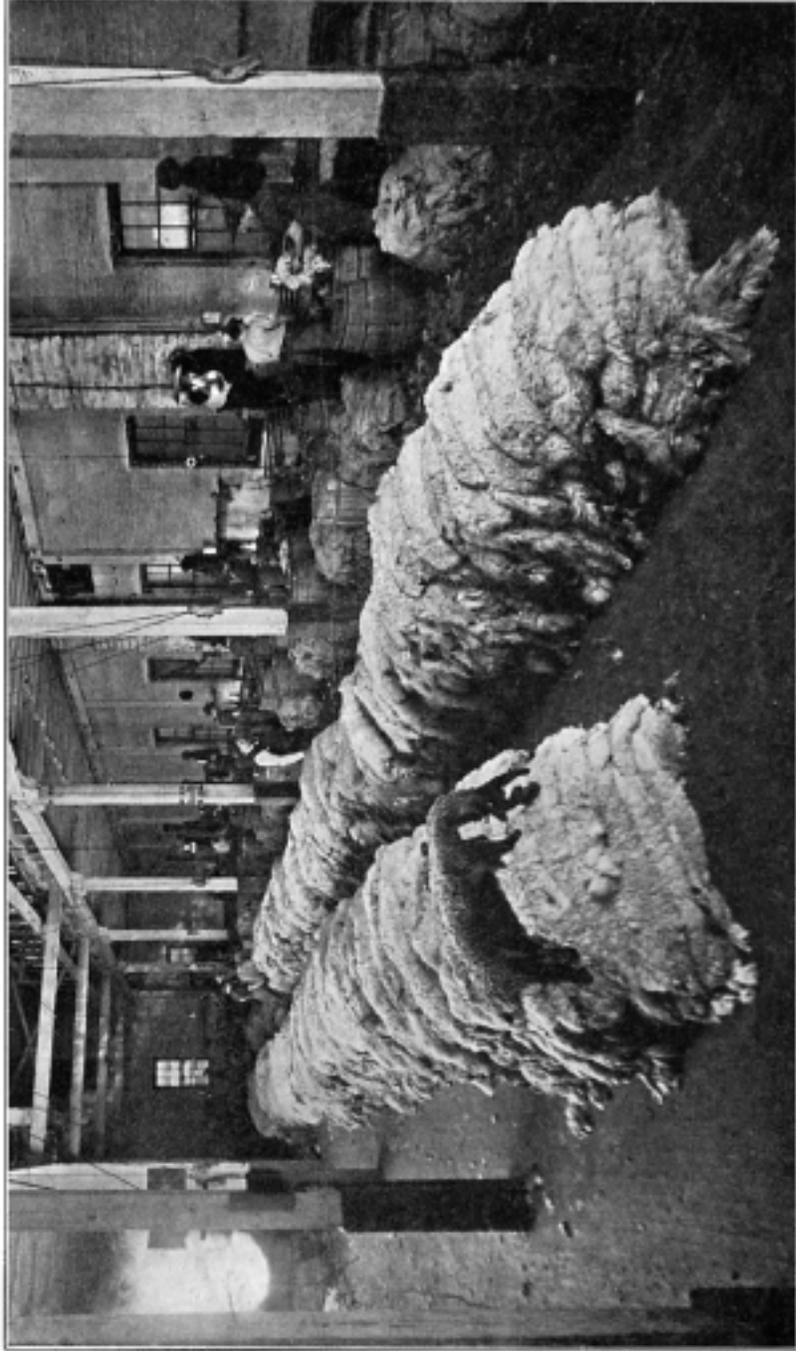


FIG. 73.—Pulling Room.

pulls the wool from the skin by the handful, throwing it into one of several baskets or barrels conveniently placed to receive the different sorts. When the receptacles are filled the wool is dried and taken to the storeroom, where it is dumped into bins. Each individual fleece loses its identity. No attempt is made to sort closely; only four grades are used, AA, A, B and C.

AA represents the XX and X in domestic grades and fine and fine medium in territory grades. A equals $\frac{1}{2}$ blood domestic and medium territory. B corresponds to two grades in both domestic and territory—namely, $\frac{3}{8}$ blood and $\frac{1}{4}$ blood. C covers both common and braid in the other two classifications. Another system of grading pulled wools only uses three grades—fine, medium and coarse. Fine would correspond to $\frac{1}{2}$ blood and above, medium would cover $\frac{3}{8}$ and $\frac{1}{4}$ blood, and coarse would represent common and braid.

The puller usually makes very few sorts from a skin. A fine fleece would be divided into AA, A, and the low parts would be thrown into B. A medium fleece would be given two sorts, B and C, while a coarse fleece would be thrown entirely into C. It must also be borne in mind that these wools are also sorted for clothing and combing staple.

The very short wool obtained from sheep sheared less than a month before slaughtering averages about one-fourth of an inch, and is known as "shearlings." This wool is used in the manufacture of hats and felts.

128. Uses of Pulled Wool.—While pulled wools are sorted as clothing and combing, a considerable quantity of the latter is spun on the woolen system for making strong, heavy warp yarns to be used in carpets and paper-mill felts. Pulled wools are used in medium and coarse fabrics, and large quantities are consumed by woolen mills featuring all-wool fabrics. They are also used in blends with wool substitutes and with cotton for making merino yarn. Pulled wools are especially adapted for use in soft-twist knitting yarns. Blanket mills use large quantities of the finer grades of pulled wool, and it makes a more attractive bed blanket

than virgin wool. The nap covers better, and the blanket has a lofty and spongy feel. There is a trifle less warmth in a blanket made of pulled wool than a similar blanket made of fleece wool. Yarns made with pulled wools are more open and loftier than those made from fleece wools. This is due to the inferior working properties, as the pulled wool fibers will not cling so closely together in drafting and twisting. When manufactured it is very difficult to distinguish between pulled and live wool.

Pulled wool is largely used in the manufacture of soft-twist knitting yarns, bed blankets, carpets and rugs, woven paper-mill felts, cheviots, cassimeres, flannels and dress goods.

129. Marketing.—Some of the large packing houses sell their pulled wool under their own name, while others have formed subsidiary companies to handle their wool. The wool merchant is not such an important factor in marketing pulled wool. While many of the wool merchants purchase pulled wools and sell them to the mills, the majority of the mills using pulled wools purchase directly from the pulling house.

The pulling houses scour large quantities of pulled wool, usually compressing it into bales resembling cotton bales, though smaller. Over half of our pulled wool is marketed in a scoured condition. The combing wools, however, are always sold in the grease, but of course the shrinkage is much less than the original shrinkage, due to the soaking in water and the brushing process. The price usually ranges from 10 per cent. to 20 per cent. less than similar fleece wool, depending on the market. Pulled wool amounts to 20 per cent. of the total wool produced in the United States. The average yearly production of this class of wool on a scoured basis is 30,000,000 pounds. Chicago is the most important producing city for pulled wools, and Boston and Philadelphia are the principal selling outlets.

130. Shrinkages.—The average shrinkage of pulled wools for this country is 27 per cent. It must be borne in mind that all pulled wools are washed in process, and the shrinkage which the

dealer and manufacturer has to consider is based on the wool in the washed state and not on its original condition in the fleece. Approximate shrinkages for United States pulled wools follow: AA, 35 per cent.; A, 25-33 per cent.; B, 12-20 per cent.; C, 15-25 per cent.

The actual shrinkage of pulled wools is greater than that of the same wool sheared. This is due to the fleece picking up considerable foreign matter, such as dust, manure, bedding, etc., while in transit to the slaughter house.

131. Mazamet Pulled Wools.—A list of Mazamet pulled wools with their description, quality and shrinkage follows:

	Quality	Shrinkage	Yield
Good fourths, long Buenos Aires	46s	10%	90%
Average fourths, long Buenos Aires	46s	15%	85%
Earthy fourths, long Buenos Aires	46s	28%	72%
Good fourths, ½ long Buenos Aires	46s	11%	89%
Average fourths, ½ long Buenos Aires	46s	15%	85%
Good thirds, long Buenos Aires	48-50s	14%	86%
Average thirds, long Buenos Aires	48-50s	18%	82%
Earthy thirds, long Buenos Aires	48-50s	28%	72%
Good thirds, ½ long Buenos Aires	48-50s	15%	85%
Average thirds, ½ long Buenos Aires	48-50s	18%	82%
Good seconds, long Buenos Aires	56s	17%	83%
Average seconds, long Buenos Aires	56s	22%	78%
Earthy seconds, long Buenos Aires	56s	34%	66%
Good firsts, long Buenos Aires	60-64s	28%	72%
Average firsts, long Buenos Aires	60-64s	30%	70%
Good fourths, long Montevideo	46s	14%	86%
Good thirds, long Montevideo	48-50s	18%	82%
Good seconds, long Montevideo	56s	22%	78%
Good firsts, long Montevideo	60-64s	36%	64%
Australian thirds, fourths, long super	46-50s	26%	74%
Australian seconds, long super	56s	22%	78%
Australian firsts, long super	64-70s	29%	71%

CHAPTER VII

MOHAIR AND OTHER TEXTILE HAIR FIBERS

132. Distinction Between Hair and Wool.—It is impossible to make a hard and fast distinction between hair and wool, as the coarser wools gradually blend to the structure and characteristics of hair. As fiber approaches hair the serrations become fewer, the diameter increases, the felting property decreases and the luster becomes greater. Hair, strictly speaking, is straight, non-elastic and glossy; stronger, smoother and usually coarser than wool, and is totally deficient in felting properties. In hairs the medulla or core is often more prominent than the surrounding cortical layer of fibrous cells. The epidermal scales are absent, except in cashmere, vicuna, mohair and alpaca, which possess thin, flat scales of comparatively large area. Cashmere and vicuna and the best grades of mohair and alpaca do not show any medulla, and more closely approach wool than any other hair fibers.

133. Mohair.—Mohair is the name given the hair grown by the Angora goat. The word "mohair" is derived from the French "moheré," and primarily from the Arabic "mukhayyar," meaning mohair cloth. The Angora goat is a native of Asia Minor, and takes its name from the district of Angora, which is the center of the industry. The Turks have raised Angora goats for over 2000 years. The original Angora type has been changed, due to the Turks crossing the pure-bred flocks with the common "Kurd" goats. This resulted in so great an infusion of inferior blood that no "pure-blood" Angoras remain. This crossing has coarsened the hair, and two distinct types of hair are now produced even on the best Angoras—namely, the soft wool-hair and the undesirable stiff beard-hair. Mohair is featured by its strength and high luster.

134. Sources of Supply.—The three principal mohair-producing countries are South Africa, Turkey and the United States. Russia and France produce mohair to some extent, but the quantities are small compared with the former countries. The annual clips are estimated for South Africa at 25,000,000 to 30,000,000 pounds; Turkey, 12,000,000 to 15,000,000 pounds, and the United States, 6,000,000 to 8,000,000. Turkish mohair is superior to the others. The flocks of South Africa and the United States were established by importations direct from Turkey, but no more Angoras can be obtained, as the Turkish Government passed an embargo prohibiting their exportation, attempting to gain a monopoly of the mohair industry. Our country also places very severe restrictions on the importation of any class of live stock from Asiatic countries as a safeguard against contagious diseases. Turkey was too late in her prohibitive measures, as enough good breeding stock had been secured to firmly establish the Angora flocks in South Africa and this country. Within the last few years the flocks have been considerably increased in this country, and additional breeding stock was brought from South Africa. The South African Government, to prevent the decline of its mohair industry through the loss of the best breeding stock, prohibited the further exportation of Angora goats.

In both South Africa and the United States the Angoras are mostly crossed with native goats. In this country the mohair industry is confined to Texas, New Mexico, Arizona and to a smaller extent in California and Oregon.

135. Type Description of Angora Goat.—Modern Angora goats are bred for size and strength of constitution, but a tendency to coarseness must be avoided, as such animals will not produce the finest fleeces. The Angora is smaller than the ordinary goat. The terms used to distinguish the various members of the goat family follow: The buck is a male used for breeding. A wether is a castrated male, a doe is a female goat, and a kid is the young offspring. Bucks are heavier than wethers, which in turn are heavier than does. From 60 to 80 pounds is the range for bucks.

The average weight of Angora goats in the United States is 60 pounds.

The chest should be broad and deep, indicating a strong constitution; the body round, and the legs short and strong. The head should be upright and clean cut, with a bright eye and a broad muzzle. The horns of the male turn upward and outward with a backward twist, and have an average length of 18 to 20 inches, while the horns of the doe are about one-half the length,

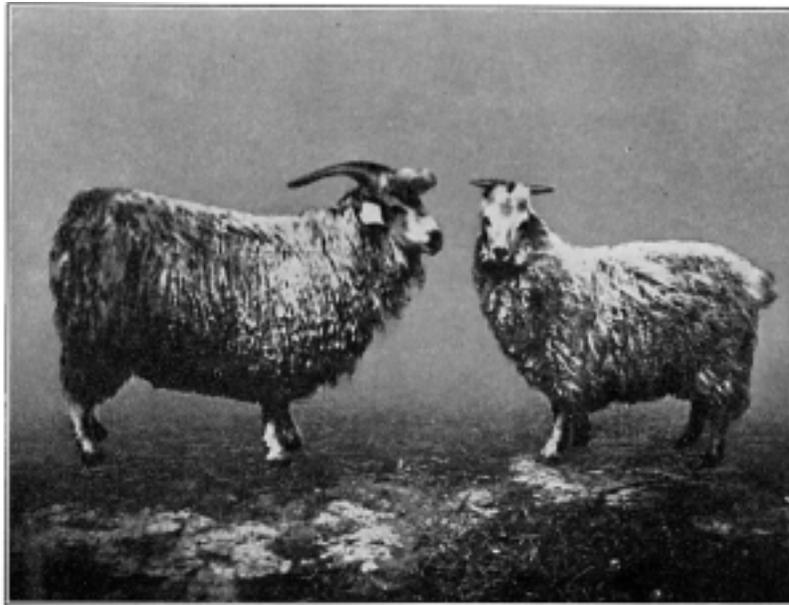


FIG. 74.—Angora Buck and Doe.

turning upward and backward, with only a slight inclination to twist. The back should be straight and the shoulders of equal height. A sloping rump must be avoided.

The color of the fleece should be a shining, silky white. Dark-colored fibers depreciate the value, and while nearly all fleeces contain some kemp (chalk-white dead fibers without luster), it is always objectionable, and the smaller the amount present, the better. Kemp is always coarser than the rest of the fleece. Mohair has even a greater affinity for dyes than wool.

136. Caring for Goats on the Range.—In general, the goats are handled much the same as the sheep, save that the constant presence of the herder is not necessary. Many goatherders turn the animals out of the pens in the early morning, sending a dog with them to keep away wild animals. During the day the herder rides out to the herd once or twice to note the direction in which they are feeding. Usually if they are allowed to graze alone the goats will travel too fast and cover too much country, which is injurious to the range as well as the animals. Careful herders remain with their goats and check this tendency to travel.

The necessary equipment for raising goats is somewhat similar to that for sheep raising. It is especially necessary that proper sheds should be furnished to shelter the goats during wet weather, as they are very susceptible to moisture. Contrary to the general belief, no domestic animal is more fastidious as to its food than the Angora. When fed hay or other artificial food every care must be taken to keep the food away from the mud and dirt; Angoras will refuse to touch any food which is soiled or trampled in the ground. Muddy or foul drinking water will not answer, and fresh water must be furnished if these animals are to do well either on the range or in feed lots.

Angoras will always endeavor to find shelter from approaching storm, and must have sheds under which to creep during stormy weather. As long as it is clear and cold, or the snow is dry, they are comfortable and remain out; but their long, open fleece is soon soaked in the rain, and is seriously affected by the moisture on their bodies.

Angoras require plenty of air and light, and all sheds provided must be open as much as is compatible with keeping out rain or snow. The pens should never become muddy, for the long, silky fleece will easily pick up a great weight of mud, which not only burdens the animal but stains and injures the fleece as well.

Contrary to the general idea, the raising of Angora goats is rather difficult. The young are more delicate than lambs, and their mortality is greater, especially among the well-bred animals.

Incessant personal care is absolutely necessary in raising the kids until they are about two months old. The methods of raising the kids are many, especially during their early weeks, when it is inadvisable to let them follow the doe out upon the ranges.

The browsing habit of the goats renders them available even on land where other domestic animals would not find sufficient feed. Goats relish and thrive on all manner of browses; on leaves, shrubs and small trees, and on moderate amounts of weeds and grass. Despite the general opinion, goats will not do well on brush alone, although a large part of their food is browse. Because of their liking for browsing, goats are occasionally introduced into many States solely for the purpose of clearing the land of brush and bringing it into pasturage. This same browsing habit has caused their exclusion from many parts of the national forests throughout the West, and from watersheds where it is desirable to protect the brushy cover in order to prevent erosion and the filling up by silt of the reservoirs for water supply.

The land upon which goats thrive best being generally useless for other domestic animals, its actual or rental value is much below that of pasture land for cattle or sheep, although on the various national forests practically the same fees are charged for goats as for sheep. The total average yearly cost for grazing for one goat is about the same as that for one sheep in the same region, or sometimes a little less. This statement refers, of course, to range-raised goats and not to those raised in small flocks upon farms or within small pastures.

137. Shearing and Preparing Mohair.—Goats do not take kindly to shearing and are much harder to handle than sheep. Various methods are used to aid the shearer. One of the best is a specially built table with collapsible sides, forming a trough. The goat is placed in the trough on its feet and a strap passed around the goat's neck and fastened to each side of the table. The legs and belly are then shorn. The legs of the goat are next tied together, the strap removed from the neck; the sides of the table lowered and fastened level with the centerpiece. The goat is laid



Fig. 75.—Shearing Angora Goats.
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on the top of the table and the shearing is completed. Both machine and hand shearing are used.

In Turkey the goats are shorn only once a year, but in South Africa shearing is usually necessary twice a year. In the United States, the goats are shorn twice a year, except in Oregon and Northern California. Warm climates usually compel shearing twice a year, on account of the tendency of the hair to come out. Shearing should take place before the goat starts to shed, as the fiber loses its life and luster during shedding. The time of shearing depends on the weather and the condition of the fleece. If the shearing is done too early the goats may suffer from the cold.

The spring shearing in the Southwest takes place in March or April, and the fall shearing in September or October. The cost of shearing varies from 10 to 15 cents per head. The average weight of American Angora fleeces is about 2.25 pounds.* The average for Turkish Angoras is 2.75 pounds per head, while the fleeces of South Africa average 3.5 pounds.

The fleeces from the kids, wethers, does and bucks should be packed in separate bags, as they represent different grades. Stained locks and tags should also be in a separate bag. After shearing, the fleeces are compactly rolled with the cut side out, and should not be tied. The presence of sisal or similar string frequently used in tying the fleeces will often reduce the price of mohair 25 per cent., as the fibers from the string often become mixed with the hair, and are carried through the various manufacturing processes, causing a defective finished product.

The grower receives a better price for his clip when it reaches the market in a good, presentable condition, as less time and labor are required to prepare it for manufacturing than is the case with mixed and poorly prepared clips.

138. Grading and Sorting.—The mohair fleeces are usually graded at the mill. The principal factors determining the various mill grades are length of staple, luster, amount of kemp present

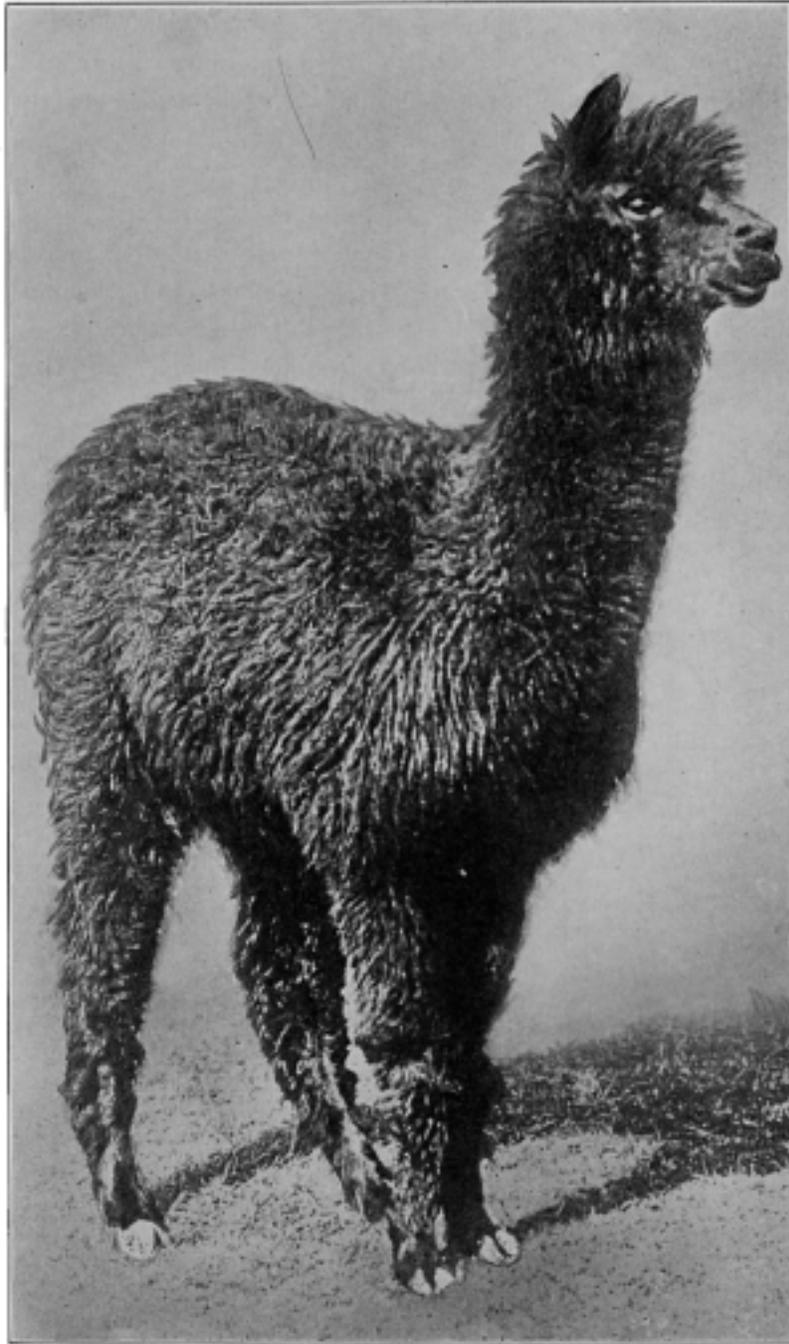
* In 1919 this average had increased to 3.5 pounds, and in 1923 to 4.2 pounds.

and fineness of fiber. Fineness determines the grade when considering wool, but this property is of less importance with mohair, which is seldom spun to very fine numbers. The degree of luster is very important. The length largely determines the value. The staple fabrics made from mohair require combed yarns. Six inches and over are required for combed mohair yarns; the shorter fibers are spun on the woolen system. Much of the mohair produced in the Southwest is short. High-grade flocks in Oregon and northern California, where the goats are only sheared once a year, produce hair averaging from 10 to 15 inches, but coarser than Texas hair. Our domestic mohair averages from four to ten inches in length. Every effort is made to grow as long a staple as possible. Foreign mohair usually runs from 9 to 12 inches in length.

As a rule, the finer mohair is shorter stapled. The influence of breed, climate, soil and care is as great in determining the character of hair produced as the same factors with the wool of sheep. Domestic mohair contains about 15 per cent. more kemp than the foreign, but by better breeding this difference is being gradually reduced. Young Angoras produce the best quality of mohair; kids, yearlings, and does are preferred in the order named. As the goat grows older, the hair becomes coarser, thinner and straighter. To produce the finest grade of mohair, the flocks must be kept young and active.

First-class foreign mohair will spin to 60s Bradford system, while our first-class domestic mohair will only spin to 40s. Domestic mohair ranges from 15 to 25 per cent. shrinkage. The shrinkage varies with the quality and section grown. The finer grades shrink heavier than the coarser qualities. Mohair produced in the Southwest shrinks more than that grown in the Northwest. Foreign mohair averages 14 per cent. shrinkage.

Sorting is performed on mohair fleeces in the same manner as wool, only less attention is paid to small differences in fineness. The sorts are made according to length, luster and kemp. No



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FIG. 76.—Alpaca.

generally accepted grades are used in stating the quality of mohair. Some of the methods follow:

Fine combing or carding. Best combing or carding. First combing or carding.
 Medium comb. or carding. Good combing or carding. Second comb. or carding.
 Coarse comb. or carding. Ordinary comb. or carding. Third comb. or carding.

139. Market Quotations for Mohair.—A typical market report on domestic and foreign mohair will be found in the appendix.

140. Marketing Mohair.—Our domestic production only supplies about two-thirds of the total mohair consumed in manufacturing in this country. The domestic mohair is usually sold by the grower, individually or through growers' association selling agencies, direct to the mills. Occasionally wool merchants in Boston and Philadelphia receive a clip on consignment, or sell to the mills from samples furnished by the grower. When sales are made by the latter method the grower usually ships the mohair direct to the purchaser. The selling commission usually charged is $\frac{1}{2}$ cent per pound.

Most of the foreign mohair entering this country is imported by wool merchants in Boston, Philadelphia and New York.

141. Uses of Mohair.—Fabrics made from mohair are remarkable for their durability and brilliancy. Staple goods manufactured from mohair include plushes, coat linings and lap robes. Changes in fashion influence the demand for mohair, and some seasons when mohair dress goods, summer suitings, bathing suits, braids, henriettas, zibilines, astrakhans and other novelty cloakings using mohair, imitation furs, etc., are in style, the demand usually exceeds the capacity of the mills spinning this fiber. The best mohair plushes are almost indestructible, and are used by railroads as the most durable of seat coverings.

Bradford, England, is the largest mohair manufacturing center, and exports mohair fabrics in large quantities to the Continent and the British colonies.

Kansas City is the only important goat market in the United States. The skins, tanned with the hair on, are extensively used for carriage robes, muffs and trimmings for coats and capes.

142. **Alpaca.**—This fiber is obtained from the alpaca, and the bulk of it represents a growth of two years with the fleeces averaging five pounds. At times, when they are hard pressed for money, the Indians shear their alpacas before the fleece has attained a good length, but only receive a small return, as such stock is undesirable and cannot be processed on the worsted system. The alpaca fiber closely resembles the better grades of mohair, and is sometimes blended with them. It is softer, finer and less lustrous than mohair. The length varies from 10 to 16 inches. The shrinkage is from 15 to 20 per cent. Contrary to the custom in wool, reddish brown and not white is the most valuable color in alpaca. The color varies from white, through brown, to black. Alpaca is required in certain dress goods fabrics and high-grade coat linings.

143. **Vicuna.**—Vicuna is produced by the animal of that name. It is an exceedingly fine, delicate and soft fiber, somewhat resembling alpaca, but much shorter and softer. It is spun on the woolen system, the length averaging between two and three inches. The color is usually reddish brown. Vicuna is required in bona fide montagnac overcoatings, and is sometimes present in very fine underwear.

144. **Llama.**—This fiber also receives its name from the animal producing it. It is usually brown. Llama is inferior to alpaca, being coarser and shorter.

145. **Summary on Alpaca, Vicuna and Llama.**—The animals producing these fibers are peculiar to the Andes in the southern part of Peru and adjoining territory in Bolivia. They are all of the same general species, being closely related to one another, and are best described as small, goat-like camels. The alpaca and llama have been domesticated. The llama is used as a burden-carrying animal, but is being supplanted by burros, and is gradually disappearing. The alpaca thrives in a restricted territory, not lower than 5000 feet. The estimated number of alpacas in Peru is 1,000,000.

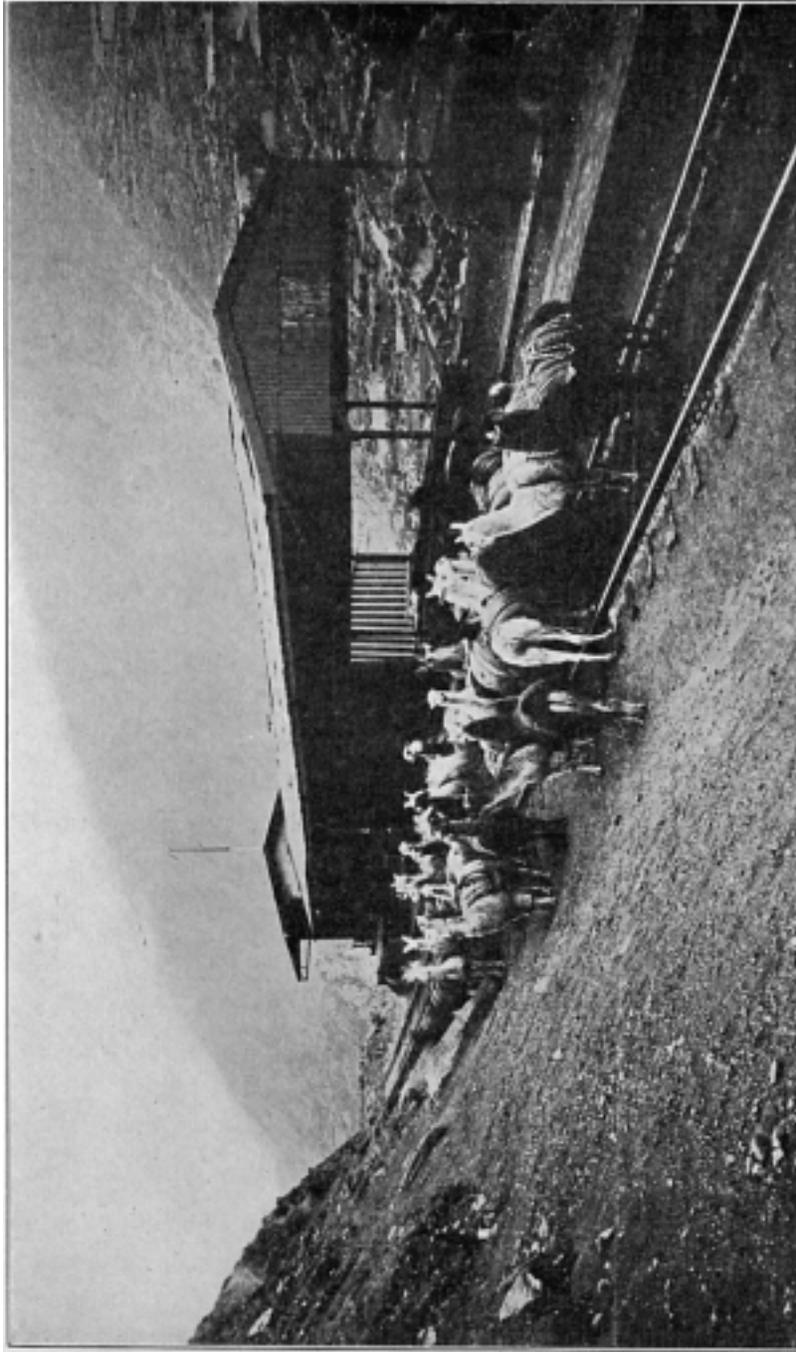


Fig. 77.—Llamas, San Mateo, Peru.
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The vicuna is found in the same regions as the alpaca, but usually at a higher elevation. These animals are wild, and run in herds near the regions of perpetual snow. They resist all attempts at domestication, and unfortunately are fast becoming extinct, as the fleece is only obtained after the animal is shot. The killing of vicunas is now prohibited by law. The small quantity of vicuna now exported is supposed to come from animals which have met a natural or accidental death. Vicuna brings \$2.50 and \$3.00 per pound, and is seldom seen in the United States. The small quantity now available is exported to France. The exportation of live alpacas and vicunas has been prohibited by Peru, as they invariably die when removed from their native haunts.

These three fibers possess the same general characteristics, varying in length, softness, fineness and luster. As with the Angora goat, two classes of hair are present in every fleece, the stiff beard-hair and the soft wool-hair.

Arequipa, the principal city in southern Peru, is the market for the entire production of these fibers. The seaport for Arequipa is Mollendo. On receipt at the warehouses in Arequipa the stock is first washed and then sorted. The alpaca is sorted into five qualities by Indian women. The grades are fine, coarse, pulled, shorts and pieces or locks. The first two qualities are then sorted into five grades according to color. Almost the total production of alpaca and vicuna is exported, but a large portion of the llama is consumed by Peruvian mills and Indian manufactures. The following represent average annual exportations: alpaca, 5,000,000 pounds; llama, 2,000,000 pounds, and vicuna, 3000 pounds. The alpaca is usually distributed as follows: Great Britain, one-half; France, one-third, and the United States, one-fifth.

146. Cashmere.—This fiber is obtained from the native Cashmere and Thibet goats which are found in the Himalayan Mountains of Asia. The principal districts for cashmere are the provinces of Cashmere in northern India and Thibet in southwestern

China. Cashmere is grayish in color and is noted for its soft, silky qualities. The goats grow two qualities of fiber; the outer fibers are long, coarser beard-hairs, $3\frac{1}{2}$ to $4\frac{1}{2}$ inches long, and the under coat is of fine, soft down-hairs, 1 to $3\frac{1}{2}$ inches long. In making the finest fabrics, the long beard-hairs must be sorted out. The down-hair is used in making the famous Cashmere and Indian shawls. It is usually spun on the woolen system. The Cashmere goats are not sheared, the hair is obtained when the goats shed their fleeces in the spring, or it is removed by combing. Each fleece only weighs about half of a pound. The production is manufactured in India. In working properties, cashmere more closely resembles wool than any other textile fiber.

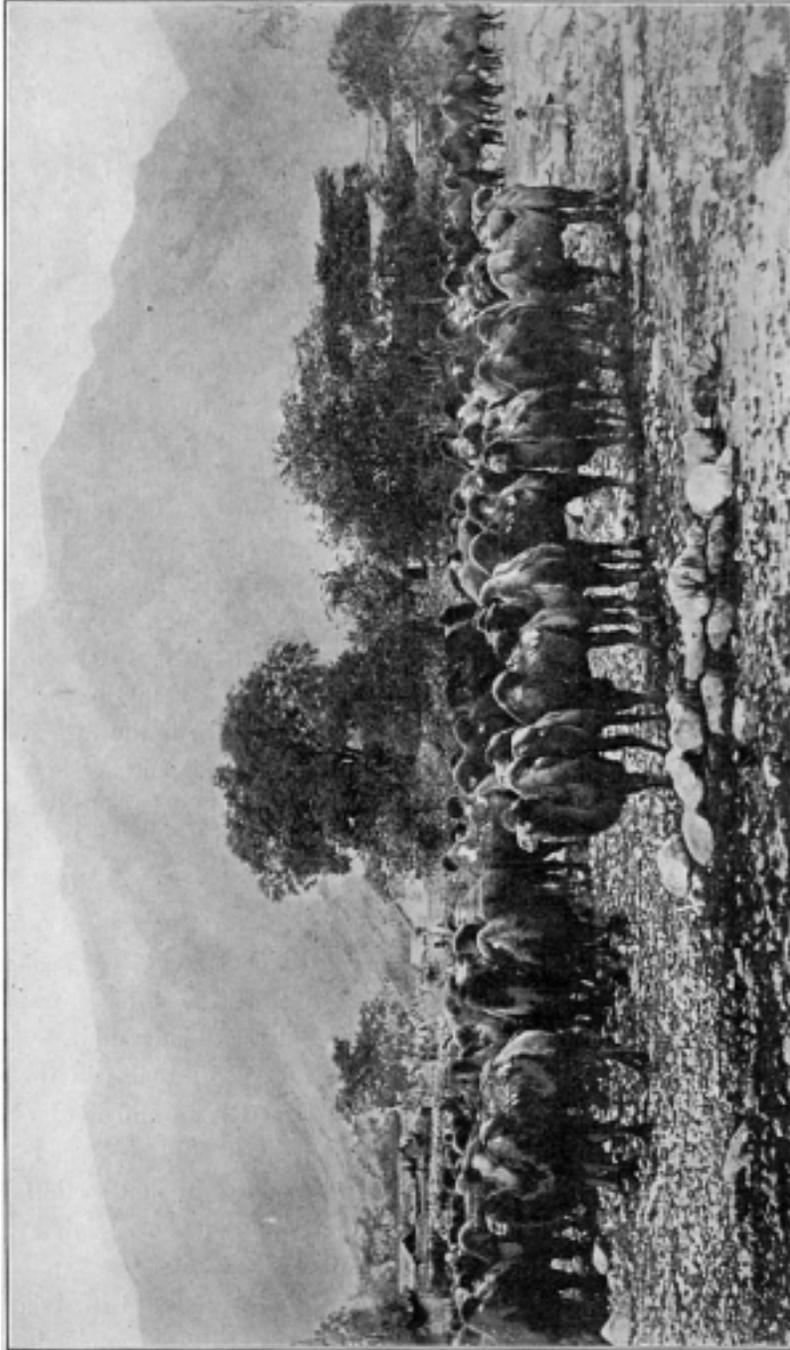
147. Bombay Hair.—This fiber is similar, but inferior, to cashmere, and is produced in India. Bombay hair is shipped to England and is used in dress goods and knit goods.

148. Camel Hair.—The principal sources of supply are Russia and China. The former annually exports about 8,000,000 pounds and China about 3,000,000 pounds. Great Britain is the largest consumer, taking 6,000,000 pounds, and the United States follows with 4,000,000 pounds, nearly all of which is shipped via Liverpool.

All Asiatic camels are of the same race, but climatic conditions and the care and treatment given the animals have their effect on the quality of the hair. In the hot southern countries the hair is shorter, stubbier and of little use. In Northern and Central Asia the milder climate gives longer, sounder and finer hair.

Most of the camel hair used in this country originates in the Russian steppes between the Volga and Ural Rivers and bordering on the Caspian Sea. It is collected, packed and shipped to England or this country from several large cities in that section, or is sent up the Volga River and sold at the big annual fair at Nijni Novgorod in August and September.

Considerable short-stapled camel hair is also produced in Asia Minor, Arabia and Northern Africa, but is mostly consumed in



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Fig. 78.—Group of Camels in the Nan Kov Pass, Great Wall, China.

local manufactures, and is seldom exported. Very little short-stapled fiber, such as the Central Asia kinds, is used in this country.

Camel hair is shipped without any preparation other than a rough sorting for grade. The shrinkage usually falls between 25 and 35 per cent.

The fiber is remarkable for its great strength and softness. The camel, like the Angora goat and similar hair-producing animals, produces two kinds of hair. The fine, soft wool-hair varies in color from yellow to brown and the average length is about 2½ inches. The coarser and stiffer beard-hair ranges in color from dark brown to black, and the length varies from 4 to 12 inches. The hair of young camels is free from beard-hair and is extremely fine and soft. The bellies of older camels are also free from beard-hair, and such hair is kept separate.

Camel hair is worked on the worsted and woolen principles, but the latter is the most common method. The principal use of camel hair in this country is the manufacture of press cloth for use in cottonseed and linseed oil compresses. This material requires a yarn of the greatest possible tensile strength, and is obtained by using the long, strong beard-hair. The fiber is slippery, lacks spinning properties and shows a slight luster. It is used in its natural condition or dyed to dark shades, and cannot be bleached. When used in making novelty napped cloakings, robes and dress goods, knitted fabrics, blankets and rugs, soft, short camel hair is usually blended with wool or cotton. It is imported and marketed by wool merchants, the price ranging from 11 to 18 cents per pound, according to the grade and market.

149. Horse Hair.—This fiber is obtained from the tails and manes of horses. It varies in length from 8 inches to 3 feet. The color varies, but black is most common. The individual hairs are cut to suit the desired fabric width, and are extensively used as the filling with a cotton warp in manufacturing hair cloth. Hair cloth is used as a shape-retaining foundation in

tailoring coats. Horse hair is also used as a superior stuffing material in the upholstering trade.

150. Cattle Hair.—This is obtained from the bodies of dead cows and horses. It is freed from the hide by a pulling process. The color varies and is desired in the following order: White, black and brown. The length varies from $\frac{1}{2}$ inch to 2 inches. It cannot be spun alone, but is blended with low-grade wool wastes and reclaimed wool stock or cotton in coarse yarns worked on the woolen principle for low-grade rugs, carpets, horse blankets and the poorest grades of tweeds. It is also blended with cotton and reclaimed wool stock in the manufacture of felts. The collapse of the ingrain carpet industry has removed one of the principal outlets for cattle hair. The value is determined by color, softness and length.

151. Goat Hair.—This includes the hair grown on common goats. The properties and uses are identical with cattle hair.

CHAPTER VIII

REWORKED WOOL AND WASTE PRODUCTS

152. **Importance and Necessity.**—The general public loosely applies the term “shoddy” to cover all such materials, but this is a misnomer. The demand for cheap grades of wearing apparel and the insufficient production of wool compel the use of reworked wool and waste products. The world’s annual production of wool is many millions of pounds short of the demand. The exclusion of reclaimed fibers as a raw material would impose a hardship on a large proportion of the inhabitants of the temperate zone, as clothing made from pure fleece wool would be too expensive. In nearly all instances, reworked wool is used for the purpose of producing fabrics at a low price.

These various materials comprise about one-third of the total raw material for our woolen industry. The following estimates for 1923 show the importance of these raw materials to the woolen industry of the United States; noils, 33,000,000 pounds, valued at \$17,000,000; wastes, 30,000,000 pounds, valued at \$5,000,000 (worsted thread waste amounts to 80 per cent. of this), and reclaimed fiber from rags, 85,000,000 pounds, valued at \$12,000,000. The quantity of reclaimed fiber includes about 30,000,000 pounds produced from rags by woolen mills for their own use.

These various substitutes are seldom used alone, but are blended with fleece wool, pulled wool or cotton. Fleece wool and pulled wool are used to improve the quality, strength and spinning properties of the blend. In some of the lowest grades of manipulated fabrics the cotton costs more per pound than the reworked wool materials used.

The process of reclaiming wool from rags was invented in England about 1815, but was not used to any extent in this

country until about 1850 with the development of the factory system and the disappearance of household manufacturing. The demand for worsted cloth in recent years has prevented any expansion of the "shoddy" industry in this country since 1889. There are about ninety establishments in the United States, nearly all of which are located in the East, where the carded-woolen mills are most numerous. In addition to these, nearly every woolen mill manufactures for its own use a considerable quantity of reclaimed fiber from purchased rags and the various wastes made by the mill. The total number of rag machines in this country is about 350.

The cities of Batley and Dewsbury, located in the Colne Valley, Yorkshire, England, are the center of the world's greatest "shoddy" producing district. This district contains about 900 machines, and is noted for the great skill shown in manipulating low-grade stock to produce finished fabrics of excellent appearance.

ECONOMIC ASPECT OF SHODDY

153. Economic Aspect of Shoddy.—Of late there has been considerable agitation for so-called "Truth in Fabric" legislation, the object of which has been supposedly to protect the consuming public from fraud, by causing manufacturers of woolen fabrics to label, distinctively and properly, their product, indicating what per cent. of the whole is reworked fiber or "shoddy." Attempts to pass such legislation have, through wide publicity, tended to instill in the minds of the general public that all shoddy is a material of imperfect fiber and of low quality, and that its use should not be permitted.

On the contrary, a good deal can be said of shoddy and its discriminating use in the manufacture of woolen goods.

As it is generally conceded that approximately one-third of the raw material manufactured into woolen fabrics at the present day consists of reworked fiber, the question becomes a large and comprehensive one. The aversion towards this class of material is in general unwarranted. The prejudice against shoddy is

principally due to a misunderstanding of what it really is, and to what extent it has to do with making up the deficiency of the world's supply of wool and thereby making it possible to supply cheap woolen goods for those who otherwise would not be able to wear woolen goods at all. Irrespective whether the wool in a woolen fabric is fleece wool or reworked wool, the question narrows itself down to one of fiber, and should be discussed, and judgment based, and comparisons made, not on origin alone, but on the quality of the fiber entering into the makeup of the fabric itself. It has already been pointed out, in the consideration of wool, that the fleece of the sheep consists of widely varying qualities of fiber, some of them being tender and of low grade, imperfect in structure, coarse, short and of poor quality. There is, in fact, a great deal of high-grade reworked wool produced, which is a far superior grade of material for woolen manufacturing purposes than is often found to be the case in some fleece wools. A law which compels the labeling of fabrics according to the origin of the raw material rather than to the quality of the fiber used, would work a great injustice to the masses, for under such circumstances fabrics could be made from imperfect, poor-quality fleece wool and yet be classed as having been made from "pure fiber fleece wool," and therefore serve all the requirements of the law's demand, while, on the other hand, fabrics made from a better class of fleece wool and containing more or less good reworked wool or shoddy, would have to be branded and therefore discredited in the eyes of the purchasing public, notwithstanding the fact that these latter fabrics, made from a combination of good fleece wool and shoddy, may possess a far better appearance as well as handle and serve the consumers' demand from every viewpoint; nevertheless, they would be considered inferior and undesired. After all, the wearing qualities and other characteristics of a fabric do not depend so much on whether it is made from fleece wool or reworked wool, but on whether it is made from high-grade or low-grade fiber. To the unbiased, the manufacture of shoddy is a very useful and legitimate indus-

try, as it utilizes a by-product which otherwise would have to be wasted. That the use of shoddy, on the other hand, is abused, and that it is introduced into goods that are misrepresented as being of higher quality than they really are, there is no doubt, but this is also a tendency in many other lines of manufacture other than those of the woolen trade.

CLASSIFICATION OF REWORKED WOOL

154. Classification of Reworked Wool.—Unlike fleece wool, tops, yarns, etc., no “clear cut” classification can be made of reworked or recovered wool.

Reclaimed fiber products are as numerous as the combinations which may be made from the by-product or rag, with their ever-varying color combination, structure and condition considered. However, obviously, all recovered wools may be divided into two general classes. (a) The fiber resulting from the wastes made in manufacturing processes, and known as soft material, not having been previously made into woven or knitted textures, and (b) the fiber resulting from cast-off clothing and worn-out domestic fabrics described as rags, in which are included tailors’ clippings, remnants and bits of new cloth, shawls, sweaters, stockings, soft material, dress goods, etc.

For technical and commercial purposes, the following classification is the one generally adopted:

Noils	.....	Rejected fibers, in combing process.
Soft wastes	...	Slubbing, roving, etc., made during processing.
Hard wastes	..	Yarn and thread waste spinning, warping and weaving waste.
Shoddy	.....	Soft woollens and worsteds, unfulled.
Mungo	.....	Hard, woven and felted cloths.
Extract	.....	Union fabrics (cotton and wool).
Flocks	.....	From fulling, gigging and shearing operations.

155. Noils.—Worsted combing separates the wool according to staple length, the comb being set to remove fibers under a desired length. The combed product, consisting of the longer and straightened fibers, is called “Top” and is used in the making of worsted yarn. The short, wavy, undergrowth fibers extracted by the comb are known as “Noils” and are a waste product of

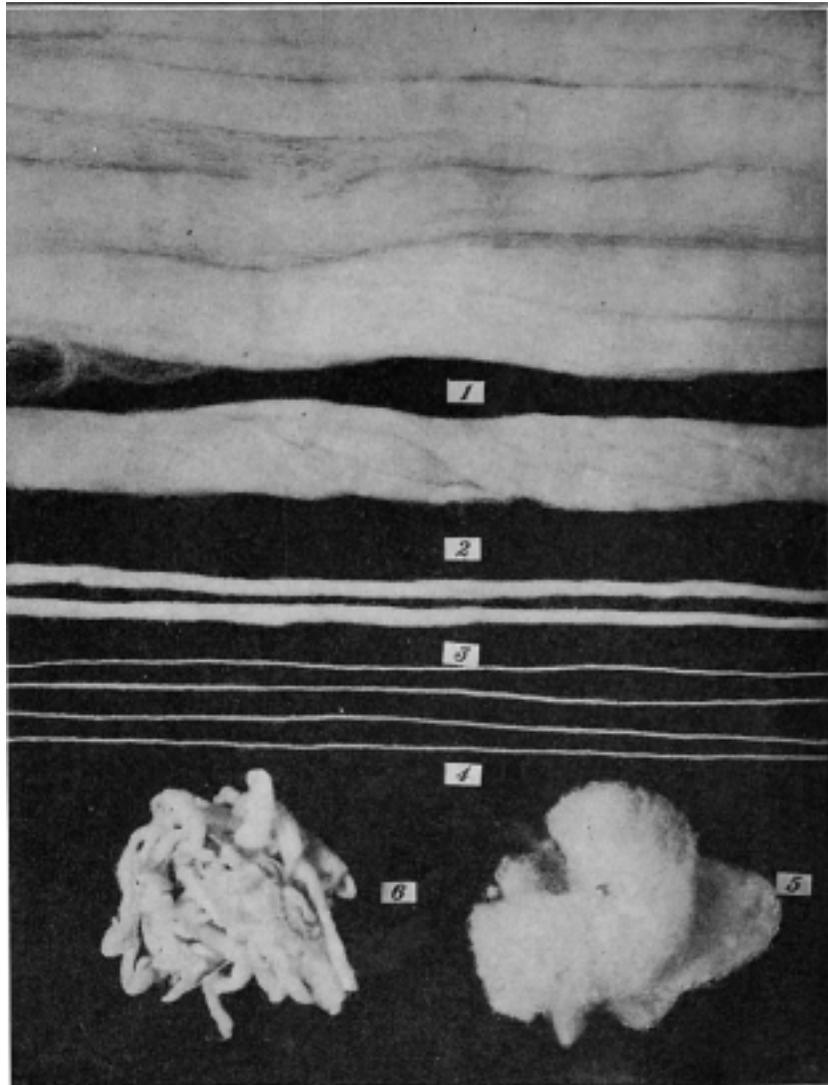


FIG. 79.—Worsted Products.

- | | |
|-------------------|---------------------|
| 1. Top | 4. Worsted Yarn |
| 2. Slubbing | 5. Nolls |
| 3. Worsted Roving | 6. Carbonized Nolls |

the worsted industry, but make an excellent raw material for the woolen industry. Noils are used to good advantage in fabrics requiring a napped face. They are used extensively in knitting yarns, blankets, flannels and broadcloths. In addition to wool noils, mohair, camel hair and alpaca, when spun on the Bradford system, furnish mohair, camel hair and alpaca noils.

The wool noils are divided into long-wool noils and short- or fine-wool noils. The former are obtained from such long wools as Lincoln, Cotswold, Leicester, Romney, etc. The fine-wool noils are obtained from medium and fine Australian, Cape, Continental, South American and domestic wools. The term "domestic" when applied to noils includes noils obtained from all wools grown in this country, and no distinction is implied between noils from territory and domestic wools. The term is frequently used in a similar manner to distinguish wools produced in this country from foreign wools.

The noils are the same grade or quality as the tops. They are classified according to the grade of wool from which they were combed, as fine domestic noils, $\frac{1}{2}$ blood domestic noils, $\frac{3}{8}$ blood domestic noils, $\frac{1}{4}$ blood domestic noils, coarse domestic noils. In the United States, foreign wool noils are usually classified in the same manner, as fine Australian noils, $\frac{1}{2}$ blood Cape noils, $\frac{3}{8}$ blood South American noils, etc. In Great Britain and the Continent, tops are classified by the yarn count to which they are supposed to spin, and noils are classified on the basis of the quality of the top produced by combing. A 40s noil is one secured by the production of a 40s top. The percentage of noil taken from wool depends upon the relative amount of short fibers present in the wool and the setting of the comb. Fine wools produce a higher percentage of noil than coarse wools. The percentage of noil removed by the comb usually falls between 7 and 25 per cent., depending on the above conditions. Average percentages for different grades of domestic combing wools are: Fine, 17 per cent.; $\frac{1}{2}$ blood, 15 per cent.; $\frac{3}{8}$ blood, 12 per cent., and $\frac{1}{4}$ blood, 10 per cent.

Just previous to combing, the sliver has usually been treated with an emulsion to improve the working properties of the wool. In such cases the amount of emulsion present in the noils removed from the sliver is usually about 3 per cent. of the gross weight of the noils.

156. Carbonized Noils.—All wools contain varying amounts of vegetable matter in the form of bits of straw, chaff, burrs, etc. Combing extracts the bulk of this vegetable matter which is removed with the noils. The removal of this vegetable matter is usually necessary to make the noils suitable for use. It is accomplished by carbonizing the noils—*i. e.*, subjecting them to a sulphuric acid bath, which reduces the vegetable matter to carbon and leaves the wool noil practically unharmed. The absence of foreign matter also improves the spinning properties of the noil. Noils vary in length from $\frac{1}{2}$ inch to 2 inches; the length usually secured is between $\frac{1}{2}$ inch and 1 inch.

In order to obtain satisfactory results in the dyeing of carbonized noils, it is good practice to use top chrome, whereas meta chrome can be used on uncarbonized noil for same shade. All Australian noils require carbonizing.

Firms devote their entire attention to buying noils from worsted mills, grading and carbonizing them, and selling them to woolen mills. The noil dealers frequently contract with worsted mills to purchase their entire annual production of noils at a stipulated price. Other worsted mills prefer to allow their noils to accumulate, and await favorable market conditions in order to dispose of them at an advantageous price. Numerous wool merchants and "shoddy" dealers also deal in noils, frequently handling them for the worsted mills on a commission basis.

157. Second Combing Noils.—In the manufacture of fine counts, spinners frequently recomb the top to remove any noil which has escaped the first combing. The percentage of noil thus secured seldom exceeds 5 per cent., and such noils are more valuable than first combing noils, as they are free from vegetable matter and do not require carbonizing.

158. **Noil Market Quotations.**—A typical market report for noils is included in the appendix, on page 232.

159. **Soft Wastes.**—In the various gilling and drawing processes of worsted manufacture previous to the actual spinning process, sliver, top, slubbing and roving wastes are produced. The term “waste” as applied to these materials is misleading, as they have suffered no loss in value. Very little of this waste is offered for sale, as the worsted mills work it up in a new lot entailing no loss to the mill except the small expense of handling it twice. Soft wastes sell for approximately the same price as scoured wool of equal quality.

Similar soft waste, such as sliver and slubbing waste, produced on the woolen system are reserved for inclusion in later identical lots. However, such soft wastes as card strippings, card fly and floor sweepings are subjected to treatment by a waste-dusting machine, and if unsuited for blending in lots intended for lower grade fabrics made by the mill they are sold to dealers.

160. **Market Quotations for Soft Wastes.**—Quality descriptions and a list of comparative prices will be found in the appendix, on page 232.

161. **Hard Wastes.**—These are also known as yarn waste, thread waste and garnetted hard ends. Worsted and woolen mills unavoidably make a considerable quantity of yarn waste. The most prominent sources are the spinning room, spooling, winding, warp dressing and weaving. The yarn wastes are kept separate in bags or bins according to their quality and color. For example, a worsted mill is spinning yarns from $\frac{1}{2}$ blood, $\frac{3}{8}$ blood and $\frac{1}{4}$ blood wools. The yarn waste from each of these grades would be kept separate. A woolen mill would not mix its all-wool white yarn waste with a merino white yarn waste, or a mixture with a solid color, even of the same quality, unless the stock was to be dyed later to a darker shade.

The method of recovering the fiber from hard waste is simple. The yarn waste is usually fed by hand on a feeding apron to

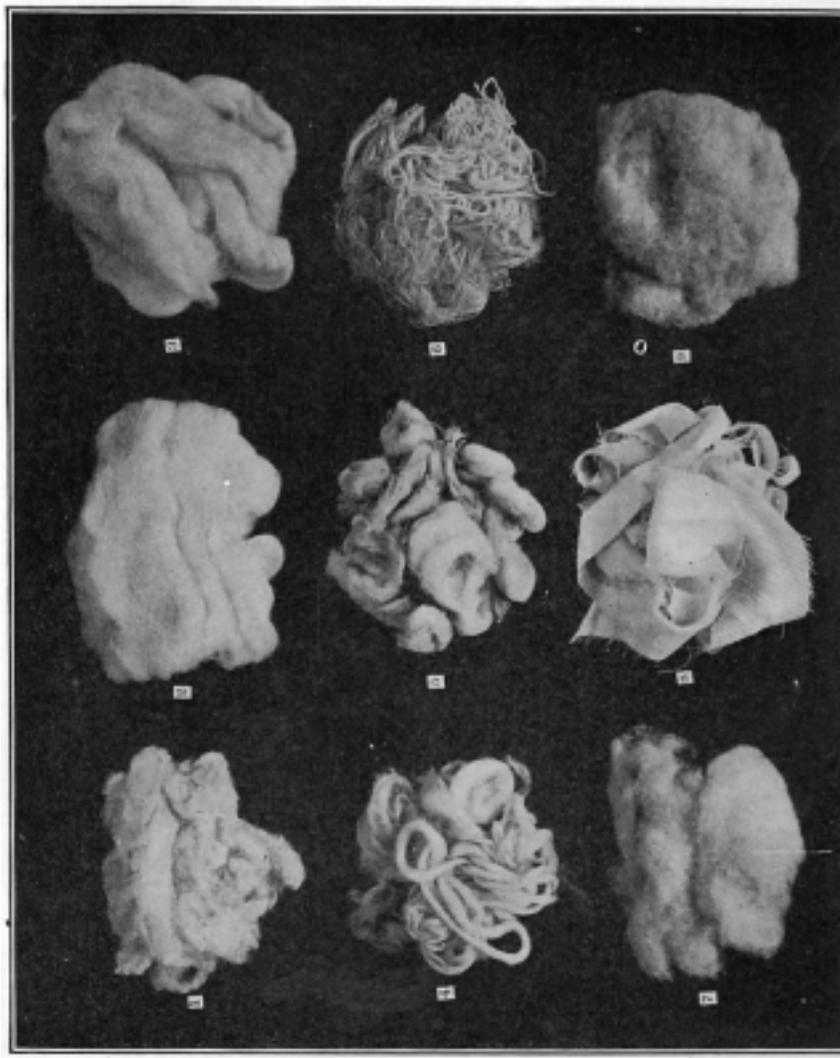


FIG. 80.—Wool in Various Forms.

- | | |
|--------------------------|---|
| 1. Scoured Wool. | 6. Worsted Thread Waste. |
| 2. Top Waste. | 7. Garnetted Worsted Thread Waste. |
| 3. Slubbing Waste. | 8. New White Serge Clippings. |
| 4. Worsted Roving Waste. | 9. Shoddy Made from Old White Sweaters. |
| 5. Ring Waste. | |

the garnett machine, which tears the thread apart and delivers the wool fibers upon a burlap sheet, which is spread on the floor at the front of the machine. The garnett machine is constructed on the same general principles as the woolen card. The working parts, however, are covered with metallic teeth instead of wire card clothing. Garnett machines are built with 1, 2, 3, 4 or 5 cylinders. Each cylinder requires a doffer, and when 2 or 3 cylinders are used the back doffers transfer the stock to the cylinder in front. After leaving the garnett machine the stock is frequently run through a breaker card to still further separate the fibers and improve the working properties. Extra hard twisted yarn and heavy feeding frequently cause inferior results on the garnett machine, delivering threads in the same conditions as fed. Garnetted stock containing numerous threads intact must be treated a second time by the garnett machine.

The garnetting process is naturally severe on the fibers, and a large percentage is broken, making the staple length of the garnetted stock considerably shorter than the wool in the yarn from which the stock was obtained. Yarn waste is the most useful of the recovered fibers. The fiber recovered from worsted yarns makes a superior raw material for woolens, possessing good length, strength, spinning and felting properties. Garnetted worsted hard ends are always superior to the best grades of fibers reclaimed from rags. Woolen yarn waste is usually garnetted and consumed in the mill where it originated.

Hard wastes are usually graded for fineness and color, as fine white or colored, medium white or colored and low white or colored. The quality is sometimes designated by the grade of wool used as $\frac{1}{2}$ blood white thread waste, $\frac{1}{4}$ blood colored thread waste, etc.

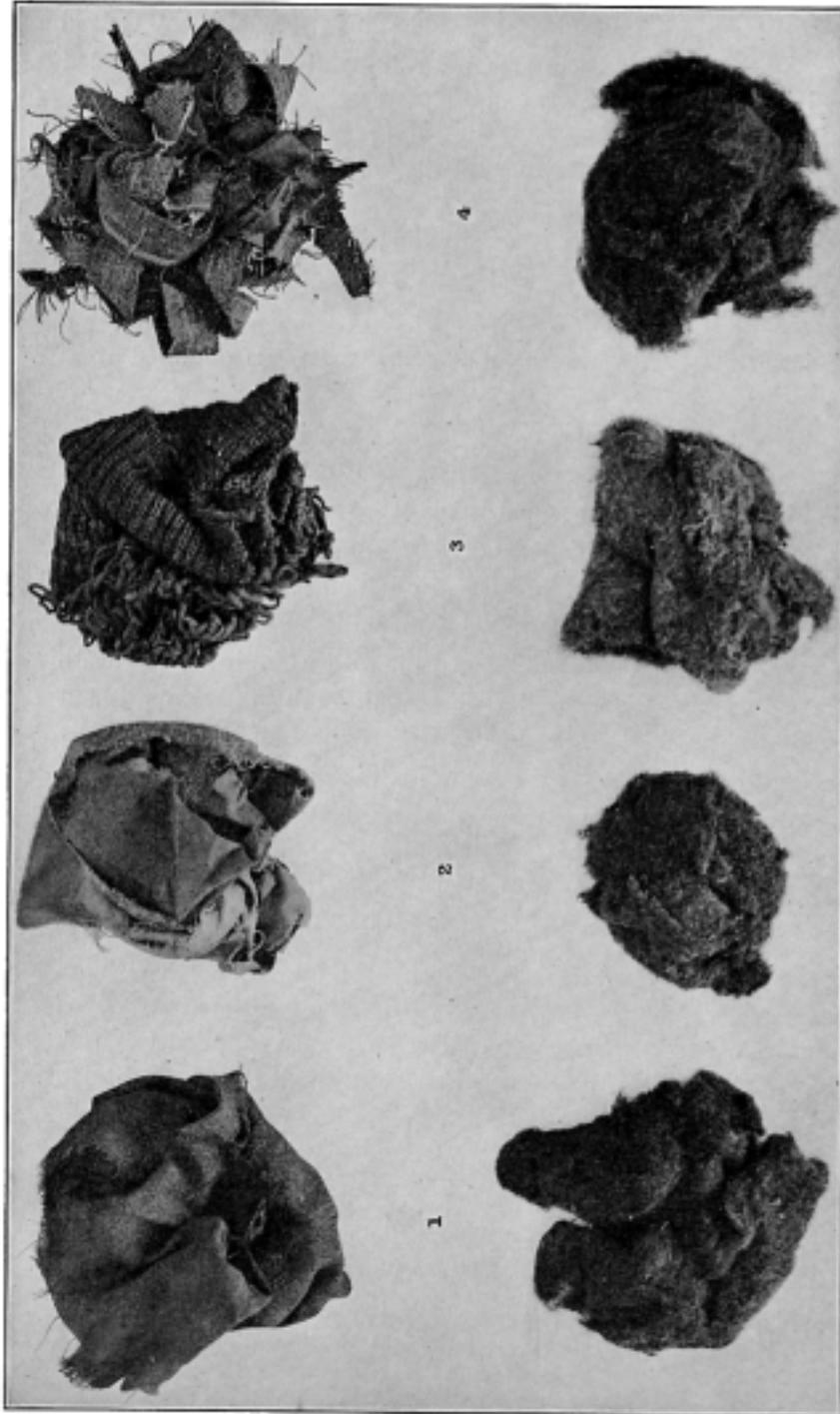
The hard wastes are purchased from the mills by the "shoddy" manufacturers, who process them and then sell them to the woolen mills. Some woolen mills purchase the hard waste direct from the worsted mills and then garnett it at the mill.

162. Market Quotations for Garnetted Yarn Waste.—A typical list showing usual descriptions and comparative prices is included in the appendix, on page 233.

163. Shoddy.—The term “shoddy” used specifically is wool reclaimed from soft woolen goods, such as stockings, sweaters and soft merino dress goods. All wool fiber reclaimed from rags is called “renaissance wool” by the French, meaning wool fiber reborn or reclaimed from rags. Shoddy is superior in strength and working properties to similar raw materials obtained from rags.

The manufacture of shoddy consists of a number of processes. Sorting is usually performed by the rag dealer, who knows the requirements of the so-called “shoddy” manufacturer. Care must be exercised in sorting in making the different shades and qualities in order to produce a uniform product. The rags are dusted in a waste duster or willow. This machine consists of a cylinder covered with long spikes all caged in, with a grating underneath the cylinder to allow the dust to pass through to a compartment below the grating. The dust is drawn through the grating by suction created by a fan. Seaming is the next process. The cotton threads are removed from the seams, together with all hard substances, such as buttons, hooks, eyes and buckles. Hand seaming has been largely succeeded by carbonizing. The rags should be colored before grinding. Shoddy colored in the rags always gives a longer staple, and makes a better and stronger yarn than shoddy which has been pickered. After the rags have been dyed and dried they are mixed and oiled. The oil is applied to soften the rags and allow the threads and fibers to slip more readily in the next operation of grinding.

The rag grinder, machine or picker consists of a pair of rollers between which the rags are firmly held as they pass into the machine. In front of the feed rollers is a rapidly revolving cylinder covered with steel teeth. These pins unravel and tear the rags apart into their component threads, and also shred the threads. The threads which have not been reduced to fiber by



the picker are bursted and teased out when the stock is treated by a garnett machine or card. The latter is usually equipped with a breast, which is similar to a single garnett machine, and receives the stock from the feed rolls. In fact, many woolen mills using reclaimed stock equip their breaker cards with breasts.

The severe treatment naturally shortens the staple and tenders the fiber. Reclaimed fiber cannot be expected to possess the working properties of the original wool. The bulk of these products is made from colored rags and is used in the original color or redyed dark shades. One hundred pounds of rags will average about 75 pounds of reclaimed fiber.

There is no clear-cut classification of "shoddies" as with wools, yarns and tops. Reclaimed fiber products are as numerous as the combinations which may be made of rags with varying structure, color and condition. Reclaimed fiber products—namely, shoddy, mungo and extract wool—are designated by the name of the rag from which they were produced. New rags and tailor clippings produce a better product than old ones.

164. Source of Rag Supply.—New rags are obtained from custom tailors and ready-made clothing houses. They consist of the waste scraps and cuttings made in cutting up cloth. New rags are smaller than old rags, and consequently require more time in sorting.

Old rags are collected by junk dealers, who buy up a wide variety of old articles, such as bottles, newspapers, rags, etc., from households. The junk dealer sells his rags to a rag dealer, who separates the cotton and woolen rags. The latter are then sorted into three grades—soft woolens, skirted cloth and rough cloth. Soft woolens are made up of sweaters, stockings, hoods, soft dress goods, known as merinos, and similar soft and loosely woven all-wool fabrics. Skirted cloth includes hard-woven and fullered fabrics such as men's suits, heavy coats and cloakings. The term "skirted" in this case applies to the tearing out of the linings. Rough cloth consists of street rags and other coarse and worn-out fabrics. This class of rags is used in making the poorest

grades of reclaimed fiber, and is also ground up and used in making felt paper and machine waste.

165. Mungo.—This name is applied to reclaimed fiber obtained from woolen material which has been fulled or felted considerably. The same process as described for manufacturing shoddy is used in the preparation of mungo, but a more severe mechanical treatment is necessary in order to tear the fibers apart, and consequently it yields fibers of shorter staple and less value than the former. The fibers vary from $\frac{1}{4}$ to $\frac{3}{4}$ inch in length. Owing to its shortness it is seldom worked up alone into yarn but is mixed with longer wool or cotton and spun into low counts of filling yarn. As has been previously stated, the term "shoddy" is largely used in a loose way to include shoddy proper, mungo and extract wool, the latter two being classed as low-grade shoddies.

166. Extract Wool.—This product is made from rags containing a percentage of cotton. The rag may be a manipulated fabric, such as a woolen with cotton in the blend; a worsted made from a two-ply yarn, one thread of the ply yarn cotton and the other worsted; or a worsted fabric dressed end and end cotton and worsted. Union fabrics are another source of supply for this class of rags. They are made with cotton warps and worsted, wool, luster wool, mohair or alpaca fillings. Extract wool is processed in the same manner as shoddy, but carbonizing is an absolute requirement for the removal of the cotton.

There are two methods of carbonizing rags in use, the one being the treatment of the rags in a bath of sulphuric acid and the other subjecting them in the dry state to the action of hydrochloric acid gas fumes. In the first method, after the rags have been sorted and then dusted or cleansed they are immersed in a solution of sulphuric acid (6° Tw.) at 140° to 180° F. The excess of acid is then removed by hydro-extracting, after which they are dried at a temperature of about 210° F. At this temperature the acid becomes concentrated and causes the vegetable matter to turn black and be reduced to a charred or carbonized

condition. The vegetable fibers are then easily dusted out by willowing, leaving the wool fibers scarcely affected. The excess of acid is next neutralized by treating the wool in a bath of soda-ash and washing thoroughly.

The sulphuric acid process is gradually being replaced by the more modern hydrochloric acid gas method of carbonizing. This latter method, besides being simple and convenient, enables the carbonizing to be carried out at a lower temperature so that the softness and luster of the wool fiber is better preserved. It also provides for treating the rags in the dry condition, which is of benefit to the wool, for in the sulphuric acid method the very thorough washing which is necessary to remove the acid is liable to damage the wool fiber by weakening or felting it. The apparatus employed consists of a large drum or cylinder revolving in an enclosed chamber and provided with some means for generating and supplying the hydrochloric acid gas, which passes through the rags and brings about the carbonization of the cotton or vegetable matter. After the rags have been treated with the hot acid gas they are run through a machine known as a "winey," a centrifugal machine for shaking out the dust from the rags. They are then taken to the "shaker" machine and finally to the grinder.

Extract wool occurs in varying shades and qualities just as the shoddy and mungo from woolen rags. It does not have the felting property of these latter, but may be used either alone or blended with other reclaimed wool fibers in the production of lightly fulled goods.

167. Market Quotations for Rags.—The rag quotations, which will be found in the appendix, on page 233, furnish an excellent illustration of the many descriptions on the market, and show their comparative values.

168. Market Quotations for Shoddy, Mungo and Extract Wool.—A list showing the descriptions usually quoted with comparative prices will be found in the appendix, on page 235.

169. **Flocks.**—Three processes of woolen cloth finishing produce flocks. These are the fulling or milling, napping or gigging, and shearing or cropping operations. The flocks produced by the first two processes are much longer than shear flocks, and are used in cheap wool mixes. They consist of short fibers which have become detached from the fabric during fulling and gigging. Shear flocks are the very short protruding fiber ends cut from the surface of the cloth by the shear. The best shear flocks are obtained from fabrics with a raised or napped face, which is leveled by shearing. Shear flocks cannot be incorporated into yarn, and after passing through a machine which grinds them up into a powder they are used for weighting cheap heavyweight woolens. The method is to pour the flocks on the back of the tacked cloth while it is running in the fulling mill. The fulling action causes the flocks to distribute evenly and felt into the back of the cloth. Twice the weight of flock required is always used, as about half the quantity applied is left in the bottom of the fulling mill. With a 24 ounce low-grade overcoating, 4 ounces of flocks is not unusual. Flocks are also made by grinding rags.

Shear flocks vary in felting qualities; the best grades are obtained from sheared white fabrics made of fine virgin wool. Shear flocks are also used by wall-paper manufacturers in producing flock-papers, which consist of paper with raised figures resembling cloth. These figures are made from flocks and glue.

A typical market report for flocks will be found in the appendix. An excellent idea can be obtained of their relative value to other reclaimed fibers by comparing with some of the preceding market lists.

CHAPTER IX

FABRIC REQUIREMENTS AND HISTORICAL SYNOPSIS

170. Wools Required for Various High Grade Established Fabrics.

BROADCLOTH	}	.....	{	Warp, fine clothing, such as Ohio, Pennsylvania; filling, 6 months and 8 months fine Texas and similar
BILLIARD CLOTH				
DOESKIN				
CHUNCHILLA	}	.....	{	Warp, ½ blood and above clothing; face filling, 6 months and 8 months fine Texas and similar
WHITNEY				
BED BLANKET				¾ blood, ½ blood, or fine clothing; 6 months and 8 months wools preferred in the filling
SWEATER				¼, ⅜ or ½ blood clothing or combing
CAR PLUSH				Mohair pile and cotton binder
WILTON	}	.....	{	Pile, ¼ blood or ⅜ blood combing; cotton and linen binders
BRUSSELS				
TAPESTRY				
VELVET				
AXMINSTER				Common and ¼ blood carding
KERSEY	}	.....	}	½ blood to fine combing
THIBET				
FLANNEL				
PANAMA				
MELTON				
UNDERWEAR				
BEAVER				
VENETIAN	}	.....	}	½ blood to fine clothing
COVERT				
CLAY SERGE				
GABARDINE				
CREPE				
SERGE				⅜ blood to ½ blood combing
WORSTED COATING				¼, ⅜ or ½ blood combing
WORSTED MEN'S WEAR				⅜ blood to ½ blood combing
HENRIETTA				Silk warp; filling, fine combing mohair
MOHAIR COAT LINING				Cotton warp; combing mohair filling
ALPACA COAT LINING				Cotton warp; combing alpaca filling
LUSTER SERGE COAT LINING				Cotton warp; luster wool combing filling
MONTAGNAC				Vicuna
CHEVIOT SUITING				¼ and ⅜ blood Cheviot wool
CASSIMERE				⅜ blood clothing
MACKINAW				¼ blood clothing wools of Cheviot nature
HOMESPUN				¼ blood clothing
FRIEZE				¼ blood clothing wools of Cheviot nature

UNITED STATES ARMY FABRICS

FACING CLOTH	Fine clothing
DARK BLUE UNIFORM CLOTH	Fine clothing
OLIVE DRAB MELTONS	$\frac{3}{8}$ blood clothing
OLIVE DRAB SHIRTING FLANNEL.....	$\frac{1}{2}$ blood combing
OLIVE DRAB BLANKET	$\frac{3}{8}$ blood clothing
OLIVE DRAB SWEATER	$\frac{3}{8}$ blood combing

171. Historical Synopsis of the Wool-Growing Industry in the United States.

1700-1800.—The early colonists brought sheep of the down breeds to this country from England, but little attention was given to breeding and the sheep deteriorated.

1801-1803.—A few Spanish Merino rams and ewes were imported direct from Spain and France, but did not attract attention at first, as the wool was finer than required for the fabrics made in household manufacture.

1810.—Embargo on foreign goods caused great stimulus to woollen manufacturing industry in the United States. Until this time, homespuns and tweeds were the popular fabrics. Broadcloth became the popular fabric, and required fine Merino wools.

1810.—Price of Merino wool rose from 75 cents to \$2 per grease pound.

1810-1811.—The invasion of Spain by two hostile armies during the Napoleonic wars caused 20,000 pure-bred Merino sheep to be sold to Americans to prevent their confiscation by the armies, and the resulting total loss to the owners. Prior to this period, the Spanish Government prohibited the exportation of sheep, except when the King of Spain presented flocks to the principal crown heads of Europe. A few had also been smuggled out of Spain.

1812.—The War of 1812 threw the country completely on its own resources, and the household industry was taxed to capacity to supply cloth and blankets for the army. Broadcloth sold for \$8 to \$12 per yard. The popularity of broadcloth caused great

demand for fine Merino wool, and the wool-growing industry became important.

1810-1816.—This period showed great growth in woolen manufacturing, and consequent increase in flocks by demand for wool. The application of power to textile manufacturing gradually broke up the household industry, starting about 1800. The change was slow at first, and by 1816 only 5 per cent. of our textile manufactures were made in factories.

1825.—Opening of the Erie Canal connecting the Lakes with the Atlantic seaboard caused the development of the Ohio and Mississippi Valley sections as important wool-growing sections, as the Eastern markets could then be reached. Previous to this all wools not consumed by the grower had to be sent to New Orleans by river.

1833.—The Ohio Canal was opened from Portsmouth on the Ohio River to Cleveland on Lake Erie. This furnished an all-water route from the Mississippi River system to Atlantic markets, and was a great transportation improvement at the time.

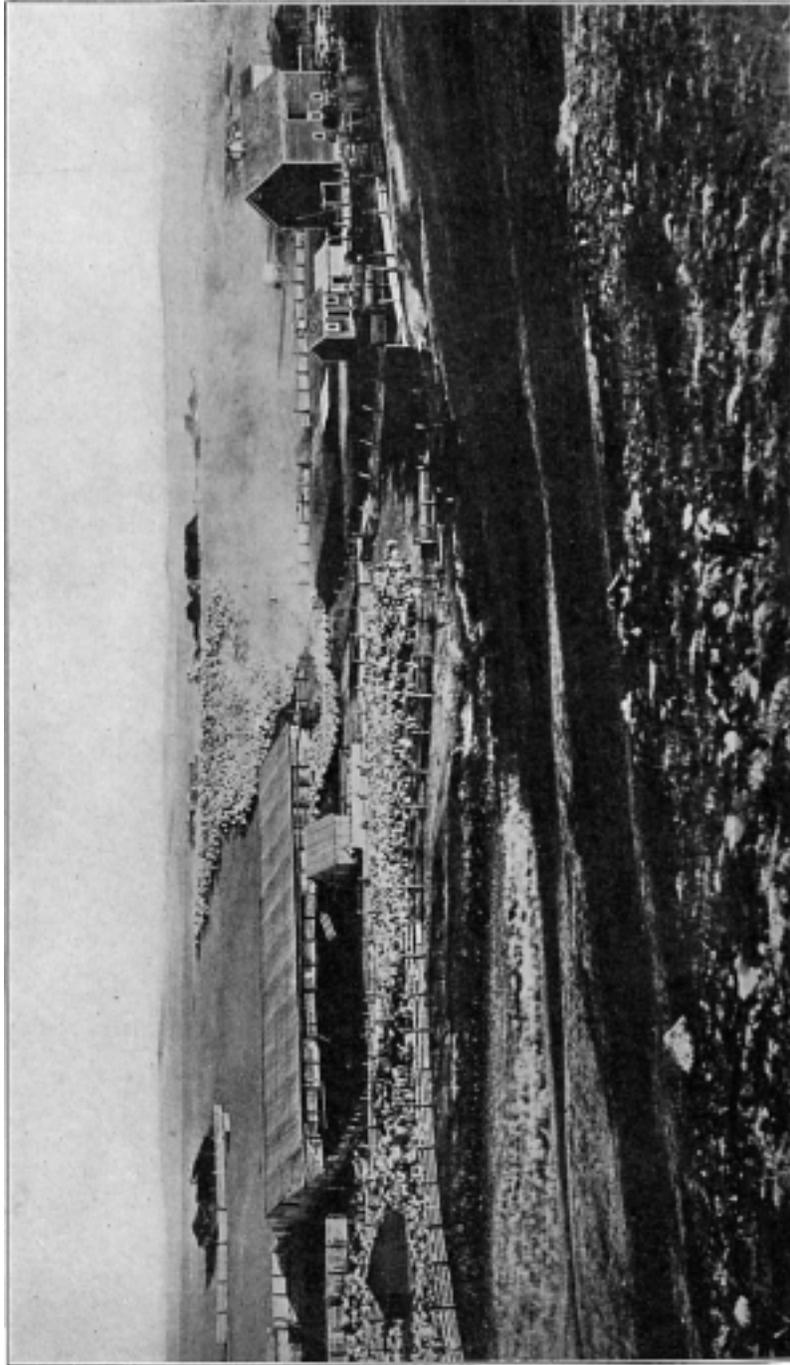
1835.—London wool auctions established.

1840.—19,300,000 sheep in the United States, and yielded 45,000,000 pounds of wool.

1840.—The New England and Middle Atlantic States groups each contained one-third of all the sheep in this country. Twenty per cent. of all the sheep at this time were in the South, principally in Kentucky, Virginia and Tennessee. The remainder were in the "Northwest," principally Ohio.

1840.—Up until this time the East was the principal wool-growing section of the country, but from this time on the Middle West became important.

1845.—Worsted industry started in the United States, and worsted cloths commenced to find favor.



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FIG. 82.—Sheep Ranch in Lake Basin, near Billings, Montana.

1845.—The average number of sets of woolen cards per factory in the United States was 1.75 sets.

1845.—Miami Canal was opened from Cincinnati to Toledo. This canal relieved the congestion on the Ohio Canal.

1849-1854.—The gold and silver rush to California and Nevada caused the importation of large numbers of sheep to these States from the Middle West. These sheep were principally used for food.

1850.—Australia, New Zealand and Cape Colony became factors in the world's wool supply.

1850.—By 1850 the Middle West became an important factor in the wool production of this country, and this new source of supply caused a lowering in wool prices which hurt the industry in the East. Eastern wool growers could not compete with Western wool, as shelter and fodder had to be provided for the sheep during five months, and the grazing land averaged \$30 value per acre. The West used free public lands, and required little shelter and fodder. The tendency in the East to congregate in cities and towns and engage in industrial pursuits created excellent markets for vegetables and dairy products. This condition developed the planting of increased acreage in the East to supply city consumption, and less ground was available for grazing.

1850.—The blue grass region of Kentucky and Tennessee was principally confined to the English mutton breeds, which required richer pasturage than Merino sheep.

1855.—Railroads had crossed the Mississippi River into Iowa.

1850-1860.—The value of machine knitted products increased from \$1,000,000 in 1850 to \$7,000,000 in 1860 following the invention of the circular knitting machine in 1851.

1860.—The carpet industry gradually developed from 1825 until 1860, when 9,000,000 pounds of wool were used. Ingrains consumed the bulk of this wool.

1860.—About this time mutton came into demand for food, and sheep owners turned to raising the English mutton breeds in place of Merinos. Broadcloth had ceased to be a popular staple fabric, but has since had periods of popularity caused by the dictates of fashion and style. The decline in popularity of broadcloth caused a lack of demand for fine wool. Worsted succeeded broadcloth in public favor, and required a longer stapled and coarser wool. The English breeds furnished the required wool for worsteds, and also furnished better mutton. The most popular English breeds at this time in the United States were the Southdown, Cotswold and Leicester.

1860.—Wool-growing industry in the East in a declining state.

1860.—Household manufacture of wool had practically disappeared by 1860, due to improved power machinery, better transportation and distributing facilities, which afforded the manufacturer a wider and larger market.

1860.—Many growers of Merino wool turned to the Rambouillet or French Merino at this time, owing to its closer approach to the demands of the time for better mutton.

1860.—Just prior to 1860 Texas became an important wool-producing State. Practically all wool grown in other Southern States up to 1860 was consumed in household manufacture, and the supply was only sufficient for local consumption, and of poor quality, burry and coarse. The climate of the South is better adapted to agriculture, specializing in cotton, tobacco, sugar and rice.

1860.—Consumption of wool in the United States amounted to 100,000,000 pounds. One-half of this quantity was grown in this country.

1860.—Wool growing was firmly established in California and Oregon.

1860.—Argentina and Uruguay became important factors in the world's wool supply.

1861-1866.—The Civil War caused the New England and Middle Atlantic States, where the sheep industry had badly retrograded, to practically double their flocks. The cotton famine in the North caused wool to be used for many purposes to replace cotton. It has been estimated that each Union soldier averaged fifty pounds of grease wool per year.

1867.—The close of the Civil War caused a reaction in the demand for wool with the return of cotton as a manufacturing raw material. The stimulus given to the demand for wool by the large army requirements was removed by the discharge of most of the troops.

1867.—This year marked the height of the supremacy in wool growing by the loyal States east of the Rockies. There were 36,000,000 sheep in the United States in 1867. Wool prices dropped very low, and great numbers of sheep were slaughtered for meat.

1867-1871.—The Civil War caused the flocks to increase 140 per cent. by 1867, but by 1871 the reaction reduced these same flocks 45 per cent.

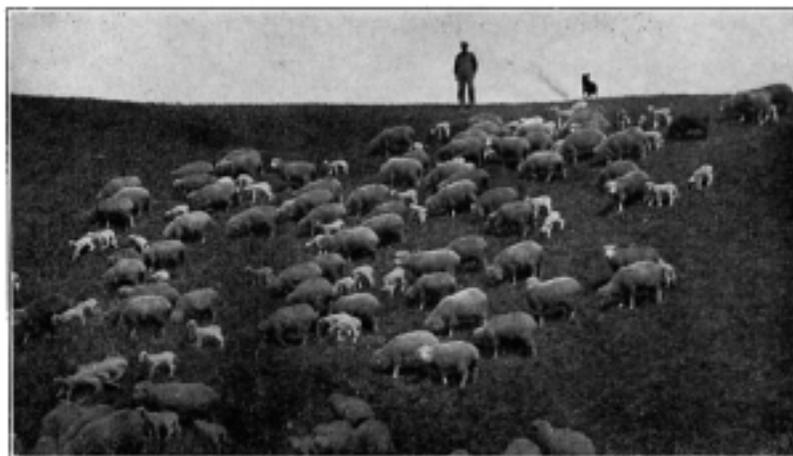


FIG. 83.—Ewes and Lambs on the Range, Canada.

1867-1871.—Another cause for the decline in flocks during this period was the increase in value of all other important agricultural products, while wool and mutton decreased in price.

1870.—The sheep industry in this country started in the hill regions of the East and started westward to the Middle West during the 1830s. About 1870 the sheep industry started to move westward again and located in the Far West. By 1890 this movement was completed and the Far West seems destined to remain the principal wool-growing section of the United States.

1870.—There were about 28,500,000 sheep in the United States in 1870, distributed as follows: New England, 1,450,000; Middle Atlantic States, 4,248,000; North Central States, 11,164,000; Central West States, 2,473,000; Southern States, 5,188,000, and Far Western States, 3,949,000.

1871.—The number of sheep in this country dropped to 22,500,000 in 1871.

1870-1890.—The general range of wool prices was low, due to panics and great increase in flocks of the United States, River Platte region and Australia. During this period, American wool came nearer to supplying the requirements of the home market than at any time since the early part of the nineteenth century.

1870-1890.—The South just held its own during this period. The main wool-producing States in this section were Kentucky and Tennessee.

1880.—The flocks of Utah, Idaho, Montana and Wyoming reached large proportions by 1880. The Intermountain States are best adapted physically and economically to wool growing; as the character of the land is less adapted to farming than other parts of the country.

1880.—This year was the high-water mark of the wool-growing industry in California.

1880-1885.—This period produced great increases in the flocks of the United States, River Platte region and Australia.

1882.—The frozen mutton trade with Argentina and New Zealand caused a tendency to crossbred wools which has reduced the world's supply of the finest Merino wool.

1884.—The number of sheep in the United States reached 51,000,000 head in 1884, and is the greatest number in our history.

1885.—The influx of a large farming population drove many sheep owners out of Texas to the Far West, as the free grazing lands disappeared in Texas.

1885.—This year found 26,000,000 sheep in the Far West. The estimated annual cost of keeping sheep in 1885 in the Northern and Eastern States was \$2.65 per head and on the Western ranges only 50 cents per head.

1890.—Mutton sheep, mostly Southdowns and Shropshires, had largely replaced Merinos in Ohio, Illinois, Indiana and Michigan by 1890.

1890.—There were 48,000,000 sheep in the United States in 1890; one-half of these were in the Far West and one-quarter in the Middle West.

1893.—The business panic of 1893 caused the price of wool to drop one-third.

1894.—The admission of foreign wool free of duty under the Wilson Bill in 1894 was followed by a 50 per cent. decline in the value of wool grown in this country.

1914.—The European War has caused an increase of about 50 per cent. in wool values. Of late years the supply of fine wools has been far below the demand, and some breeders are turning their efforts again to growing fine wool.

1915.—Introduction of the Australian method of shearing and preparing wools may lead to its adoption by the entire Far West, and help to prevent any further decline in the industry in its last stronghold in this country.

1923.—In this year the number of sheep in the United States, according to official estimates, was 38,347,000, and the wool produced, according to the latest available reports and estimates, was 266,110,000 pounds.

172. Economic Necessity for a Greater Sheep Industry in the United States.—Many causes have directly and indirectly brought about the decline in the wool production of this country. Our wool production supplies a little over one-third of the amount annually consumed, and it is necessary to import from 300,000,000 to 500,000,000 pounds annually to supply this demand. While the number of sheep and the wool production are continually decreasing, our population and consequent wool consumption are continually increasing, and the proportionate amount of wool to be imported is therefore constantly growing larger.*

For several decades the western part of our United States has furnished two-thirds of our total wool clip, with two States—namely, Montana and Wyoming—producing one-fifth of our total production. The opening of the West, following the close of the Civil War, afforded unlimited free pasturage to millions of sheep. The sheep owner was under comparatively small expense for the maintenance of his flocks. The sheep industry under such conditions was bound to be profitable, except in rare instances where the flocks were destroyed by blizzards or long droughts. Although large numbers of sheep annually fall prey to coyotes in the West, the decline of the sheep industry there cannot be attributed to coyotes, as they are less numerous now than twenty or thirty years ago.

The most important factor in the reduction of the wool clip in the West is undoubtedly the encroachment of farms. The

* Sheep raising for wool fiber, however, in the United States does not seem to be on the increase, but on the contrary the wool production during recent years has been decreasing. The consumption of wool in the United States during 1922 was about 803,000,000 lbs., or somewhat over 7 lbs. per capita. During the same year the United States produced only about 250,000,000 lbs. of wool and had, consequently, to import about 550,000,000 lbs. In 1923 the United States produced about 300,000,000 lbs. of wool, so that notwithstanding the considerable increased consumption of wool in this country, its cultivation and production has steadily declined.

farms have pushed farther and farther into the sheep country and have greatly reduced the size of the open ranges. The Federal Government has also seen fit to withdraw from public use about 225,000,000 acres in the West. These include Indian reservations, national forests and parks, and natural resources, such as power sites, mineral deposits, oil and coal lands. In addition, the development of large arid tracts by means of irrigation has been another factor in the reduction of available sheep-grazing lands in this region. With increasing land values the sheep industry is supplanted by farming. There are large sections in the Intermountain States which are only suited for sheep grazing, and will indefinitely continue as such, but unless the present influences are removed the sheep industry in the West will continue to show a heavy decline.

The conditions in the farming States of the East, Middle West and South are of an entirely different nature. Since 1870 none of these sections has possessed a sheep industry on a large scale. In these States sheep raising is only incidental to general farming. In the United States only one farm out of seven carries sheep, and the average number of sheep per farm in this country in 1910 was 8.14. The farm flock usually ranges from 25 to 100 head. Practically all the sheep in the farm States are raised with mutton as the primary object. The quality and value of the wool produced by such sheep is of secondary importance to the owner. The bulk of these sheep belong to the various British breeds, and do not produce fine wools. Most of these wools are $\frac{3}{8}$ blood and $\frac{1}{4}$ blood combing.

The greatest decline has been in the East and Middle West. The contributing causes are several in number. The high values of farm lands have made it impossible to make sheep raising on a large scale a profitable business in these sections, as the cost of maintaining a flock on a farm is excessive when compared with the cost on the ranges in the West.

Large numbers of sheep are annually run to death by dogs in the farm States. Further damage is caused by these dogs fright-

ening sheep, thereby throwing them off their feed and often causing them to fail during breeding season. There is no doubt that the trouble and losses caused by dogs have been the reason for many farmers disposing of their sheep.

Another important factor in the elimination of sheep from the farm has been the increasing preferment shown by the farmers for dairy and beef cattle.

The demand for mutton is not nearly so great as that for beef and pork. The wide fluctuations in the prices of mutton and wool have also caused many farmers to become discouraged with sheep raising.

The conditions and high prices caused by the European War have focused the attention of the consuming public, as well as those interested in the producing and manufacturing of wool to a realization of the economic importance of the wool situation in this country. The embargo placed on the exportation of wool by Great Britain during the European War has caused a scarcity in this country, as the only large producing section not affected by this embargo was South America. As the large wool-producing sections of the world seemed to have reached their limit, a steady decline in the wool production from Australia, South America and South Africa may be expected as these sections become more thickly populated and increase their farming area. The question of a sufficient wool supply is not only concerning this country, but is of equal importance to the rest of the civilized world. There is no doubt but that the wool situation in this country would have reached a critical condition many years ago if the average weight per fleece had not been doubled during the past fifty years by selection in breeding.

Wool is an absolute necessity for many articles of clothing, and as there is no possibility that a satisfactory artificial substitute will be invented, something must be done to increase the wool production. As previously stated in describing the reasons for the decline of the sheep industry in the West, there is no chance for relief in that section of the country. All authorities have

agreed that an increased wool production in this country must be developed in the farming States of the East, Middle West and South. The United States Department of Agriculture and State Agricultural Colleges have distributed useful pamphlets on the selection of breeding stock and the care of sheep as well as the advantages secured to the farmer from sheep raising. It is expected that the extensive educational program developed through agricultural and live-stock journals, agricultural college extension bureaus, demonstration cars, boys' lamb-club prizes and the county farm agents of the United States Department of Agriculture will interest the farmers to maintain small flocks of sheep.

The raising of sheep on the farm offers numerous advantages. Sheep will graze on hilly and rough ground which is unsuitable for agriculture or cattle pasture. They also keep down the fence rows and greatly increase soil fertility. Sheep require slight attention except at lambing time, which usually comes during the early spring before the work in the field starts. The presence of sheep makes fresh meat available for the farmers' table all year round. Sheep annually yield two money crops, lambs and wool.

There are millions of acres of land in the United States which are at present non-productive, but could be utilized for sheep grazing. Extensive areas of deserted stump land are available for this purpose. The Appalachian Mountain district, extending from the Catskills to Georgia, offers excellent opportunities for the profitable raising of sheep. This region is sparsely populated and comparatively few sheep are found there. It is hardly possible that the South will increase its flocks extensively, as many of the States are better suited for producing cotton, tobacco, sugarcane, rice and corn.

If one-fourth of the farms now without sheep maintained flocks to the number which now averages on the farms keeping sheep there would be enough wool produced to make this country independent of the rest of the world. However, carpet wools would continue to be imported, as it would never be advisable to maintain the class of inferior sheep which produce these cheaper wools.

The State Legislatures have been urged to enact suitable laws for curbing the dog menace and a strict enforcement of existing dog laws is demanded.

This country has about reached the point where it must curtail waste and halt the exploitation of its natural resources. Our increasing population and the increased cost of living will force the adoption of the economic methods employed in Europe. The British Isles, with an area less than the State of Texas, produce more wool on a scoured basis than the wool-producing territory of the United States. In the British Isles there is one sheep for every two acres, and for every one and one-quarter inhabitants there is one sheep. Scientific management, co-operative marketing and more stable prices, with a possibility of governmental regulation, will be the new program which will supplant the individualism of the past and present. There is no doubt that when this era arrives the true value of sheep on the farm will be recognized, but the best interests of the country should be served now by increasing the number of sheep to such a point that the United States is able to produce sufficient wool for home consumption. At the present time, wool is the only important raw material which is a basic necessity that is not produced in sufficient quantity to satisfy our home requirements. A wool supply is a vital factor in national preparedness.

APPENDIX

APPENDIX

TABLE A

IMPORTATION AND PRODUCTION OF FLEECE AND PULLED WOOL IN UNITED STATES, 1913-1923

Fiscal Year, June 30	Total Imports Pounds	Production in U. S. Washed & in Grease Pounds	Scoured Estimate of Product Pounds	Average Percentage of Shrink
1913-14	247,648,869	296,175,300	132,022,080	55
1914-15	308,083,429	290,192,000	131,840,680	55
1915-16	534,828,022	288,777,000	131,987,960	54
1916-17	372,372,218	288,490,000	130,755,750	56
1917-18	379,129,934	285,573,000	129,431,055	55
1918-19	422,414,664	299,921,000	130,611,290	57
1919-20	427,578,038	314,239,000	138,937,484	56
1920-21	318,235,873	302,207,000	137,315,165	54
1921-22	255,087,236	273,064,000	126,021,000	54
1922-23	525,472,657	261,095,000	119,228,950	54
1923		266,110,000	121,652,000	54

TABLE B

UNITED STATES WOOL IMPORTS SHOWING COUNTRY OF PRODUCTION, FISCAL YEAR, JUNE 30, 1923

	Pounds		Pounds
England	23,564,803	Turkey in Asia	5,308,652
Scotland	19,284,326	British South Africa	27,124,346
France	5,264,596	Argentine	96,976,725
Germany	4,182,853	Chile	9,416,524
Iceland	1,621,207	Peru	2,906,864
Russia in Europe	4,305,657	Uruguay	48,643,416
Spain	1,647,759	Australia	102,991,474
Turkey in Europe	5,845,156	New Zealand	38,876,856
British India	28,729,906	All others	19,312,508
China	67,350,907		
		Total	525,472,657

TABLE C

CARPET WOOLS IMPORTED BY THE UNITED STATES, FISCAL YEAR ENDED JUNE 30, 1923

	Pounds		Pounds
China	65,620,669	Germany	3,893,451
Russia (Europe and Asia)	4,230,274	France	4,156,895
United Kingdom	28,856,216	Iceland and Faroe Islands	1,620,255
Turkey (Europe and Asia)	5,820,802	All others	20,426,673
British East Indies	28,543,200		
Argentina	8,710,757	Total	171,879,192

TABLE D

IMPORTS OF RIVER PLATTE WOOLS INTO THE UNITED STATES, 1915-1923

ARGENTINA:		URUGUAY:	
	Pounds		Pounds
1915	77,808,253	1915	16,597,623
1916	129,163,353	1916	9,508,746
1917	207,970,092	1917	37,601,961
1918	181,154,575	1918	18,409,011
1919	139,451,795	1919	41,107,665
1920	139,225,920	1920	47,307,367
1921	104,023,117	1921	36,186,291
1922	32,386,855	1922	23,390,488
1923	96,976,725	1923	48,537,170

TABLE E

WOOL IMPORTED INTO BOSTON, NEW YORK AND PHILADELPHIA BY PORTS AND CLASSES. FISCAL YEAR 1922-23

	Class I	* Class II	Class III	Totals
Boston	26,872,837	260,288,500	21,092,186	308,253,523
New York	4,484,574	22,314,040	80,943,214	107,741,828
Philadelphia	5,828,968	23,560,777	60,170,702	89,560,447
				<u>505,555,798</u>

NOTE: These figures represent 96.2 per cent. of the total quantity of wool imported into all the ports of the United States.

In 1923, fiscal year, the imports at all ports were:

Clothing, Class I	43,703,289
Combing, Class II	298,496,152
Mohair	11,394,024
Carpet, Class III	171,879,192
Total	<u>525,472,657</u>

TABLE F

IMPORTS BY GRAND DIVISIONS, FISCAL YEAR ENDED JUNE 30, 1923
ANNUAL WOOL REVIEW, NAT. ASS'N WOOL MANUFACTURERS

Places of Production	Class I	Class IIa	Hair of the	Class III	Total
	Clothing	Combing	Angora goat, alpaca, etc.	Carpet	
	Pounds	Pounds	Pounds	Pounds	Pounds
Europe	5,515,134	14,687,020	3,536,905	56,036,245	80,055,447
Asia	371,294	1,222,598	2,528,464	103,937,066	108,059,422
Africa	2,208,781	20,706,618	3,903,212	1,542,513	28,361,124
North America	3,168,064	5,263,214	16,124	523,666	8,971,068
South America	16,342,899	131,635,819	1,076,193	9,102,355	158,157,266
Australia	16,097,117	124,980,883	333,126	457,204	141,868,330
Totals	<u>43,703,289</u>	<u>298,496,152</u>	<u>11,394,024</u>	<u>171,599,049</u>	<u>525,472,657</u>

* Includes Mohair.

TABLE H
WOOL PRODUCT OF THE UNITED STATES—1918

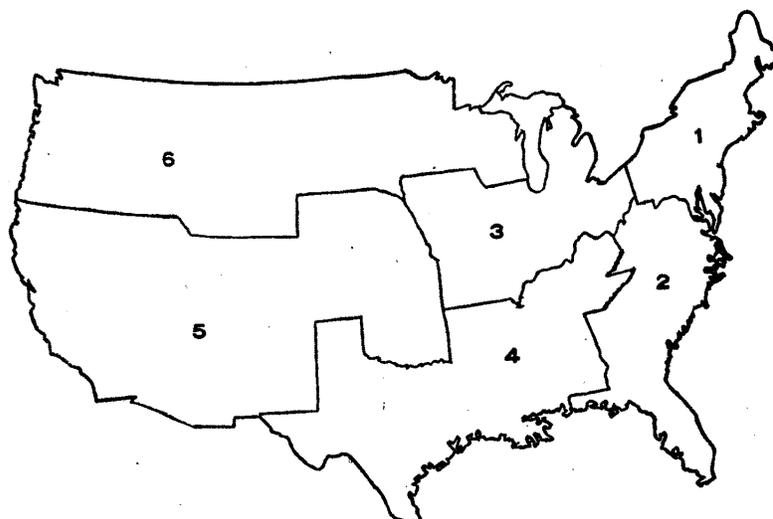
States	Quality	Estimate of U. S. Dept. of Agriculture				Per Cent. of			Av. Value per Scoured			Total Value, 1918
		Number of Fleeces	per Fleece Pounds	Raw Wool Product Pounds	Shrinkage	Quantity of Scoured Wool Pounds	1916		1917			
							Cents	Cents	Cents	Cents		
Maine	10% fine, 90% medium...	132,000	6.7	883,000	42	512,140	80	135	135	\$691,389		
New Hampshire	5% fine, 95% medium...	27,000	7.0	192,000	43	109,440	78	134	134	146,650		
Vermont	20% fine, 80% medium...	92,000	7.2	663,000	48	344,760	81	140	140	482,664		
Massachusetts	Medium	20,000	6.0	119,000	42	69,760	80	135	135	93,177		
Rhode Island	Medium	4,000	6.0	24,000	41	14,160	80	135	135	19,116		
Connecticut	Medium	14,000	5.5	76,000	41	44,840	80	135	135	60,534		
New York	30% fine, 70% medium...	547,000	7.0	3,830,000	49	2,053,300	85	145	145	2,977,285		
New Jersey	Medium	16,000	5.5	88,000	41	51,920	85	145	145	75,284		
Pennsylvania	60% fine, 40% medium...	713,000	6.7	4,774,000	51	2,339,260	87	152	152	3,555,675		
Delaware	Medium	5,000	5.7	31,000	41	18,290	80	135	135	24,692		
Maryland	Medium	133,000	5.8	773,000	41	456,070	80	135	135	607,595		
West Virginia	75% fine, 25% medium...	544,000	5.2	2,830,000	50	1,415,000	87	152	152	2,150,800		
Kentucky	Medium	624,000	4.9	3,058,000	39	1,865,380	80	135	135	2,518,263		
Ohio	65% fine, 35% medium...	1,726,000	7.3	12,600,000	53	5,922,000	86	150	150	8,883,000		
Michigan	25% fine, 75% medium...	1,184,000	7.4	8,765,000	50	4,382,500	85	145	145	6,354,625		
Indiana	Medium	671,000	7.1	4,765,000	45	2,620,750	80	135	135	3,538,013		
Illinois	10% fine, 90% medium...	506,000	8.0	4,048,000	49	2,064,480	81	137	137	2,828,338		
Wisconsin	5% fine, 95% medium...	375,000	7.6	2,850,000	46	1,311,000	80	135	135	1,769,850		
Minnesota	5% fine, 95% medium...	421,000	7.4	3,112,000	50	1,556,000	78	130	130	2,022,800		
Iowa	10% fine, 90% medium...	642,000	7.5	4,815,000	50	2,407,500	80	135	135	3,250,125		
Missouri	5% fine, 95% medium...	790,000	7.0	5,532,000	45	3,042,600	80	134	134	4,077,084		
		9,184,000	6.95	63,828,000	49.0	32,600,410	..	...	...	\$46,126,959
Virginia	Medium	408,000	4.7	1,918,000	38	1,189,160	81	137	135	1,605,366		
North Carolina	Medium	142,000	4.0	570,000	42	330,600	75	132	122	403,332		
South Carolina	Medium	26,000	4.0	103,000	42	59,740	75	132	122	72,883		
Georgia	Medium	165,000	2.9	478,000	42	277,240	76	133	122	338,233		

Florida	Medium	133,000	3.2	426,000	42	247,080	75	132	122	301,438
Alabama	Medium	105,000	3.5	368,000	41	217,120	75	132	122	264,886
Mississippi	Medium	155,000	4.0	619,000	41	365,210	75	132	122	445,556
Louisiana	Medium	161,000	3.7	594,000	44	332,640	75	132	122	405,821
Arkansas	Medium	82,000	4.9	402,000	44	225,120	74	130	130	292,656
Tennessee	Medium	425,000	4.6	1,954,000	41	1,152,860	78	134	130	1,498,718
		1,802,000	4.12	7,432,000	59.2	4,396,770	..	...	...	5,628,889
Kansas	Fine, fine med., and med.	214,000	7.6	1,624,000	63	600,880	85	150	150	901,320
Nebraska	Fine, fine med., and med.	217,000	7.8	1,696,000	64	610,560	85	150	150	915,840
South Dakota	Fine, fine med., and med.	641,000	7.4	4,747,000	60	1,898,800	83	152	152	2,886,176
North Dakota	Fine, fine med., and med.	205,000	7.6	1,560,000	63	577,200	83	150	150	865,800
Montana	Fine, fine med., and med.	2,847,000	8.2	23,342,000	64	8,403,120	86	155	155	13,024,836
Wyoming	Fine, fine med., and med.	4,051,000	8.4	34,026,000	67	11,228,580	85	153	153	17,179,727
Idaho	Fine, fine med., and med.	2,468,000	7.9	19,500,000	63	7,215,000	85	153	153	11,038,950
Washington	Fine, fine med., and med.	640,000	8.6	5,504,000	69	1,706,240	84	151	151	2,576,422
Oregon	Fine, fine med., and med.	1,562,000	8.0	12,500,000	67	4,125,000	85	156	156	6,435,000
California	33% fall, 67% spring	1,792,000	7.0	12,545,000	64	4,526,200	83	150	150	6,789,300
Nevada	Fine, fine med., and med.	1,429,000	7.0	10,000,000	70	3,000,000	85	153	150	4,500,000
Utah	Fine, fine med., and med.	2,052,000	7.7	15,800,000	65	5,530,000	84	151	151	8,350,300
Colorado	Fine, fine med., and med.	1,494,000	6.2	9,261,000	63	3,426,570	83	150	150	5,139,855
Arizona	Fine, fine med., and med.	927,000	6.1	5,656,000	65	1,979,600	85	153	153	3,028,788
New Mexico	Fine, fine med., and med.	3,059,000	5.6	17,132,000	68	5,482,240	83	150	150	8,223,360
Texas	25% fall, 75% spring	1,607,000	7.0	11,250,000	67	3,712,500	82	150	150	5,568,750
Oklahoma and Indian Territory	Fine, fine med., and med.	76,000	6.8	518,000	63	191,660	82	150	150	287,490
Totals		25,281,000	7.30	186,661,000	65.6	64,214,150	..	...	...	\$97,711,914
Pulled Wool		36,269,000	7.11	257,921,000	60.8	101,211,290	84.6	\$1.482	\$1.486	\$149,467,762
Total Product, 1918		.....	..	42,000,000	30	29,400,000	75.5	1.507	1.52	44,692,000
		.....	..	299,921,000	..	130,611,290	82.5	1.487	1.487	194,159,762
		.....	..	.....	..	.....	37.4*	.673*	.647*	.....
		.....	..	.....	..	.....	29.4†	.559†	.564†	.....

* Equivalent value, unwashed. † Farm value as estimated by the Department of Agriculture.

TABLE I

DISTRIBUTION OF UNITED STATES SHEEP BY STATE GROUPS
Compiled by the Philadelphia Wool and Textile Association



NUMBER OF SHEEP, SHEARING AGE

	1901	1915	1923
1. North Atlantic States	2,451,000	1,636,000	1,293,000
2. South Atlantic States	1,424,000	1,606,000	1,075,000
3. Central States	7,203,000	6,305,000	6,363,000
4. Southern States	3,831,000	3,256,000	4,331,000
5. Western States	11,441,000	10,470,000	12,613,000
6. Northwestern States	15,553,000	13,395,000	11,548,000
Total	41,903,000	36,668,000	37,223,000

TABLE J

UNITED STATES SHEEP RECORDS BY DECADES

	Farms	Sheep	Sheep Per Farm	Sheep Per Capita
1850.....	1,450,000	21,773,000	15.0	.93
1860.....	2,044,000	22,471,000	10.9	.71
1870.....	2,660,000	40,859,000	15.3	1.65
1880.....	4,009,000	40,766,000	10.1	.81
1890.....	4,564,000	44,336,000	9.7	.70
1900.....	5,740,000	41,884,000	7.2	.54
1910.....	6,340,000	51,638,000	8.14	.56
1920.....	6,448,343	39,025,000	5.43	.33

TABLE K

RELATIVE STANDING OF LEADING WOOL-PRODUCING STATES, ARRANGED
ACCORDING TO NUMBER OF SHEEP, 1900, 1910 AND 1920

STATES	1900	1910	1920	STATES
1 New Mexico				Idaho
2 Montana				Texas
3 Wyoming				New Mexico
4 Ohio				California
5 Idaho				Wyoming
6 Oregon				Oregon
7 Texas				Utah
8 Utah				Ohio
9 Colorado				Colorado
10 California				Montana
11 Michigan				Missouri
12 Arizona				Michigan
13 New York				Arizona
14 Pennsylvania				Nevada
15 Washington				Iowa
16 Wisconsin				South Dakota
17 Indiana				Kentucky
18 Nevada				Indiana
19 Illinois				Illinois
20 Iowa				Washington
21 Missouri				New York
22 Kentucky				Nebraska (b)
23 West Virginia				West Virginia
24 Minnesota				Minnesota
25 South Dakota				Pennsylvania
26 Virginia (a)				Wisconsin
27 North Dakota (a)				Tennessee (b)

(a) Among the first 27 States in 1900 and 1910, but not in 1920.
(b) Among the first 27 States in 1920 only.

TABLE L

COMPARATIVE CHART OF UNITED STATES WOOL AND SHEEP STATISTICS, 1901-1920
Compiled by Philadelphia Wool and Textile Association

NUMBER OF SHEEP, SHEARING AGE

1901	41,900,000
1906	38,540,000
1911	39,481,000
1915	36,600,000
1920	39,025,000

DOMESTIC WOOL PRODUCTION

1901	302,000,000 Pounds
1906	298,000,000 "
1911	318,000,000 "
1915	288,000,000 "
1920	277,905,000 "

VALUE OF PRODUCT

1901	\$51,000,000
1906	\$80,000,000
1911	\$67,000,000
1915	\$85,000,000
1920	\$113,000,000

ESTIMATED CONSUMPTION

1901	400,000,000 Pounds
1906	491,000,000 Pounds
1911	510,000,000 Pounds
1915	591,000,000 Pounds
1920	516,041,442 Pounds

TABLE M

WOOL PRODUCTION OF THE WORLD ACCORDING TO THE LATEST AVAILABLE
REPORTS AND ESTIMATES

Country	Year	Pounds
NORTH AMERICA:		
United States	1923	266,110,000
British Provinces	1923	15,539,416
Total North America		281,649,416
CENTRAL AMERICA AND WEST INDIES:		
Mexico	1923	780,000
All other		750,000
Total Central America and West Indies...		1,530,000
SOUTH AMERICA:		
Argentina	1922-23	297,000,000
Brazil	1922	23,800,000
Chile	1922	38,500,000
Columbia	1917	860,000
Peru	1922	10,000,000
Faulkland Islands	1923	3,200,000
Uruguay	1922	92,000,000
All other		5,000,000
Total South America		470,360,000
EUROPE:		
Austria	1923	1,322,760
Belgium	1922	826,725
Bulgaria	1922	25,000,000
Czechoslovakia	1920	4,303,000
Denmark, Iceland and Faroe Islands.....	1921	3,508,000
Estonia	1923	3,150,000
Finland	1922	7,500,000
France	1923	41,777,000

Country	Year	Pounds
EUROPE—Continued:		
Germany	1922	48,501,000
Greece	.....	13,000,000
Hungary	1923	13,779,000
Italy	1922	58,000,000
Latvia	1923	2,700,000
Netherlands	.....	5,100,000
Norway	1923	5,200,000
Poland	1923	5,839,000
Portugal	1923	6,000,000
Roumania	1923	52,910,000
Russia	1923	87,465,000
Spain	1922	90,364,000
Sweden	.....	2,700,000
Switzerland	1923	780,000
United Kingdom	1923	102,300,000
Yugoslavia	1921	35,000,000
All other	.....	100,000
Total Europe	.....	617,125,485
ASIA:		
British India	1923	65,000,000
China	1923	78,000,000
Japan	1923	72,276
Persia	1923	18,000,000
Russia in Asia	1923	45,000,000
Turkey in Asia	.....	60,000,000
All other	.....	1,000,000
Total Asia	.....	267,072,276
AFRICA:		
Algeria	1922	35,155,000
Egypt	1921	4,500,000
Morocco	1923	19,976,000
Tunis	.....	6,765,000
Union of South Africa	1922-23	176,000,000
All other	.....	25,000,000
Total Africa	.....	267,396,000
OCEANIA:		
Australia	1922-23	600,931,156
New Zealand	1922-23	214,705,920
Total Australasia	.....	815,637,076
All other	.....	70,000
Total Oceania	.....	815,707,076
Total World	.....	2,720,840,253

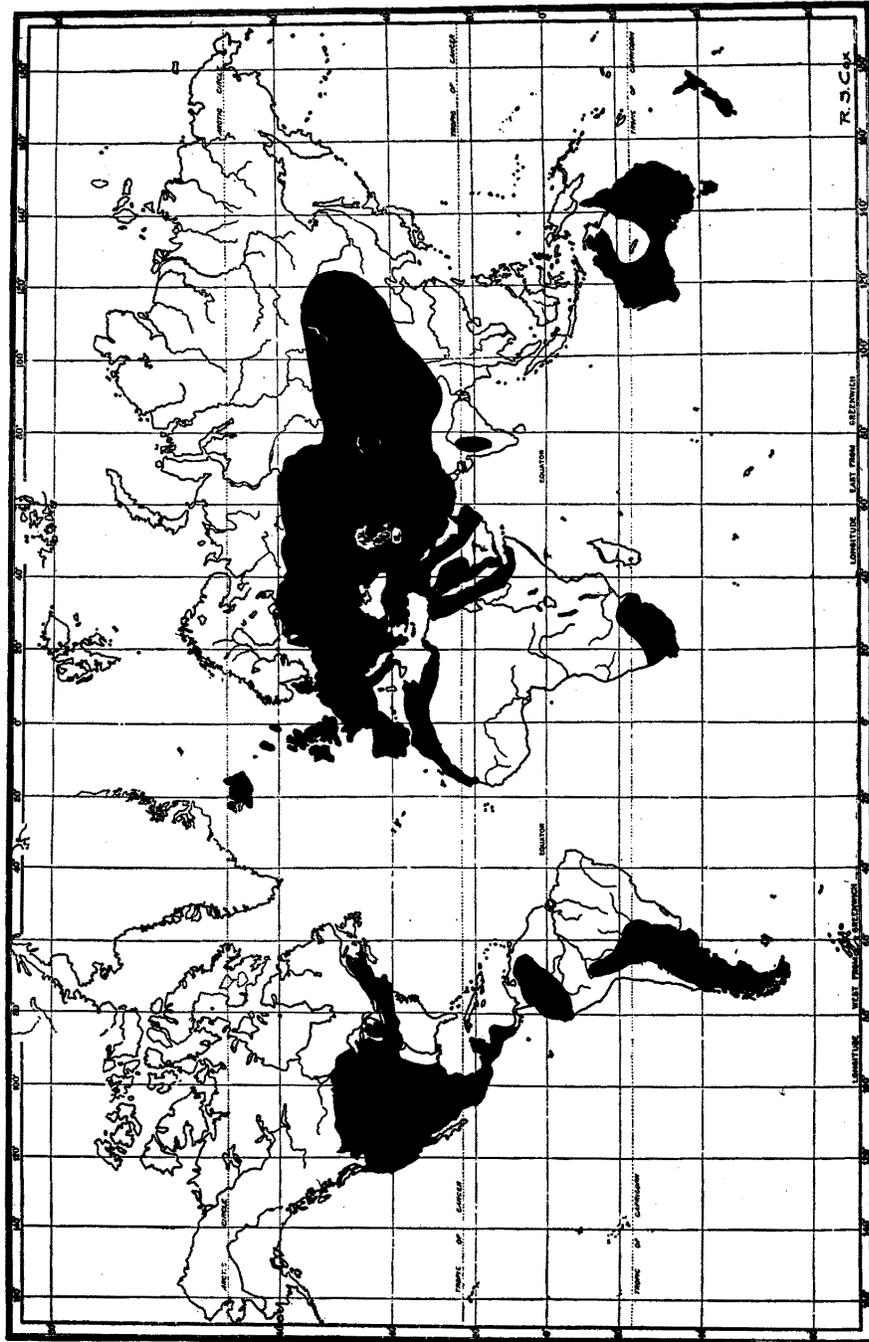


Fig. 84.—Map of World—Geographic Distribution of Sheep and Sources of Wool.

TABLE N
 Boston prices of domestic wools in October for the last eleven years are shown in the table which follows:
 COMPARATIVE PRICES OF DOMESTIC WOOLS IN BOSTON, OCTOBER, 1913-1923.

	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913
Ohio, Pennsylvania and West Virginia											
(Unwashed):											
Fine .....	.48	.46	.28-.29	.42	.67	.67	.63	.32-.33	.26-.27	.23	.20-.21
½ blood .....	.54	.55	.30-.31	.42	.80	.78	.75	.39-.40	.34-.35	.27	.23-.24
¾ blood .....	.51	.50	.26-.27	.40	.67	.78	.75	.40-.42	.36-.37	.26	.23-.24
¼ blood .....	.48	.45	.25-.26	.38	.64	.77	.75	.40-.42	.35-.36	.26	.23-.24
Fine Delaine .....	.54	.55	.35-.36	.60	.83	.75	.75	.36-.37	.30-.31	.24	.22-.23
Michigan, Wisconsin, New York, etc.											
(Unwashed):											
Fine .....	.46	.45	.26-.27	.40	.65	.64	.60	.29-.30	.24-.25	.22	.19-.20
½ blood .....	.52	.51	.28-.29	.40	.75	.76	.74	.37-.38	.33-.34	.26	.22-.23
¾ blood .....	.50	.48	.26-.27	.38	.60	.77	.74	.41-.42	.35-.36	.26	.22-23
¼ blood .....	.46	.43	.24-.25	.36	.60	.76	..	.40-.41	.34-.35	.25	.22-.23
Fine Delaine .....	.51	.52	.32-.33	.55	.80	.73	.72-.73	.35-.36	.27-.28	.23	.21-.22
Kentucky and Indiana (Unwashed):											
¾ blood .....	.53	.50-.51	.27-.28	.42	.63	.79	.80	.44-.45	.37-.38	.27	.24-.25
¼ blood .....	.50	.47-.48	.25-.26	.40	.62	.78	.80	.43-.44	.37-.38	.25	.24-.25
Braid .....	.34	.36-.37	.15-.17	.28	.35	.68	.67-.68	.36-.37	.33-.34	.22	.23-.24

TABLE N—Continued

	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913
Missouri, Iowa and Illinois (Unwashed):											
% blood .....	.46	.48	.24-.25	.38	.60	.76	.72	.40-.42	.35-.36	.25½-.26	.22-.23
¼ blood .....	.45	.43	.23-.24	.36	.60	.75	.72	.39-.40	.35-.36	.25-.26	.22-.23
Braid .....	.32	.32	.15-.16	.28	.35	.67	.67-.68	.36-.37	.31-.32	.21-.22	.22-.23
Texas (Scoured basis):											
12 months, fine and fine medium.....	1.20	1.30	.65-.75	1.00	1.80	1.75	1.70	.80-.85	.67-.68	.56-.58	.50-.52
Spring, fine and fine medium.....	1.15	1.20	.55-.60	.85	1.60	1.60	1.50	.70-.75	.60-.62	*	*
Fall, fine and fine medium.....	1.00	1.10	.50-.55	.65	1.50	1.50	1.48	.57-.58	.55-.57	.45-.47	.42-.43
California (Scoured basis):											
12 months, fine	1.15	1.05-1.10	.70-.75	.90	1.80	1.75	1.68	.80-.85	.65-.67	*	*
Spring, fine	1.10	.95-1.10	.55-.60	.75	1.60	1.60	1.50	.65-.70	.60-.62	*	*
Fall, fine .....	.90	.90-.95	.50-.55	.50	1.30	1.47	1.45	.60-.62	.54-.56	*	*
Territory Wool—Montana, Wyoming, Utah, Idaho, Oregon, etc. (Scoured basis):											
Staple, fine and fine medium.....	1.30	1.30	.80-.85	1.20	2.00	1.85	1.80	.88-.90	.70-.72	.58-.60	.52-.54
Clothing, fine and fine medium.....	1.15	1.15	.60-.65	1.00	1.85	†	1.65	.83-.85	.67-.68	.54-.55	.47-.49
½ blood	1.15	1.10	.68-.72	.90	1.70	1.78	1.68	*	.68-.69	*	*
% blood	1.00	.90	.50-.55	.75	1.35	1.55	1.42	*	.66-.67	*	*
¼ blood .....	.85	.80	.38-.42	.55	1.15	1.40	1.28	*	.62-.64	*	*
New Mexico (Scoured basis):											
No. 1	1.20	1.20-1.25	.65-.70	.95	1.56	1.65	1.70	.78-.80	.64-.66	.54-.55	.47-.48
No. 2 .....	.90	1.10	.55-.58	.75	1.40	1.55	1.58	.63-.65	.58-.60	.46-.48	.42-.43
No. 3 .....	.75	.80-.85	.38-.40	.40	1.10	1.35	1.38	.58-.60	.53-.55	.38-.40	.37-.38
Georgia and Southern (Unwashed).....	.48	.43-.45	.19-.21	.25	.58-.64	.68-.70	.70-.71	.37-.38	.33-.34	.24-.25	.22-.23

† But little in the market.

* Grade not quoted.

TABLE O

PRODUCTION OF RAW WOOL IN PRINCIPAL WOOL PRODUCING COUNTRIES, 1923.

United States	266,110,000	Union of South Africa....	176,000,000
Australia	600,931,156	Continent of Europe	
New Zealand	214,705,920	(Fleece washed)	514,825,485
Argentina	297,000,000	United Kingdom	
Uruguay	92,000,000	(Fleece washed)	102,300,000

TABLE P

NUMBER OF SHEEP IN THE WORLD ACCORDING TO THE LATEST AVAILABLE
REPORTS AND ESTIMATES, 1923
FROM NATIONAL ASSOCIATION WOOL MANUFACTURERS' ANNUAL WOOL REVIEW

Country	Year	Number of Sheep
NORTH AMERICA:		
United States, Continental.....	1923	38,347,000*
Noncontiguous, except Philippine Islands...		
Hawaii	1920	44,000
Porto Rico		4,000
Alaska		200
Total United States		38,395,200
Canada	1923	2,755,273*
Newfoundland		98,000*
Total North America		41,248,473
CENTRAL AMERICA AND WEST INDIES:		
Mexico	1922	500,000
Guatemala		383,000
Other Central America		124,000
Cuba	1921	30,000
British West Indies		28,000
Dutch West Indies		22,600
Other West Indies		20,000
Total Central America and West Indies.		1,107,600
SOUTH AMERICA:		
Argentina	1923	35,267,591
Brazil	1923	7,933,437
Bolivia	1913	b 1,750,000*
Chile	1923	4,800,000
Columbia	1917	246,000
Ecuador	1921	180,000
Uruguay	1919	11,473,000
Paraguay		600,000
Peru	1917	a 6,357,000
Venezuela	1921	62,800**
Faulkland Islands		667,389
Other South America		300,000
Total South America		69,637,217
EUROPE:		
Austria	1922	597,414**
Belgium	1921	125,000
Bulgaria	1922	10,000,000
Czechoslovakia	1920	986,611**
Denmark (d), Iceland and Faroe Islands...	1921	c 1,169,328**

Country	Year	Number of Sheep
EUROPE—Continued:		
Estonia	1922	744,937
Finland	1922	a 1,570,985**
France	1922	9,782,420
Germany	1922	5,566,086
Greece	1921	a 5,547,000**
Hungary	1923	a 2,800,000
Italy	1918	11,753,910
Latvia	1923	1,461,000
Lithuania .....	....	1,161,500
Netherlands	1921	668,211
Norway	1918	1,207,923**
Poland—exclusive of Vilno and Upper Silesia	1921	2,178,216**
Portugal (Continental)	1920	3,850,733*
Roumania	1922	12,164,405*
Russia	1920	36,065,000
Spain .....	....	20,600,000
Sweden	1919	1,563,654
Switzerland	1921	a 244,435
United Kingdom	1923	24,196,448††
Yugoslavia	1921	a 7,542,110
All other Europe .....	....	20,000
Total Europe		163,567,326
ASIA:		
British India .....	....	22,084,579
Ceylon	1921	57,200
China	1921	e 45,000,000**
Cyprus	1922	280,747
Japan	1922	12,046
Philippine Islands	1916	130,000**
Russia in Asia	1921	10,499,000
Turkey in Asia	1913	27,094,678
Other Asia .....	....	1,240,000
Total Asia		106,398,250
AFRICA:		
Algeria	1922	8,941,000
Basutoland	1920	1,854,426
British Southwest Africa (formerly German)	1922	1,350,000
British Tanganyika Territory (formerly German East Africa)	1921	3,405,103
Egypt	1922	941,700
French Equatorial Africa	1918	1,000,000
French West Africa .....	....	5,863,971
Italian Somaliland	1920	1,666,308
Kenya (British East Africa)	1922	2,463,715
Madagascar	1921	110,000
Morocco	1922	7,264,000
Nigeria	1921	1,909,000
Rhodesia	1922	316,811
Soudan (Anglo-Egyptian)	1909	830,000
Tunis	1922	2,820,000
Uganda Protectorate	1920	266,920
Cape of Good Hope	} Union of South Africa	30,052,705**†
Natal		
Orange Free State		
Transvaal		1,500,000
All other Africa .....	....	1,500,000
Total Africa		72,555,659

Country	Year	Number of Sheep
OCEANIA:		
Australia	1922	80,209,951
New Zealand .....	.....	22,928,864
Total Australasia		103,138,815
Other Oceania		10,000
Total Oceania		103,148,815
Total World		557,663,340

a Includes lambs.

b Includes goats.

c Iceland and Faroe Islands, years 1920 and 1919, respectively.

d Does not include sheep and lambs in North Slesvig.

e Includes Thibet, Mongolia and China-Turkestan.

* Official estimates from the countries covered.

** Official census or other official reports from the countries covered.

All figures without asterisk are estimates based on best information obtainable.

† Includes only woolled sheep and Angora goats. Wool estimate does not include 16,000,000 pounds of mohair grown.

†† Figures for Irish Free State estimated, official figures not being available.

TABLE Q

DISTRIBUTION OF SHEEP AT CLOSE OF YEAR IN AUSTRALIA, 1923

	Number of Sheep	Pounds of Wool Exported 1922-1923
New South Wales	37,177,402	294,200,000
Victoria	11,765,520	95,718,000
Queensland	17,051,756	111,602,100
South Australia	6,000,000	51,198,000
West Australia	6,664,000	38,721,056
Tasmania	1,551,273	9,472,000
	80,209,951	600,931,156
New Zealand	22,928,864	214,705,920
Combined total	103,138,815	815,637,076

TABLE R

NUMBER OF WOOLED SHEEP IN SOUTH AFRICA AT CLOSE OF YEAR 1923

Cape	} Union of South Africa	} 30,052,705
Transvaal		
Orange Free State		
Natal		

TABLE S

ESTIMATED NUMBER OF SHEEP AND LAMBS IN CANADA BY PROVINCES, 1922-1923

Provinces	Sheep		Lambs		Total	Total
	1923	1922	1923	1922	1923	1922
P. Edward Island..	46,781	59,244	37,152	46,459	83,933	105,703
Nova Scotia.....	140,479	185,987	118,058	143,358	258,537	329,345
New Brunswick...	87,441	127,886	70,367	108,145	157,808	236,031
Quebec	463,538	567,095	359,459	423,823	822,997	990,918
Ontario	464,549	501,319	443,124	485,298	907,673	986,617
Manitoba	51,010	61,539	42,152	51,324	93,162	112,863
Saskatchewan	79,483	127,598	57,757	64,339	137,240	191,937
Alberta	143,517	166,012	95,657	94,364	239,174	260,376
Br. Columbia.....	28,530	28,171	24,806	21,574	53,336	49,745
Indian Reserves (a)	780	b	633	b	1,413	b
Total	1,506,108	1,824,851	1,249,165	1,438,684	2,755,273	3,263,535

a Included for the first time.

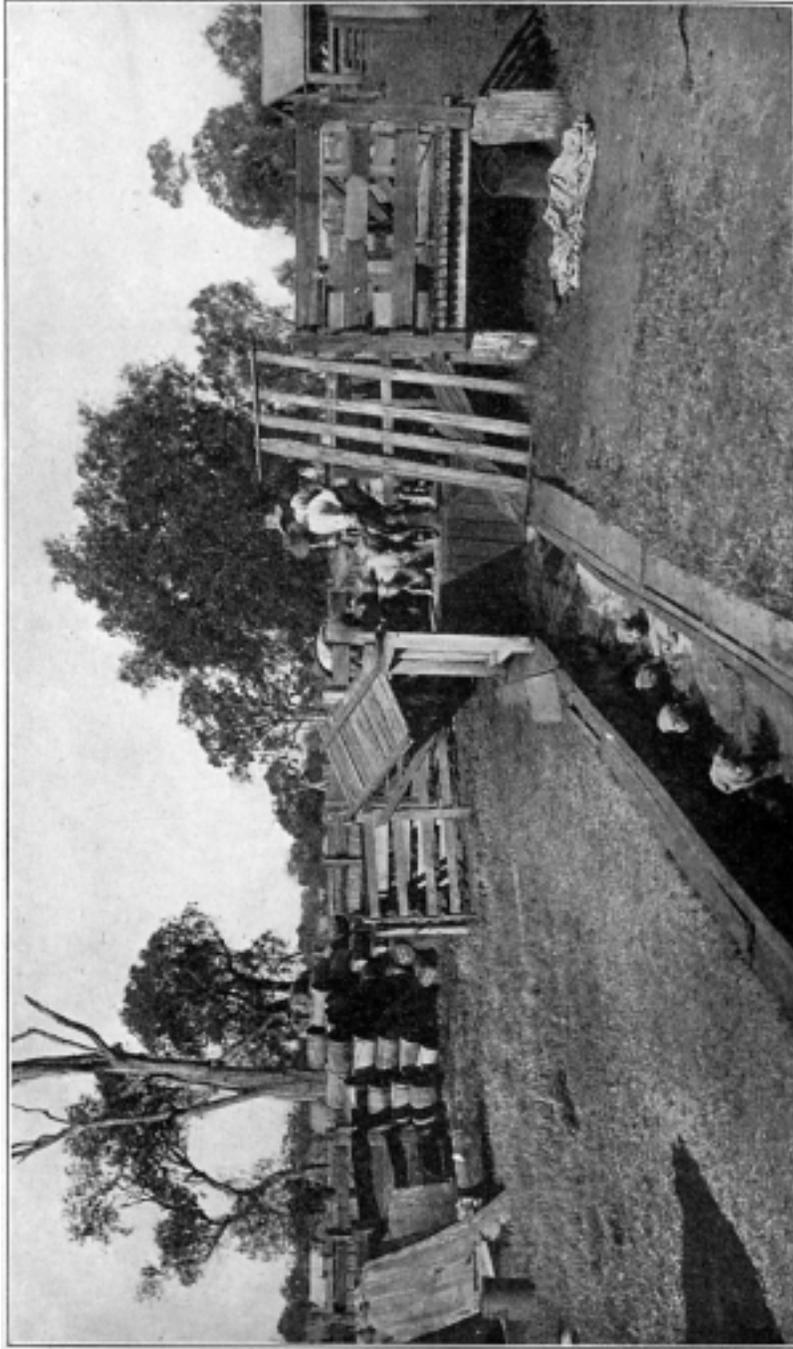
b Not available.

TABLE T

ESTIMATED NUMBER OF SHEEP AND THE PRODUCTION AND VALUE OF
CANADIAN WOOL CLIP, 1915-1923

Year	Sheep	Production	Average	Value
			Price Per Lb.	
		Pounds	Cents	
1915.....	2,038,662	12,000,000	28	\$3,360,000
1916.....	2,022,941	12,000,000	37	4,440,000
1917.....	2,369,358	12,000,000	59	7,000,000
1918.....	3,052,748	20,000,000	60	12,000,000
1919.....	3,421,958	20,000,000	60	12,000,000
1920.....	3,720,783	24,000,000	22	5,280,000
1921.....	3,675,860	21,251,000	14	2,975,000
1922.....	3,262,626	18,523,392	15	3,149,000
1923.....	2,755,273	15,539,416	23	3,574,000*

* Provisional estimate.



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FIG. 85.—Sheep Dipping at Jondaryan, West Queensland, Australia.

MISCELLANEOUS

SCORE CARD FOR SHEEP

As Adopted by the Illinois Agricultural College

Weight, pounds	4
Weight, score according to age and breed	4
Form, straight top and underline; deep broad, low set, compact, symmetrical	10
Quality, hair fine; bone fine but strong; even covering of firm flesh; features refined but not delicate; stylish	10
Constitution, chest capacious; brisket well developed; flanks deep; bone strong; movement bold and vigorous	10
Condition, thrifty; skin pink; fleece elastic; well fleshed, but not excessively fat; deep covering of firm flesh	5
Disposition, quiet, but not sluggish	2
Color and markings, according to breed	2
Muzzle, mouth and nostrils large; lips thin	1
Eyes, full, bright, clear	1
Face, short, according to breed	1
Forehead, broad, full	1
Ears, texture fine; size and form, according to breed	1
Neck, thick, short, neatly tapering to head; throat clean, according to breed	3
Shoulder vein, full	1
Shoulder, covered with flesh; compact; smoothly joined with neck and body	3
Brisket, well developed; breast wide	1
Legs, straight, short, set well apart; pasterns upright; feet squarely (fore), placed neither close nor sprawling	2
Ribs, long, well sprung, thickly fleshed	3
Back, broad, straight, thickly and evenly fleshed	5
Loin, thick, broad, firm	5
Flank, full, even with underline	1
Hips, level, smoothly covered; width in proportion with other part	1
Rump, long, level, wide and even in width; not covered at tailhead with excessive fat	3
Thighs full, fleshed well down to hock	2
Twist, deep, plump, firm, indicating fleshiness	5
Legs, straight, short, set well apart, bones smooth strong, being neither (hind) coarse nor fine; pasterns upright; feet squarely placed; neither close nor sprawling	3
Wool, quantity, long, dense, even, according to breed	5
Wool, quality, structure and color true; fine, soft, even, according to breed	5
Wool, condition, strong, bright, clean, slight amount of yolk	4
Total (perfect score)	100

SCORE CARD FOR MUTTON SHEEP

Adopted by Department of Animal Husbandry, the University of Wisconsin

Age.....	Teeth.....	
GENERAL APPEARANCE—24 points:		Possible Score
Weight, estimated; actual pounds according to age		6
Form, low, long, symmetrical, compact and evenly covered with firm flesh		10
Quality, clean bone; silky hair		6
Temperament		2
HEAD AND NECK—9 points:		
Muzzle, fair size; nostrils large; lips thin; mouth large		2
Eyes, full, bright		1
Face, short, bold expression		1
Forehead, broad		1
Ears, fine, erect		1
Neck, thick, short; throat clean		3
FOREQUARTERS—13 points:		
Shoulder vein, full		2
Shoulders, covered, compact		3
Chest, deep, wide, large girth		3
Brisket, full, prominent; breast wide		2
Legs, straight, short, wide apart, strong; forearm full, shank smooth..		3
BODY—13 points:		
Back, straight, wide		4
Loin, broad, thick		4
Ribs, deep, arched		3
Flank, low, thick, making underline straight		2
HINDQUARTERS—17 points:		
Hips, smooth, far apart		3
Rump, long, level, wide		4
Thighs, full, well fleshed		3
Twist, plump, deep		4
Legs, straight, short, strong; shank smooth		3
CONSTITUTION—10 points:		
Girth large		3
Skin, pink color		3
Fleece, dense and even over body, yolk abundant		4
WOOL—14 points:		
Quantity, long, dense, even		6
Quality, fine, soft, pure, even		4
Condition bright, strong, clean		4
Total		100

DIRECTIONS FOR CARING FOR SHEEP IN ORDER TO PRODUCE
A GOOD QUALITY AND CONDITION OF WOOL

(Canadian Live Stock Branch)

1. Feed sheep well and regularly. Sheep poorly fed will possess a harsh fleece lacking in oil and frequently with a feeble or weak fibre. This does not constitute desirable wool for sale. Where sheep are starved for a period the effects will be shown in the wool by a weak section which will break readily and consequently cannot be used satisfactorily for combing or worsted purposes.
2. Every effort should be taken to keep the wool free from chaff, hay and burrs. This can be avoided by using proper feed racks and care in preventing hay or straw dropping upon the sheep during feeding.
3. If sheep are scouring, if possible keep the wool well clipped behind, so as to prevent the formation of heavy dung locks.
4. Endeavor to eliminate in breeding operations black sheep from the flock. Mate only sheep possessing pure white wool. Black wool is sold in the reject class.
5. In marking sheep, never use oil paint or tar, which are insoluble and will not scour from the wool.
6. Sheep should be dipped in some reliable material twice a year, in the fall before entering winter quarters and in the spring after shearing.

AN OLD SHEPHERD'S DON'TS

(Canadian Live Stock Branch)

1. Don't use a "scrub" ram.
2. Don't forget to trim the ram's feet once in six or eight weeks and the ewes' feet at least three times a year. The wool on the ewes' rump requires trimming also.
3. Don't overwork any ram, particularly a ram lamb. Confine the size of the flock in accordance with the age and vigor of the ram. A mature ram should be restricted to 50 ewes; a ram lamb, 30.
4. Don't allow the ram to remain with the pregnant ewes during the winter.
5. Don't overfeed or underfeed at any time. In order to gain the highest profits, thrift must be maintained in the flock.
6. Don't feed, except very sparingly, mangels or sugar-beets to rams. Calculi or stones may be formed in the urinary organs which may become, at times, large enough to block completely the urethral canal and cause the bladder to burst, with consequent death.
7. Don't forget to cull the ewe flock before each mating season. A few good ewes well-mated are more satisfactory and profitable than a large number of indifferent ones. "Every ewe has her day."
8. Don't forget to sow your rape patch for flushing the ewes. The ewes require and deserve a vacation after raising lambs. It pays for itself in the next lamb crop.

9. Don't think you can remember each ewe's record. Have ear-marks and be certain.

10. Don't expect to fix a type by constantly changing the ram. Decide on the type which is best suited to your purpose and sustain it through thick and thin.

11. Don't forget to dip all sheep at least once a year. Newly purchased animals may be the carriers of disease. Dissemination can be prevented by quarantine and dipping.

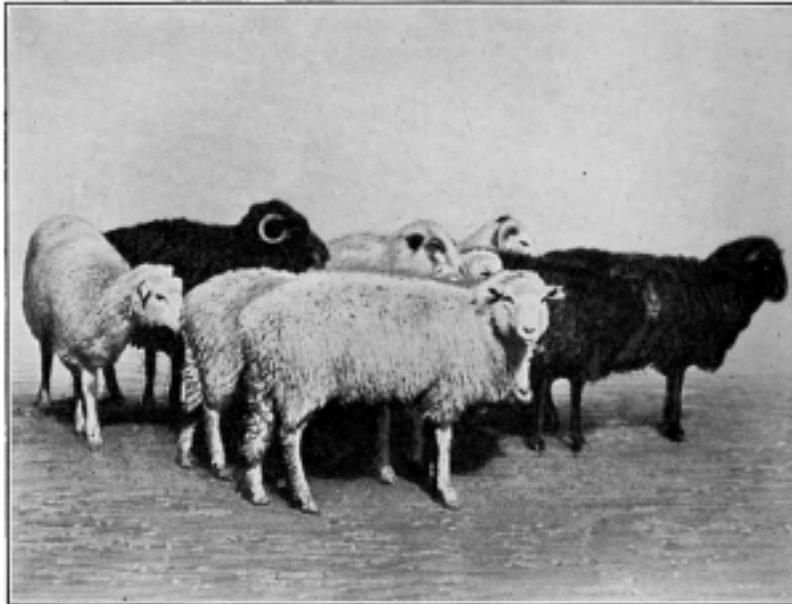


FIG. 86.—Culls.

DIRECTIONS FOR PREPARING AND PACKING WOOL
(Canadian Live Stock Branch)

1. Shearing should be done on a clean board floor, never on the dirt, and the fleece should be kept as compact as possible.
2. Fleeces should be tied with paper twine, never binder or sisal twine. Turn in the sides of the fleece and roll compactly from tail to neck with the bright or clipped surface outward.
3. The wool should be packed in very closely woven jute, hemp or paper-lined sacks.
4. Tags, dung locks or stained pieces should never be included with the fleeces, but always packed separately if wool is adhering to them.
5. All black or gray fleeces should be packed by themselves.
6. Lamb fleeces possessing unusual quality and length may well be kept apart from the others and offered for sale as a distinct class.

7. The wool should be absolutely dry at shearing and should never, subsequently, be permitted to become wet.

8. Tubwashing should not be practiced. If washing is followed at all, let it be done on the sheep's back, and at the time of shearing keep the washed separate from the unwashed.

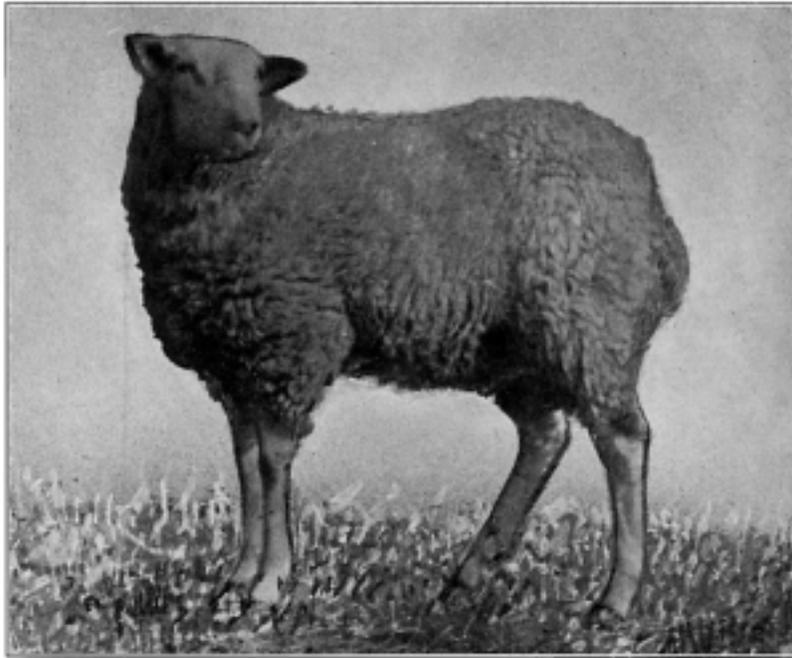


FIG. 87.—Scrub Ram.

TYPICAL MARKET QUOTATIONS

(107) WOOL

(June, 1924)

OHIO, PENNSYLVANIA AND WEST VIRGINIA (Unwashed)

Fine .....	.44	$\frac{3}{8}$ blood .....	.46
Fine Delaine .....	.50	$\frac{1}{4}$ blood .....	.42
$\frac{1}{2}$ blood .....	.50		

MICHIGAN, NEW YORK AND WISCONSIN (Unwashed)

Fine .....	.42	$\frac{3}{8}$ blood .....	.44
Fine Delaine .....	.48	$\frac{1}{4}$ blood .....	.40
$\frac{1}{2}$ blood .....	.48		

MISSOURI, IOWA AND ILLINOIS (Unwashed)

$\frac{3}{8}$ blood .....	.45	Braid .....	.40
$\frac{1}{4}$ blood .....	.41		

KENTUCKY AND INDIANA (Unwashed)

½ blood .....	.49	¼ blood .....	.45
⅜ blood .....	.48	Braid .....	.40

TEXAS (Scoured Basis)

12 mos., fine and fine medium..	1.30	Fall, fine and fine medium.....	1.05
Spring, fine and fine medium...	1.17		

CALIFORNIA (Scoured Basis)

Northern, 12 mos.	1.35	Fall free	1.08
Spring Middle Counties	1.18	Fall defects	1.03
Southern, 12 mos.	1.13	Carbonized	1.15

MONTANA, WYOMING AND IDAHO (Scoured Basis)

Staple, fine and fine medium...	1.30	⅜ blood .....	.95
Clothing, fine and fine medium..	1.15	¼ blood .....	.85
½ blood	1.15		

NEW MEXICO AND COLORADO (Scoured Basis)

No. 1	1.25	No. 3 .....	.80
No. 2	1.10		

NEVADA, UTAH AND ARIZONA (Scoured Basis)

Staple, fine and fine medium....	1.30	⅜ blood .....	.95
Clothing, fine and fine medium..	1.15	¼ blood .....	.85
½ blood	1.15		

GEORGIA AND SOUTHERN STATES

(Unwashed)48

DAKOTAS AND MINNESOTA (Scoured Basis)

Staple, fine and fine medium....	1.30	⅜ blood .....	.95
Clothing, fine and fine medium..	1.15	¼ blood .....	.85
½ blood	1.15		

OREGON (Scoured Basis)

Staple, fine and fine medium....	1.30	⅜ blood .....	.95
Clothing, fine and fine medium..	1.15	¼ blood .....	.85
½ blood	1.15		

PULLED WOOLS (Eastern Scoured Basis)

Fine A	1.28	Fine combings	1.10
A Super	1.13	Medium combing .....	.97
B Super	1.00	Low combing .....	.88
C Super .....	.80		

The following table shows a typical market report and the price of English wools when the European War commenced, and the value of the same descriptions ten years later. The prices have all been changed from pence to cents.

Description	June, 1914	June, 1924	Description	June, 1914	June, 1924
	Cents per Lb.			Cents per Lb.	
Southdown tegs and ewes.	.31	.59	Irish hogs, pick and super	.28½	.45
Pick Shropshire hogs and wethers	.30	.57	Irish wethers, pick and super	.28½	.43
Wiltshire Down tegs and ewes	.30½	.57	Best Kent tegs	.27½	.44
Hampshire Down tegs and ewes	.30	.55	Lonk ewes and wethers	.23	.28
Dorset Down tegs and ewes	.30½	.58	Welsh fleeces, selected	.24½	.33
Oxford Down tegs and ewes	.29	.49	Radnors, pick and fine	.24	.38
Cheviot hogs, super	.28	.51	Radnors, deep	.23	.31
Cheviot wethers, super	.26	.49	Herdwick ewes and wethers	.17	.25
Half-bred hogs (Mid Counties)	.26½	.43	Black-faced hogs	.18	.25
Half-bred wethers (Mid Counties)	.26	.42	Black-faced ewes and wethers	.17½	.25
Norfolk half-bred hogs	.27	.43	Half-bred, super, 56's	.30½	.62
Norfolk half-bred wethers	.26	.42	Half-bred, super, 50's	.27½	.50
Lincoln hogs	.24½	.36	Cross-bred, medium, 46's	.24	.37
Lincoln wethers	.24	.35	Cross-bred, coarse, 40's	.22	.36
Leicester hogs	.25	.37	Cross-bred, coarse, 36's	.21½	.35
Leicester wethers	.24½	.36	Sliped half-bred lambs	.35½	.67
Devon greasy	.20	.31	Sliped three-quarter-bred lambs	.30	.58
			Sliped Leicester lambs	.27½	.49
			Sliped Lincoln lambs	.26½	.44

FOREIGN CLOTHING AND COMBING

Australia (Scoured Basis)		Montevideo (Greasy):	
Victorian combing:		Lincoln	.44 @ .46
70s	1.15 @ 1.17	¼ blood	.41 @ .43
64s	1.00 @ 1.05	High	.43 @ .45
60s	.85 @ .88	¾ blood	.47 @ .50
Sydney combing:		½ blood	.50 @ .52
70s	1.11 @ 1.15	Merino	.54 @ .58
64s	.96 @ 1.01	Buenos Aires, X-breds:	
60s	.81 @ .83	Lincoln	.35 @ .37
New Zealand, X-breds:		¼ blood	.37 @ .39
36 to 40s	.31 @ .33	High	.46 @ .48
40 to 44s	.33 @ .35		
46s	.37 @ .39		

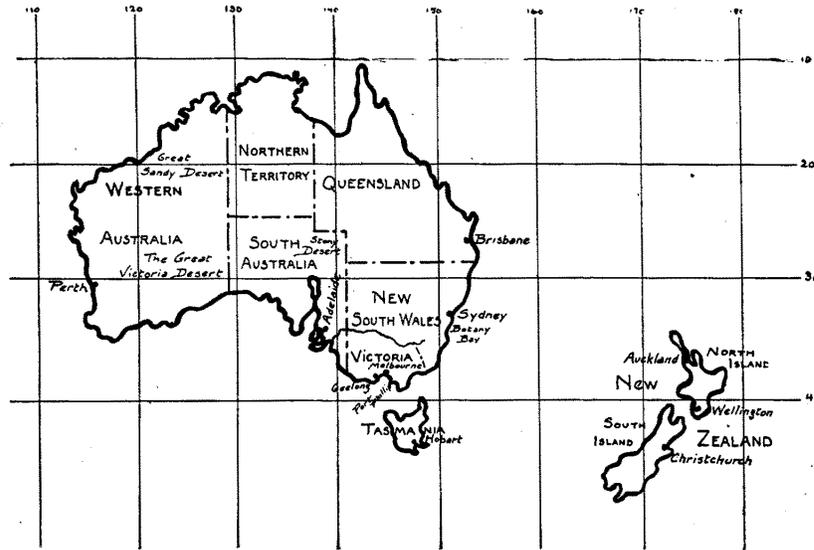


FIG. 88.—Map of Australia and New Zealand.

(139) MOHAIR
(October, 1922)

FOREIGN

Turkey:	Description	Price Per Pound	Cape:	Description	Price Per Pound
	Fine districts	.44		Summer kids	.88
	Fair average	.33		Winter kids	.72
	Good, yellow fleece	.31		Firsts	.33
	Ordinary	.29		Seconds	.30
	Inferior	.20		Winter	.31
	Good gray	.23		Mixed	.31
	Locks	.16		Thirds	.20

The above prices are in bond.

DOMESTIC

Best combing	.75	Best carding	.60
Good combing	.45	Good carding	.38
Ordinary combing	.40	Ordinary carding	.20

MOHAIR PRODUCTION

Mohair Produced in United States, 1900 to 1923, from the United States
Census and Best Available Sources

Year	Weight of Mohair	Year	Weight of Mohair
1900	961,328	1917	6,000,000
1910	3,778,706	1918	6,000,000
1912	4,000,000*	1919	8,000,000
1913	4,500,000	1920	7,000,000
1914	4,500,000	1921	7,000,000
1915	6,000,000	1922	7,750,000
1916	6,000,000	1923	8,000,000

* Figures from 1912-1923, inclusive, are commercial estimates.

TYPICAL MARKET QUOTATIONS ON NOILS, WASTES, CLIPS, RAGS
AND RE-WORKED WOOL
(May, 1923)

(158) NOILS

Fine white noils.....	.92 @ .95	Mohair noils, No. 1, second combing ....	.90 @ 1.10
½ blood white noils...	.88 @ .92	Alpaca noils, first combing .....	.55 @ .75
¾ blood white noils...	.85 @ .93	Alpaca noils, second combing (recombed).	.90 @ 1.10
High ¼ blood white noils .....	.73 @ .75	Camel hair noils....	
Recombed white ¼ blood noils .....	.75 @ .80	Short nubby silk noils.	.20 @ .24
Fine colored noils, re- combed .....	.75 @ .78	Long staple silk defec- tive noils .....	.35 @ .40
½ blood colored noils.	.60 @ .64	Foreign good white clear long staple silk noils .....	.42 @ .47
¾ blood colored noils.	.53 @ .57	Foreign good white clear fair staple silk noils .....	.32 @ .36
¼ blood colored noils.	.48 @ .52	Tussah silk noils, long staple .....	.35 @ .40
Fine carbonized noils..	1.00 @ 1.06		
Medium carbonized noils .....	.88 @ .92		
¼ blood carbonized noils .....	.78 @ .82		
Mohair noils, first combing, best .....	.76 @ .80		

(160) SOFT WASTES

Fine white Australian lap waste	1.35 @ 1.40	Fine white card waste, dusted .....	.60
Fine white lap waste..	1.30 @ 1.35	Medium white card waste, dusted .....	.48
Fine colored lap waste..	1.10 @ 1.15	Colored card waste, fine, clean .....	.22
Medium colored lap waste .....	.65 @ .70	Colored card waste, medium .....	.12 @ .15
Fine white Australian ring waste	1.20 @ 1.25		
Fine white ring waste..	1.20 @ 1.25		
Australian white card waste, dusted .....	.58 @ .62		

(162) GARNETTED YARN WASTE

Free fine colored thread worsted . . . . .	.54 @ .58	Fine colored thread waste . . . . .	.35 @ .40
½ blood white thread worsted . . . . .	.85 @ .92	Medium colored thread waste . . . . .	.26 @ .30
¼ blood white thread worsted . . . . .	.75 @ .80	White spinners' waste, greasy . . . . .	.30
Fine white Australian thread waste	1.05 @ 1.12	Colored spinners' waste, greasy . . . . .	.22
Fine white thread waste	1.00 @ 1.07	Colored carpet yarn waste . . . . .	.25 @ .30
White carpet thread waste . . . . .	.38 @ .42	Low carpet yarn waste. .22 @ .26	

(167) RAGS

(May, 1923)

NEW WOOLEN RAGS

Fine worsted clips13 @ .16	Foreign clothing clips. .14 @ .15	
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MEN'S WEAR CLIPS

Worsteds:

Dark17 @ .18	Brown25 @ .30
Fine dark15 @ .16	Blue25 @ .30
Light21 @ .22	Black30 @ .32
Black and white. . . . .	.25 @ .26	Edges . . . . .	.18 @ .20

LADIES' WEAR CLIPS

Worsteds and Serges:

White . . . . .	.54 @ .56	Maroon . . . . .	.30 @ .32
Blue . . . . .	.26 @ .28	Light . . . . .	.20 @ .22
Black . . . . .	.27 @ .28	Tan . . . . .	.34 @ .36
Brown . . . . .	.32 @ .33	Light blue . . . . .	.28 @ .30
Old green . . . . .	.09	Mixed dark . . . . .	.10 @ .12

FLANNELS

Blue . . . . .	.13 @ .14	Tan . . . . .	.26 @ .27
Black . . . . .	.10 @ .11	Mixed . . . . .	.09 @ .10
Green14 @ .15	Scarlet34 @ .35
Light French24 @ .25		

CLOTH

Fine black and white. .20 @ .22		Fine light18 @ .20
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HEAVY CLIPS

Mixed Mackinaws06 @ .07	Oxfords10 @ .12
Mixed overcoatings . . .04 @ .05		Black and white14 @ .16
Brown chinchillas and and cheviots . . . . .	.08 @ .09	Mixed lights . . . . .	.09 @ .10
Blue chinchillas and cheviots . . . . .	.09 @ .10	White chinchillas . . . . .	.16 @ .18
Black chinchillas and cheviots . . . . .	.10 @ .12	Brown lights . . . . .	.10 @ .12
		Shawls . . . . .	.08 @ .10

COTTON WARP CLIPS

Serges, black and white	.13	Black cloakings	.10
Serges, light	.12	Blue cloakings	.10
Palm Beach	.12	Brown cloakings	.10
Delaines, mixed colored	.08	Mixed cloakings	.07
Black astrakhans	.10	Dark unions	.04½ @ .05
Mixed astrakhans	.10	Light unions	.05 @ .05½

GOVERNMENT CLIPS

Indigo	.30	@ .32	Cadets	.30	@ .32
Khaki	.34	@ .36			

OLD WOOLEN RAGS

Merinos:		Linseys:	
Fine light	.20 @ .21	Red flannel	.04½
Coarse light	.07 @ .08	Best plaids	.04½
Fine dark	.06 @ .06½	Best brown	.04½
Coarse dark	.03 @ .03½	Best blue	.04½
Fine black	.14 @ .15	Common gray	.02 @ .03
Serges:		Light yarn, extra fine	.30 @ .35
Light	.14 @ .15	Light yarn, worsted	.38 @ .40
Brown	.15 @ .16	Dark mixed, extra fine	
Blue	.07 @ .07½	and free from cotton	
Black	.06 @ .06½	and silk	.20 @ .23
Red	.14 @ .15	Dark mixed, No. 2	.16 @ .18
Green	.11 @ .12	Medium to coarse grades,	
Flannels:		all wool yarn	.19 @ .22
Fine white	.35	Red flannel, all wool	.20 @ .22
Coarse white	.32	Red knit stock, strictly	
White No. 2	.25	all wool	.28 @ .30
Red	.17	No. 1 dark blue for	
Blue	.05½	hosiery, strictly all wool	.18 @ .19
Knit:		No. 2, same, not all wool	.12 @ .14
White	.35 @ .36	Fine dark merino, all	
Blue, dark	.17 @ .18	wool, No. 1	.07
Blue, light	.14 @ .16	Medium dark merino, all	
Blue, mixed	.15 @ .16	wool, No. 2	.05
Black, trimmed	.16 @ .17	Medium dark merino, not	
Black, untrimmed	.14 @ .15	extracted	.03
Red	.23 @ .24	Medium dark merino, all	
Brown	.19 @ .20	wool	.05
Light	.22 @ .23	Fine light merino, all	
Steel gray	.19 @ .20	wool	.11 @ .13
Dark	.15 @ .16	Fine black merino, all	
Fancy	.09 @ .10	wool	.14 @ .17
Hoods:		Medium light merino, all	
Light	.24 @ .25	wool	.15 @ .18
Delaines:		Medium light merinos,	
Skirted	.04 @ .05	extracted	.10 @ .12
		Medium black	.10 @ .12
		To order: Olives, all	
		wool, fine	.13 @ .15
		Blues, all wool	.13 @ .15

SKIRTED CLOTHS

Skirted worsteds:

Light .....	.07	@	.07½
Black .....	.06	@	.06½
Blue .....	.05½	@	.06
Dark .....	.04	@	.04½
Brown .....	.07	@	.07½

Skirted cloth:

Fine light .....	.05	@	.05½
Light .....	.04½	@	.05
Blue .....	.03	@	.03½
Plain black .....	.03	@	.03½
Dark .....	.02½	@	.03
Skirted, tan kersey ...	.15	@	.16
Skirted, tan covert ...	.18	@	.20

(168) SHODDY, MUNGO AND EXTRACT WOOL

White softs, "mixed," all wool .....	.56	@	.60	New blue worsteds, fine. .42	@	.44
White softs, all wool....	.62	@	.64	New light worsteds, fine. .29	@	.32	
Coarse light merinos, all wool21	@	.22	Fine white worsteds, garnetteds50	@	.55
Fine light merinos, all wool36	@	.37	¼ blood white worsted garnetteds60	@	.65
Coarse dark merinos, all wool12			⅜ blood white worsted garnetteds53	@	.55
Dark worsteds, all wool. .16	@	.18	½ blood white worsted garnetteds .....	.55	@	.60
Black worsteds, all wool. .23	@	.24	Colored garnetteds .....	.56	@	.58
New black worsteds, fine. .43	@	.44	Fine Oxford garnetteds..	.58	@	.60	
Light worsteds, all wool. .22	@	.25					

FLOCKS

Fulling flocks, white....	.09	@	.10	Blanket flocks, good straight white .....	.05	@	.06
Fulling flocks, colored ..	.06	@	.07	Shear flocks .....	.01	@	.02
Napper flocks, white ....	.08	@	.10				
Napper flocks, colored ..	.05	@	.06				

IMPORTS OF NOILS, WASTES, WOOL RAGS, FLOCKS AND MUNGO BY MONTHS, FISCAL YEAR ENDED JUNE 30, 1923

Fiscal Year July 1-June 30, 1922-1923	Noils		Wastes (a)		Wool Rags, Flocks and Mungo	
	Quantity	Value	Quantity	Value	Quantity	Value
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
July 1 to Sept. 1, 1922†	222,585	143,437	.....	.....	17,851,682	2,277,570
October*	1,517,438	710,050	1,321,447	570,935	1,507,842	233,375
November	2,375,091	1,187,061	478,271	232,807	450,541	104,492
December	2,127,466	1,132,723	1,047,650	519,845	507,926	168,160
January	1,157,559	572,680	1,129,430	522,344	984,469	251,474
February	947,733	535,464	823,763	427,800	921,193	228,779
March	1,885,469	1,047,295	1,250,333	656,381	2,396,761	620,386
April	1,115,769	699,135	1,138,650	580,022	1,875,652	485,785
May	915,398	694,473	631,368	324,616	963,810	253,390
June	433,893	333,986	523,423	280,443	555,433	174,792
Total	12,698,401	7,056,304	8,344,335	4,115,193	28,015,309	4,798,203

a Wastes not reported separately prior to October.

† Not possible to give monthly totals.

* September 22 to October 31.

GLOSSARY OF TERMS USED

ADELAIDE WOOLS.—Most of the wools from the State of South Australia are sold in Adelaide, and are known as Adelaide wools.

ANTHRAX.—Both men and animals are subject to this infectious disease, which develops a virulent ulcer and high fever. It localizes in the skin or lungs and sometimes in the intestines. It is not always fatal. When confined to the skin alone a cure is usually effected. This disease is also known as black-leg and wool-sorters' disease.

ASTRAKHAN.—(a) This name is given to a grade of Karakul lambskins. The astrakhans are less lustrous, have longer hair and a much more open curl than the first grade of Karakul lambskins, which are known as Persian lamb. The name is taken from a province of that name bordering on the Caspian Sea, in the southeastern part of European Russia. (b) The name is also applied to woven and knitted imitations of natural astrakhan. Mohair and luster wool yarns are used to give the luster.

BABY COMBING WOOL.—Short, fine staple wools usually under 2.5 inches, and treated by the French comb in the manufacture of French-spun worsted yarns.

BELLY WOOL.—That which grows on the belly of the sheep. It is often uneven and tender, and is always shorter than wool from other parts of the body. It is often stained and dungy.

BLACK TOPPED.—This term describes the effect produced by Merino fleeces containing a large amount of yolk which collects and holds dirt and dust.

BLACK WOOL.—The term includes any wool that is partially or wholly black, brown or gray.

BOTANY WOOL.—All fine Australian wools are better known in Great Britain as Botany wools, and the term is used extensively in the United States. The name is taken from the harbor called Botany Bay, which is located on the eastern coast of

Australia, south of Sydney, in the State of New South Wales. The district adjacent to this bay is noted for the production of fine wools.

BRADFORD SYSTEM.—This is also known as the English System. It is one of the methods of producing worsted yarns. The spinning is performed on cap frames. The thread is smooth compared with woolen yarn and the fibers parallel.

BRAID WOOL.—Grade name. Also known as luster wool.

BREAK IN WOOL.—Wool which is weak at one particular point of the staple, but sound above and below the break.

BRIGHTNESS.—Wool of light appearance.

BRITCH WOOL.—Wool from the hindquarters of the sheep; usually the coarsest on the body.

BROAD.—A straight-fibered, non-elastic wool.

BROAD TAIL.—The grade of Karakul lambskin lower than astrakhan is known as broad tail. Broad-tail skins are taken from lambs prematurely born. Their hair is shorter than that on Persian lambskins, and instead of being tightly curled it is swirled, and exhibits a very attractive wavy pattern. Woven fabrics manufactured to imitate the broad-tail effect are usually called karakul or caracul in the trade.

BROAD-TAILED SHEEP.—Practically the same as fat-tailed sheep.

BROKEN WOOL.—That which has become detached or been torn from the fleece.

BROKES.—Short wool found around the edges of the belly and neck.

BRUSHED WOOLS.—This term is only applicable to pulled wools, and is taken from the scrubbing or brushing process, which removes burrs, sand, dirt and other foreign substances from the fleeces. This brushing process takes place while the wool is still a part of the pelt.

BUCK.—A male goat used for breeding.

BUCK FLEECES.—Fleeces shorn from rams.

BUTTS.—Heavy dungy locks. Butts and tags are the same.

CAPE WOOLS.—These wools are produced in British South

Africa, and are also known as South African wools. The name was first given to the wools produced in Cape Colony, which in turn was named from the Cape of Good Hope.

CARACUL.—This is another spelling for Karakul.

CARBONIZED WOOL.—That which has been treated with a solution of sulphuric acid to remove the vegetable matter. Carbonizing is more commonly practiced with clothing wools.

CARDING.—Consists of opening the wool staples, separating the fibers to a certain extent, condensing and delivering the opened wool in a continuous strand or sliver.

CARDING WOOLS.—Wools best adapted by their short length for processing on the woolen system.

CARPET WOOL.—Low, coarse wool, usually obtained from native, unimproved sheep and used in the manufacture of carpets. There is very little produced in the United States.

CASING.—To separate and pack fleeces of the same quality in bales or sacks.

CHARACTER.—A true, sound stapled wool with evenness of quality and regularity of crimp and serrations.

CLASSING.—A term used in Australia for grading fleeces after they have been skirted.

CLOTHING WOOLS.—Same as carding wools.

CLOUDY WOOL.—Such wool shows the presence of discolorations in the fleece on various parts of the body. It is usually due to rain dripping down on sheep from leaky roofs, irregular and uneven exposure, or inheritance. It is seldom found in the fleeces from range sheep.

COLD TEST.—Shrinkage tests are known as cold tests when the scoured wool is allowed to stand several hours after drying in order to regain moisture.

COLONIAL WOOLS.—This term is applied to the wools of Australia, New Zealand and South Africa.

CRUTCHINGS.—Colonial term for pieces.

COMBING.—An operation in worsted manufacture which straightens the fibers, and separates the short, weak and tangled

fibers known as noils from the continuous strand of long, parallel fibers known as top.

COMBING WOOL.—That which is best adapted for making worsted yarns.

COMEBACK.—In America this refers to a wool fine in quality and having more length than would ordinarily be expected. In Australia, it is the result of breeding crossbreds back toward pure Merinos, one of the parents being a pure-blood Merino.

CONCORDIA WOOL.—Located in Argentina on the Uruguay River is the city of Concordia. It is the main shipping point for the wools grown in northern Uruguay and contiguous territory in Argentina.

CONDITION.—Refers to the degree of oil in grease wool. It largely regulates the price. In scoured wool it is used to indicate the degree of moisture.

COTTED FLEECE.—A cotted fleece is one in which the fibers close to body are matted or tangled. This condition may be caused by ill health of the sheep, such as a fever, or the absence of the proper amounts of yolk or grease in the wool. These fleeces are often produced by very old sheep with low vitality.

COW-TAIL.—A very coarse fleece, or exceptionally coarse britch wool. More like hair than wool.

CRIMP.—The natural waviness of the wool fiber. Uniformity and abundance of crimp indicate superior wool. The term crimp is sometimes applied only to Merino wools where the waves are frequent and sharply defined, leaving the term waviness to describe other wools not possessing this feature to such a high degree.

CROSSBRED.—The offspring resulting from mating a ram and ewe of different breeds, usually a Merino ewe, with a long-wool ram.

CROSSBRED WOOLS.—Wools obtained from crossbred sheep.

CULLS.—Sheep which are below a required standard.

DAM.—Same as ewe.

DAMP WOOL.—When stored in a damp condition wool becomes

discolored and turns yellow. This cannot be removed by scouring, and prevents its use in white yarns, thereby lowering its value. Pronounced forms of mildew are liable to develop and weaken the wool, lowering its spinning properties.

DEFECTIVE.—Denotes that something will show disadvantageously after the wool is scoured. Fire, water, vegetable matter or moths may cause defective wools. California burry wool is quoted as defective.

DEGREASED WOOL.—Wool from which the grease and dirt have been extracted by the naphtha process.

DEMI-LUSTER.—Wool that is not sufficiently lustrous or bright to be classed or graded with pure-bred luster wool.

DELAINE WOOL.—Delaine originally referred to a fine type of women's dress goods. Delaine wools are fine combing wools from Ohio and vicinity, but not necessarily confined to the Delaine Merino.

DENSITY.—The number of fibers produced on a given area of the sheep's body. The more numerous the fibers the greater the density.

DEPILATORY.—An application used to take off hair. The compound used in wool pulling usually consists of sodium sulphide, sulphuric acid and oyster shells. The latter yield lime.

DOE.—A female goat.

DOMESTIC WOOL.—(a) General meaning includes all wools grown in this country as distinguished from foreign wools. (b) In a strict sense wools grown in this country, east of the Rockies, and raised under farming conditions.

DOWNRIGHTS.—In England this term is applied to the short wool obtained from the neck portion of the fleece.

DOWN WOOLS.—Wools produced by the British down breeds of sheep, such as the Southdown, Hampshire, Shropshire, etc.

DOWNY WOOLS.—Very soft to the touch.

EASTERN PULLED WOOLS.—Pulled wools obtained from the slaughter houses of the East, therefore domestic wools are supe-

rior to the Western pulled wools which are principally territory wools.

EWE.—A female sheep.

EXTRACT WOOL.—Recovered wool fiber obtained from rags containing a percentage of cotton.

FALL WOOL.—Wool shorn in the fall, and represents a five to six months' growth, and is the second shearing in the year.

FAT-TAILED SHEEP.—These sheep are common sheep and native to Asia, Asia Minor, Russia and the Balkan States. The fat, which is secured from the enormous tails of these sheep, is the most valuable product of the carcass. The fleeces are unusually kempy and grade as carpet wools.

FELLMONGERING.—A term used to describe the removal of wool from sheep pelts.

FELTING.—The property wool possesses of matting or felting together.

FILLING (WEFT).—Threads that run crosswise in cloth and fill in between the warp interlacings.

FLAT-TAILED SHEEP.—Similar to fat-tailed sheep.

FLEECE.—The coat of wool which covers a sheep, or that is shorn from a sheep at one time, usually representing one year's growth.

FLOCKS.—Short waste fibers obtained from cloth in fulling, napping and shearing.

FREE.—This term is used to indicate the absence of defects. The usual meaning is free from burrs.

FRENCH SYSTEM.—This method of processing produces worsted yarn from shorter staple wool than the Bradford System. It is usually mule spun. The yarn is softer, bulkier and loftier than Bradford yarn. No twist is introduced in the processes preceding actual spinning.

FRIBS.—Short and dirty locks of small size. Dungy bits of wool and second cuts.

FROWSY WOOL.—A lifeless-appearing wool with the fibers lying

more or less topsy-turvy. The opposite of lofty wool. Usually dry and harsh.

GARNETTED STOCK.—Recovered fiber obtained by treatment of garnett machine on rags or thread waste.

GRADE.—(a) The quality or relative fineness of the wool. (b) Sheep of mixed blood, showing no particular breed characteristics. The term is also applied to crossbred sheep.

GRADING.—Classifying the fleeces according to fineness and length of staple and availability for the various mill requirements without untying the string.

GREASE WOOL.—Wool as it comes from living sheep with the grease still in it.

GRITTY.—Wool containing an excessive quantity of sand or grit.

GUMMY FLEECE.—This is due to the coagulated yolk, and is often caused by shearing the fleece while damp.

HAIR.—Usually straight, non-elastic and glossy. Stronger, smoother and usually coarser than wool. Lacks felting properties.

HALF-COMBING WOOLS.—Medium wools such as produced by the British down breeds were at one time widely known as half-combing wools.

HARD WASTES.—These are also known as yarn waste, thread waste and hard ends. The spinning, spooling, winding, warp dressing and weaving departments are the principal contributing sources for hard wastes.

HOG OR HOGGETT WOOL.—English term for the first fleece shorn from a sheep about one year old. Naturally finer and longer than wether wools and classes a trifle higher.

“HOT-HOUSE” LAMBS.—This term is given to lambs dropped in the fall and winter. They are also known as winter lambs.

HOT TEST.—This is the name applied to a shrinkage test when the scoured wool is weighed immediately after drying.

KARAKUL.—(a) A breed of sheep native to Bokhara in Central Asia. Important owing to the valuable fur produced on the

lambskins. (b) Woven fabrics made to imitate natural broad-tail are termed karakuls in the trade. The name "karakul" is taken from the village of Kara Kul (black lake), in the eastern part of Bokhara.

KEMP.—Dead fibers, chalky white and without luster. Larger diameter than surrounding wool fibers. Resists dyestuffs and is deficient in felting properties.

KID.—A young goat.

LAMB.—A young sheep.

LAMB'S WOOL.—Wool shorn from lambs up to seven months old. Soft and possessing superior spinning properties over wools of equal quality shorn from older sheep. This is due to the fiber ends retaining the natural tip, while the fiber ends have been cut by a previous shearing on older sheep and are therefore blunt.

LEAN WOOL.—Wool with very poor spinning properties. Especially deficient in waviness.

LINE FLEECES.—Those midway between two grades as to quality or length.

LIVE WOOL.—Lofty wool shorn from living sheep.

LOFTY WOOL.—Open wool, full of "life." Springs back into normal position after being crushed in the hand. Very elastic.

LUSTER WOOL.—This is obtained from long-wool sheep, such as the Lincoln, Leicester, Cotswold, etc. It is known as luster wool because the coarse fibers reflect light. It is also known as braid wool.

MATCHINGS.—Portions of fleeces of the same quality from which all inferior wool has been removed.

MEDIUM WOOLS.—(a) Those wools which average in length between long and short wools. (b) Sometimes refers to the general quality. In such cases the term includes the grades high $\frac{1}{4}$ -blood, $\frac{3}{8}$ -blood and low $\frac{1}{2}$ -blood wools.

MERRIN WOOL.—This is secured from the decomposed remains of Merino sheep on the Western ranges. After scouring it has an old-ivory tint, and is very difficult to bleach. Merrin wool possesses unnatural softness.

MODOC.—Reclaimed wool fiber from hard-woven and fulled fabrics.

NATIVE WOOLS.—This term is applied to those wools produced east of the Mississippi River.

NOIL.—A by-product of worsted manufacture during combing consisting of short and tangled fibers under a desired length. It is used as a raw material in the manufacture of woolens.

OFF SORTS.—The by-products of sorting consisting of the less desirable parts of the fleece. In fine staple or any other grade there are certain quantities of short, coarse, stained and colored wools. These are the off sorts.

ORDINARY.—The term "ordinary" is sometimes used for territory clothing or carding wools. In such cases it distinguishes the wool so described from "staple."

PERSIAN LAMB.—This is the best grade of Karakul lambskins. They have the most pronounced, most uniform and tightest curls. The term Persian was given to them for the reason that at one time all these skins found their way to the European markets from Persia, and the impression then prevailed that practically all the skins were produced in Persia.

PICKLOCK WOOL.—Formerly a grade above XX. Picklock was the product of Silesian and Saxony Merino blood. There is no American market grade of that name at present, as there is practically none of this wool on the American market. A very small quantity of this quality of wool is produced in West Virginia.

PIECES.—The wool removed by skirting the fleece.

POLLED.—Without horns.

PORT PHILLIP WOOLS.—Wools raised in the southern part of Victoria, and shipped through Melbourne and Geelong are known as Port Phillip wools. Port Phillip is an extensive bay on the southern coast of the State of Victoria, and the two important wool centers named above are located on its shores.

PULLED WOOL.—Wool taken from the skin of a slaughtered sheep's pelt by slipping, sweating or the use of depilatory.

PUNTA ARENAS WOOL.—Punta Arenas is a seaport in Chile on the Straits of Magellan. Large quantities of low crossbred combing wools especially suitable for knitting yarns are grown in neighboring provinces of both Argentina and Chile, and are shipped from this town.

QUALITY.—The diameter and relative fineness of the wool. It largely determines the spinning quality.

RAM.—A male sheep used for breeding. A ram produces longer and stronger wool than ewes and wethers.

RANGE WOOL.—That shorn from sheep raised under ranching conditions. In the United States, better known as territory wool.

REGAIN.—This term refers to the amount of moisture absorbed from the air by scoured wool after leaving the dryer.

REJECTS.—Off-grades and off-sorts, such as cotted fleeces, black wool, tender wool, too much kemp and fleeces with a vile odor shorn from sick sheep or decaying carcasses. Also fleeces containing considerable vegetable matter.

RIVERINA WOOLS.—These come from river lands in the State of Victoria, Australia.

RUN-OUT FLEECE.—One that is not uniform, but much coarser on the "britch" than elsewhere. Lacking character. It may contain a large amount of kemp.

SECOND CUTS.—Careless shearing sometimes results in cutting wool which has already been shorn once. This produces short fibers known as fribs and second cuts.

SCRUBBED WOOLS.—Same as brushed wools.

SEMI-BRIGHT WOOL.—Brighter than territory wool, but too dark to be classed as bright.

SHAFTY WOOL.—Wool of good length and spinning properties.

SHEARING.—The removal of the fleece of wool from the sheep.

SHEARLINGS.—Short wool pulled from skins of sheep shorn before slaughtering. Also an English term for yearling sheep.

SHIVY WOOL.—A somewhat broad term. It refers to the presence of small particles of vegetable matter in the wool, such as burrs, stickers, leaves, twigs and stems.

SHODDY.—(a) In its broad meaning, wool that has been previously made into yarn or fabrics, torn apart and made ready for use again. (b) In a strict sense, the term applies to recovered wool fiber obtained from soft all-wool rags.

SHRINKAGE.—The loss due to removal of grease, suint and foreign matter when grease wool is scoured.

SIRE.—Same as ram.

SKIN WOOL.—Same as pulled wool.

SKIRTING.—This consists in removing the neck, belly and leg pieces and the low quality wool of the britch from the edges of the fleece. It is the universal method of preparing wools for market in Australia and New Zealand.

SLIPE WOOL (SLAPE, SLIPY).—A Yorkshire dialect word, meaning “slip” or “slippery.”

All pulled wool treated with lime is slipy wool and much pulled wool not treated with lime is also slipy wool. The lower the grade, the more it has a tendency to be slipy. There are wools other than pulled wools that are slipy. Wools that have been sheared from sheep that have been so-called hurriedly fattened for the market are recognized as slipy wool. Wools from old ewes that have passed their usefulness and are fattened up for the butcher will produce wools as above mentioned, slipy. The lower grades become more slipy than the higher grades.

All mohair is slipy compared with wool, yet it is rarely referred to as a slipy material. In sorting mohair, a slipy fleece can be recognized, just as you can tell a fat sheep fleece in sorting ordinary wool. Overfeeding is the cause in both cases. There is a wonderful difference as to wool of well-fed sheep and one that is underfed.

SOFT WASTES.—These include card strippings, card fly and soft floor sweepings. Also included are sliver, top, slubbing and roving wastes, but these seldom reach the market, as they are usually worked up by the mill in which they originate.

SORTING.—The classification and division of the wool fibers

in a fleece into various groups or sorts, according to fineness, length, soundness, elasticity, spinning and other properties.

SPRING WOOL.—Six to eight months' growth; shorn in the spring where sheep are sheared twice a year.

STAINED WOOL.—That which is discolored by urine, dung, etc.

STAPLE.—(a) A lock or bunch of wool as it exists in the fleece. (b) Territory combing wool. (c) Having reference to the length of the fiber.

STAR LOTS.—Lots of wool consisting of one, two or three bales offered at the London Auctions are known as star lots.

STUBBLE SHEARING.—Shearing some distance from the skin, leaving a "stubble."

SUI GENERIS.—This Latin term means of its own kind; in other words, an original and distinctive type without relationship with any other type.

SUINT.—Excretions from sweat glands deposited in the wool.

SUPER.—This trade term is apparently without a definite meaning, and when used, it is applied to medium pulled wools, such as B super and C super. However, the term is seldom used, and is fast disappearing. It is probably an abbreviation for the word superior. In Great Britain, "super" is a grade term, and represents wools between the grades of "pick" and "selected."

SWEATING SHEDS.—Sheds in which sheep are "sweated" before shearing. The object is to raise the yolk and make shearing easier.

TAGS.—Large dungy locks.

TEG OR TEGGETT.—English term. Same as hog or hoggett, but is applied to shorter wools.

TERRITORY WOOLS.—Territory wools are in general those which come from the territory comprising the Intermountain States.

TIPPY WOOL.—Wool in which the tip or weather end of the fiber is more or less incrustated.

TOP.—A continuous untwisted strand of the longer wool fibers straightened by combing. The short fibers or noil have been

removed by the comb leaving the top. After reducing, drawing and spinning it becomes worsted yarn.

TOP-MAKERS' QUALITIES OR COUNTS.—Top-makers' qualities or counts are the numbers used in designating the quality of certain foreign wools. They range from 12's upwards. The numbers are supposed to indicate the number of hanks of yarn to which a pound of top will spin. Each hank represents 560 yards.

TUB WASHED.—Wool that has been washed in the fleece after having been sheared. Very rare in America; this practice was formerly practiced in Kentucky.

UNMERCHANTABLE.—Fleeces containing an unusual amount of chaff, burrs, seeds or straw, usually necessitating carbonizing, and therefore of inferior value compared with other similar wools free from such foreign matter. Also includes wool that has been poorly washed upon the sheep's back, or the wool allowed to remain on the sheep for some time before shearing, after having been washed.

VAN WOOL.—This name is given Merino wools grown in Tasmania.

VIRGIN WOOL.—Wool sheared from live sheep, and of course not previously used in manufacturing.

WARP.—The threads which run lengthwise in cloth.

WASHED WOOLS.—Those from which the suint has been removed by washing the sheep before shearing.

WESTERN WOOLS.—Often applied to all wools grown west of the Mississippi River. Specifically it designates the true territory wools grown in the Intermountain States.

WETHER.—(a) In English wools it refers to wool other than the first clip from the sheep. (b) In sheep, a castrated male.

WIRY WOOL.—That which has very poor spinning properties, owing to the poor elasticity and pliability of the fiber.

WOOLEN SYSTEM.—After carding, yarns are spun directly on the mule in this system. The fibers are criss-crossed and do not lie in any general order.

WOOL-SORTERS' DISEASE.—See anthrax. When this disease is contracted by wool sorters it is usually caused by a skin abrasion on the hands, and nearly always while working on wools from Asia or from South America.

WORSTED.—Yarn spun from top. The wool fibers are paralleled and equalized, and the yarn is smooth compared with woolen yarns. Owing to its structure, a worsted thread does not possess felting properties to the same extent as a woolen. The two systems of manufacturing worsted yarn are the Bradford and French.

YEARLING.—A sheep one year old.

YIELD.—The amount of scoured wool obtained from a definite quantity of grease wool.

YOLK.—The fatty grease deposited on the wool fibers from the oil glands.