

nor in those that are inclined to cachexy ; there would be a risque of losing a great number of them ; some, because the force of the muscular action and of the circulation of the blood would be increased ; others, because they would be exhausted by a too violent effort. By choosing warm weather for the time of shearing, there is less need of making the sheep sweat. If it be necessary to shear while the air is yet cold, care should be taken, after the operation, to put the animals in some temperate place during several days.

In many countries it is customary, before shearing, to wash the fleeces on the backs of the sheep. To do it well, the sheep are exposed one after another, to a fall of water from the flood-gate of a mill, or a dam in a river or brook ; two men hold the animal with one hand, and with the other rub the wool, and clear it of its filth, which the stream carries away. It should be done in fine weather, that the sheep may dry quickly. The principal advantage of this practice results from the diminution of weight which it occasions, and the consequent saving of expense in freight ; another advantage to the proprietor is that the fleeces being thus rendered all equally clean, the merchants who buy them have no longer any pretext for lowering the price. This washing does not serve, as has been supposed, to render the wool finer. *Daubenton* has advised it, because it was practised in the country where he lived, but he was ignorant of the disadvantages attending it. It cannot be employed except in places near the water : it gives a great deal of trouble and does not diminish the succeeding operation, either in the laundries, or at the manufacturer's. Besides, long and thin wool may be washed upon the back of the animal, but not tufted wool, like that of merinos, without great difficulty. As to its effect upon the animals, if practised upon such as are sanguine, it may be conducive to their health, but it would be improper for such as have a disposition to the rot. However, in Germany, especially in Saxony, this manner of washing is generally practised.

The proprietor of a flock should be present when it is sheared : he can then judge whether the animals are in good condition, or whether any of them are diseased, for the latter are shorn with less ease than the former ; he also sees the quality of the wool, and knows beforehand what changes in his flock are necessary. He does not suffer to be left, through negligence, among the fleeces any portions that have been affected by scab, nor any jar, nor long hairs, and, above all, no filth.

The place on which the shearing is performed should always be clean ; too much attention cannot be paid to this.

The fleeces are tied in bunches, by means of straw, or bits of rush, or packthread ; these last two things are best, because they weigh so little that no allowance need be made for them when the wool is weighed. It is better to separate the wool of the belly, of the head, of the thighs and the feet, which is inferior to that on the rest of the body ; but merchants ought, in consequence to pay dearer for the fleece.

Care should be taken not to expose sheep, immediately after shearing, to cold rains nor to hail, which might occasion the death of many.

*Daubenton* advises, in shearing, to lay the animal upon a table which has several holes near its edges, and, by means of a rope passed through these holes, to fix the fore-legs in one place and the hind-legs in another, and if it be a ram, to tie him by one of his horns also : in this way the shearer may be seated. He thinks this method least painful to the animal, and most easy for the operator. He is greatly mistaken : when the animal is thus stretched out it is not more at ease than if its four feet were tied together ; and the shearer seated and leaning over a table, is much more fatigued than if he were on his feet : his movements are not free and easy, and he shears fewer sheep in a day. A man who stands, is, it is true, obliged to stoop ; but, like the reaper, he soon becomes accustomed to it. The animal remains tied but a short time, half an hour at most : as soon as the wool is taken from the body, its feet are loosened.

A good shearer should cut the wool as near as possible to the skin, without leaving ridges and without wounding the animal. An expert man may shear from forty to fifty sheep a day. I have known some men who could shear as many as seventy ; but they were sheep of the common breed ; merinos require a considerably longer time, as they carry heavy and thick fleeces ; from twenty to twenty four is as great a number as can well be shorn in a day, if they be ewes ; and from fifteen to twenty, if they be rams. Notwithstanding all the care that can be taken, the sheep sometimes receive wounds in consequence of their struggles ; pulverised charcoal, or dust from a smith's forge, or pounded slate, should be immediately applied : sores are thus prevented, and the flies are kept off.

Hitherto the proprietors of flocks in France, have been in the habit of selling their merino wool unwashed ; and some merchants have made it a practice to wash it before they disposed of it to the different manufactories ; but the greater part of the wool has been prepared entirely by the manufacturers themselves.

The wool should be kept in a place which is neither damp nor dry. In a damp place it would grow heavier, to the disadvantage of the purchaser ; in too dry a place, it would lose part of its weight, which would be unfavourable to the vender.\* To keep it well, it should be placed in a lower room that is exposed to the north, and cool, 3 or 4 feet from the ground, and not touching the walls. No dust should enter this place, otherwise the wool must be covered with linen.

### *Of the Fleeces and Wool.*

The fleeces of merino rams which come from Spain weigh at most, unwashed, 8 pounds, and those of the ewe, 5 pounds ; and in France we obtain from rams of that race as much as 18 pounds, and from ewes as much as 12 pounds,† this is the *maximum*. The usual weight, for ewes, is from 7 to 8 pounds, and for rams, from 8 to 10 pounds.

What is the reason of the difference between the weight of the fleeces of merinos in Spain and in France ? It is because in Spain sheep live only upon what they find in the fields ; sometimes they find very little there : besides, as they are of a smaller size, they must carry less wool. In France, the deficiency of pasture is always amply supplied in the stable.

The weight of wool does not depend upon its thickness alone, but also upon its length : in this latter respect we have gained much ; our wool has become more fit for the manufacture of casimirs.

All parts of a fleece are not alike ; it may be distinguished into wool of four different qualities ; the first grows upon the shoulders and the back, from the neck to about half a foot from the tail, including a third part of the body ; the second covers the sides, and extends from the thighs to the shoulders, approaching to the neck ; the third grows about the neck and covers the buttocks ; the fourth covers, 1. from the fore part of the neck to the extremities of the feet, comprehending a part of the shoulders, 2. the two hind-legs to the hoofs : in Spain this fourth sort is called *cayda*, and in France *basse laine*. The more equal in quality the wool is on all parts of the body, the greater is the value of the animal which carries it.

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\* In a parcel of wool weighing 758 pounds, I have remarked a diminution of 4 pounds from the 15th of June to the 15th of September, that is to say, in three months, during the summer.

† An ewe sold at Rambouillet has been known to give a fleece of 15 pounds.

Experiments which we have made in the garden of the Museum of natural history, by covering with linen-cloth, during a year, the bodies of some wethers, have proved that wool, when protected from the air, grows finer and whiter: the difference is very sensible. But it remains to be determined whether the expense of covering them does not more than counterbalance the increased value of the wool; any person may easily make the calculation.

The wool of dead or sick sheep should be put by itself, as being less fit for manufacturing than that of healthy animals.— I suspect it is more liable to be attacked by vermin; Mr. *Roard*\* has proved by experiment that in dyeing it does not take colours so well.† Of three kinds of wool which I gave him, one from healthy sheep, another from sick sheep, and a third from dead sheep, the first took a deep die from the different colours with which it was tried; the second took them faintly; and the third more faintly still. It follows, that proprietors of sheep should be careful not to mix these different kinds of wool, and that manufacturers would do well to show peculiar favour towards those who do not deceive them. I also think that the wool of sheep killed in the slaughter-houses, which is taken off by means of lime, is much inferior to that of sheep shorn while they are alive. It wants that oily matter which nourishes it during the animal's life, and which continues in the wool if it be shorn while the sheep is in full health; which is not astonishing, since the same thing may be observed with regard to hair. Lime also renders the wool hard.

With a view of obtaining fleeces both fine and long, sheep at *Renbouillet*‡ have been suffered to go without shearing, two, three, four and five years. These animals bore their burden without appearing to be much incommoded by it; only they could not get up again if they happened to fall upon their sides, especially during the third year, for they carried a weight of from twenty four to thirty pounds. After three years, the wool began to come out, and its quantity continued to decrease; none of them fell sick after their fleeces were taken off. The manufacturers, every year, purchase, with eagerness and at a great price, these noble fleeces; it is not yet known to what

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\* He has charge of the dyeing department in the imperial manufacture of the Gobelins, and is an able chymist.

† See the details of these experiments in the XXII vol. of the *Annales de l'agriculture française*.

‡ I believe this experiment was first thought of by *Gilbert*, it has since been adopted and continued by my colleague *M. Huzard* and myself.

use they apply them. I advise proprietors who wish to try this method, to do it with wethers rather than ewes, because the length of the wool is troublesome to ewes when they give suck.

*Daubenton*, in order to distinguish the different degrees of fineness in wool, makes use of a micrometer. But this instrument, though it affords the surest method, is troublesome for farmers, who do not know how to make use of it. Habit teaches them to distinguish the different kinds of wool, by simply comparing them together, or by laying them upon paper or black cloth.

Another observation, for which I am indebted to Mr. *Roard*, is that the wool of different breeds does not all take die equally well; merino wool takes the deepest colour.

Wool may be kept longer if the yoke remain in it, than if it be washed; this oily substance keeps off a long time the insects which are apt to attack it. By placing it in the manner which I have before described, it will be still less exposed to vermin.

Wool is liable to be destroyed by several kinds of moths or caterpillars (*tinea pellionella*, *tinea topezzella*, *tinea vestinella*, *tinea sarcitella*); the butterflies which produce them flutter about places in which wool or woollen goods are kept, from the months of April to the the months of October; that is, almost from spring to winter, with some variation, according as the season is more or less warm. During all that time, they deposit upon the wool little eggs which can scarcely be perceived; from these eggs are produced the caterpillars; they are hatched in October, November and December; they grow slowly at first, and become stiff when the weather is very cold. In March and April they grow more; at that period they cut off many filaments with which to nourish and cover themselves. They afterwards form a sort of sheath in which they gradually envelop themselves; when they are entirely sheathed, they are in the chrysalis state; at the end of three weeks, they change to butterflies.

There are three ways of discovering when wool is attacked by insects: at first, butterflies of a bright yellowish colour, and three lines in length, are seen flitting about it; afterwards, are found upon the wool little dry, angular grains, which appear grey if the wool is white, and blackish if it is black: lastly, along the walls and ceiling are perceived sheaths of a line in diameter,

and four or five in length, a little swelled in the middle, and and widened at the extremities.

It is difficult to guard effectually against these insects. The furriers beat with rods, several times during the summer, the fur and wool which they have in their stores: the woollen-draperies are careful to brush their cloths frequently; but these preventives would be ineffectual, if it were requisite to keep large quantities of wool; I know of no other than to place it as I have directed, taking care to kill all the butterflies which are found upon the walls, and to search for and sweep down the sheaths. The penetrating substances which have been proposed are of no use.

### *Of Washing the Wool.*

The wool, before it can be used, must be freed from a great proportion of that oily matter (in French called *suint*) with which it is impregnated, and be cleansed from all the filth which adheres to it. As the wool of merinos contains more grease than that of common breeds, and as it is shorter and more curled, it is usually dirtier, so much so that a flock of merinos may be distinguished at a distance by this mark alone. Common wool is more easily cleared of its grease than the fine kinds; nothing more is requisite than to wash it in water which is a little warmed by fire or by being exposed to the heat of the atmosphere. If the sheep-houses are kept clean by frequently changing the litter, if the sheep are not led through the dust, and if their folds are not upon a dusty soil, the fleeces are more profitable to the merchant or manufacturer who purchases them, because they lose less in washing. It is desirable that the proprietors of merinos attend habitually to the cleanliness of the fleeces, and particularly at the time of shearing, by preventing any dung from getting among the wool, of which manufacturers sometimes justly complain. And this should be attended to not only from considerations of probity, but also that the manufacturers may have no pretext for beating down the price of the wool. But notwithstanding all the care of the proprietors, the fleeces become more or less dirty, and consequently lose more or less in weight, according to the nature of the soil on which the sheep are kept; so that it is best to wash the wool and put it nearly in the condition in which it is when sold by the Spaniards, or at least to clear it of the greatest part of its filth.

Many people endeavour to imitate the Spaniards: and, as is always the case when a first attempt is made at a process which

is not understood, the wool was but imperfectly washed and cleared of its grease. The manufacturers complained of it; they said it was ill-washed, knotty and brown; they preferred buying it in the state in which it was when taken from the animal: in which they were right; for Mr. *Roard* has remarked that when wool is imperfectly washed it cannot be properly cleaned by a second operation. Latterly, people have in many places been more successful, notwithstanding what the manufacturers say, who, for the most part, being guided by interest, pretend to see no difference between what is well or what is ill done. It must, however, be confessed that many people in France do not yet wash it well. If we can establish laundries, we shall be able to offer for sale wool like that which comes from Spain: all haggling between the owners of flocks and manufacturers will be prevented; the wool will be sold according to its quality: the expense of carriage, as has been already observed, will be saved, and no pretext will be left for purchasing at a low price. This is still wanting to complete our improvements, and to enable us to arrive at the end proposed in introducing merinos into France.

Above twenty years ago, I procured information in Spain upon this subject; I am also indebted for information to Mr. *Pouféré de Cère*, who has given me the plan of a laundry drawn by himself upon the spot.

In France, wool cannot be well washed except between the time of shearing and the end of October, because time is necessary to dry it.

The first operation is, to part the different qualities, that they may be washed separately; practice teaches to distinguish the various sorts. After this, the wool is spread upon hurdles, tossed about and beaten with rods, in order to clear it as much as possible from dust and other dirt; all the dung, pitch, &c. must be picked out by hand; it is then combed with a little instrument that has short curved teeth set far apart; this operation must precede every mode of washing.

I shall first give *Gilbert's* method of washing wool, with the more confidence, as I found that it was followed in a famous manufactory at *Touliers*; the workmen may perhaps have concealed the process from me; yet it is certain that the method I shall explain answers very well. I shall afterwards give the mode of washing on a great scale, as it is now brought by *Cère* from Spain, with the description of the laundry at *Alfaro*.

*Gilbert's method.*

“ The fleeces are put into tubs or casks or any other vessels of a capacity suited to the quantity of wool to be washed. When they are filled with wool gently pressed down, but not trampled, water warmed to 30 or 40 degrees (of Reaumur, equal to 67 1-2 or 90 of Farenheit) is to be poured in gradually, till it covers the wool. The next morning, or at the end of twenty-four hours, the washing is to be begun; the soaking should not continue less than 18 hours. In order to avoid trouble, the tubs should be placed as near as possible to the place where the washing is performed. The water in which the wool is soaked becomes filled with grease ;\* it is this water which is most necessary in the washing ; and care should be taken not to waste it ; some of it is to be poured into caldrons, and heated to 50 or 60 (112 1-2 or 135) degrees ; a heat below 50 (112 1-2) degrees would not be sufficient ; if above 60 (135,) it would crisp the wool, and render it hard and brittle. The proper temperature may be determined without the aid of a thermometer ; it should be just that at which the hands cannot be held in the water without scalding them.

“ When the water is at this temperature, some wool is put into the caldron : the less is put in at a time, the more completely is the end answered. A smooth stick or rather a smooth wooden fork, should be employed to stir the wool, which should be continually lifted up, in order to open it and render it more permeable ; if it were turned over, it would twist, and thus impede the subsequent operations. After having been immersed three or four minutes, it is to be taken out either with the hands or with the fork ; it is put into a basket, which is held a short time over the caldron, to drain and to save the greasy water : as the water in the caldron diminishes, it must be replenished : if it becomes muddy, the caldron must be entirely emptied, and fresh water from the tubs poured in. The water is warm enough if the wool washes well ; before taking it out of the caldron, it should be tried from time to time. It would be well if the place where this operation is performed was under cover ; this cannot always be the case, for which reason fine weather should be chosen. When the wool is taken out of the caldrons, it is to be carried near the place where it is to be washed ; baskets are made use of for this purpose. It is not a matter of indifference what kind of water is used ; the best is that which washes linen well, in which vegetables are soon cooked, which makes good soap-suds, and which is very good

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\* This grease, according to the experiments of Mr. *Vauquelin*, is partly composed of a soap whose base is potass.



to drink ; running water is better than stagnant water ; well-water is the worst ; if no other can be procured, it should be previously drawn and exposed to the air several days, or it should be boiled.

“ To wash wool effectually in running water, two open-wrought baskets should be placed in the stream, one higher up than the other ; care being taken that the water does not rise to the top of the baskets, lest the wool be carried away : the washing is done in the lower basket, and the wool when washed is thrown into the one which is higher up ; it there takes its last degree of purity. Care should be taken not to rub the wool ; it is sufficient to move it about rapidly in the water and to open it as much as possible with rake ; it should be drawn continually from one part of the basket to another. As soon as the wool opens freely and floats on the surface like a cloud, and the water of the first basket becomes clear, it is taken out to dry.

“ When the washing is performed in water that does not flow, baskets with two handles at the sides are made use of, and are plunged repeatedly into the water until it ceases to be fouled by the wool.”

*Gilbert* directs a press to be used in order to squeeze the water out of the wool, or a compression produced by two strong men twisting a cloth into which the wool is put. This method, which does no injury to the wool, accelerates the drying of it, and is convenient when the season is far advanced ; a single fine day is afterwards sufficient.

A spot of short thick grass should be chosen on which to dry the wool, unless there be a building constructed for the purpose : the place must first be cleaned and swept, so that no filth may adhere to the wool ; it would be better to dry it upon hurdles or upon flint-stones.

According to *Gilbert*, merino wool well washed and well dried loses two fifths of the weight which it had before washing ;\* and according to our own observations, it loses three fifths or fifty four per cent.

In all the manufactories, a last washing is given to wool brought from Spain, which never comes thoroughly washed ; it loses in this last operation from fifteen to twenty per cent.—

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\* It was probably wool very little dirtied, and perhaps washed upon the animal's back

To the water in which the wool is soaked, urine and potash are added : according to *Gilbert*, these additions are useless. If the wool be soaked in warm water for eighteen or twenty four hours, it preserves its flexibility and elasticity ; and it is whiter than that which comes from Spain.

*Method recommended by Mr. Girou de Buzaringues.*

A proprietor in the department of Aveyron, who has succeeded well in cleaning his merino wool, says that he soaked it twenty four hours in cold water, to obtain the grease. I think that warm water would be preferable. *Mr. Girou de Buzaringues* advises, properly I think, to spread the fleeces and to place them in the tubs, with the outside of the fleeces uppermost, lest the pressure of the water, if they were placed otherwise, should render them impermeable. When, for the purpose of obtaining greasy water, he employs coarse wool, which is always dirtier, he strains the water. On these three points he differs from *Gilbert*, whose method, on the whole, he follows.

The methods recommended by *Gilbert* and *Mr. Girou* may be practised by any body. Every one may wash his own wool, if he follows the directions given : it is only necessary to proportion the apparatus and water to the quantity of the wool to be washed.

*Spanish method.*

In Spain, where numerous flocks belong to great proprietors, buildings have been erected for the purpose of washing wool, in which are at once united economy of time and expense, and where the wool is cleansed sufficiently for the subsequent operations which it is to undergo in the manufactories. This was a subject worthy of inquiry. *Mr. de Poyféré de Cère* has afforded us every requisite information, by giving us an exact description of one of their fine laundries, of which he took a drawing upon the spot ; it is that of Alfaró, where the wool of the Paular, Montarco, Turbietta, and other famous flocks, is carried every year to be prepared, at a small expense, and afterwards sold to foreigners.

The united waters of the Eresma and of other streams which have their source in the mountains which separate Old from New Castille, flow towards Segovia, and thence into reservoirs or basins at Alfaró.

“ These reservoirs, says *Mr. de Poyféré*, contain above one hundred and fifty eight thousand nine hundred and four cubic feet of water ; an immense resource, supplied by a constant stream, which serves to afford a temporary supply to the laundry, if at any time the stream becomes muddy and unfit for use.

“ The water being admitted into the laundry and the wool having been picked by hand and separated into first, second, third qualities, and refuse, it is placed under a shed near to the vats.

“ The vats are filled to two thirds of their depth with hot water, by means of a cock communicating with a boiler. This water may be tempered at pleasure with cold water. A man is stationed to regulate it, which he does by putting his leg into each vat and ordering hot or cold water to be added as he sees proper, until the degree of heat is such that he can endure it without being scalded. He then gives the signal for immersing the wool ; the length of the immersion is regulated by the time requisite for emptying the second and third vats before returning to the first.

“ A man descends into one of the vats, takes out a certain quantity of wool, and put it into wicker baskets.

“ Children, holding fast by lines, get upon the wool in the baskets, and tread it with their feet, to press out the greasy water with which it is charged : this water escapes through the drains of the grated-work on which the baskets are placed, into a cistern, and empties itself out of the laundry.

“ The wool thus pressed is emptied out upon a grated-work. Three children take it up, divide it, and deposit it on the margin of one of the lavers. A man (this is the principal hand,) placed upon a flight of steps, takes the wool, handful by handful, divides it again, and lets it fall into a canal.

“ Two men are placed in a laver, resting their hands on a cross-piece, which is firmly fixed, who move their right and left leg alternatively, so as to drive back the water and separate the flocks of wool. The depth of the water in the laver is from 11 to 12 inches.

“ Four men placed in the canal of the laver, resting their hands upon the sides of it, repeat the motions of the two men stationed in the basin.

“ Four other men, also standing in the canal, gather up the wool as it is carried along by the current of water : they make it up into bundles, without wringing or twisting it, press out the water, and throw the wool upon the floor. A child takes it and deposits it on a shelving drainer. After passing through several hands, it is finally placed in a heap on the top of the drainer.

The wool is suffered to remain here during four and twenty hours. At the expiration of which time, it is carried to a neighbouring meadow, which has been raked and even swept with care, and there spread out in small parcels until it is quite dry, which commonly requires three or four days.

The wool which escapes the four men placed in the canal is carried by the stream into a wooden cage, whose bottom and sides are covered with a net that has very small meshes.— Three men stationed in this cage stir about the wool with their feet ; and as they gather it up, they make it into small bundles which they press out with their hands, and which they throw upon the floor, where two children receive it in small baskets, squeeze it, and carry it to the great heap at the top of the drainer.

Such is the operation of washing practised in Spain for wool of the highest reputation. At Alvaro, the work begins at three o'clock in the morning and does not end till night. In one working day, which is about sixteen hours, three hundred French quintals (antient measure) of wool are washed.\*

*Method communicated by a Manufacturer of Montjoie.*

A manufacturer of Montjoie, in the department of Roer, is of opinion that proprietors of merino flocks, who are distant from manufactories, might advantageously confine themselves to a simple washing, so as to take off nearly all the filth, and to preserve grease sufficient for the washing at the manufactory. He directs the different sorts of wool of which a fleece is composed to be picked, and put separately into a basket ; the wool to be placed in a stream of water, and taken out and plunged in again from time to time ; to be stirred with a wooden rake ; and when no more filth comes out, to be dried in the open air. According to him, fleeces thus cleaned do not lose in the washing at the manufactory more than thirty three per cent, while that which is sold dirty and with all its grease, may lose as much as seventy five, if the animals have

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\* Mr. *Sylvestre*, my colleague, after reading this description, thought that the labour might be diminished by substituting machinery for a part of the men there employed ; and his opinion is very just.

been ill taken care of, and kept in dusty places. This at least is certain, that having tried this method with a small quantity of my wool, a distinguished manufacturer of Verviers who saw it, assured me that it would wash perfectly well at the manufactory, and that this was the state in which it answered best. If this assertion be true, as in all probability it is, nothing is easier than to give the wool a first preparation, which will diminish the expense of carriage, which may be effected by all proprietors of flocks in the neighbourhood of streams of water, and which will not prevent the last washing, indispensable before the wool is manufactured. If this method be pursued, the coarse and very dirty parts of the fleeces should be excluded, such as the wool of the forehead, of the belly, the thighs and the legs. This mode of washing answers nearly to washing the wool upon the sheep's back, except that it cleanses it more effectually. If the manufacturers will be just enough to give a price for this wool such as to compensate for its diminution in weight, and proportioned to what they would have given if they had bought it dirty and greasy, I do not doubt that many proprietors will adopt this method.

#### *Washing at the Manufactory.*

The washing at the manufactory is performed in the following manner. A caldron, capable of holding with ease from 30 to 40 kilogrammes of wool, is filled with a mixture of two thirds water and one third urine, and is heated. When this liquid arrives at the temperature of from 40 to 45 degrees (90 to 101 of Fahrenheit) so that the hand can bear it, the wool is put in, and left there half an hour, being stirred about continually with much care by means of small wooden forks; it is then taken out and drained, then washed, in small parcels, in a river or brook, until it ceases to foul the water, and finally dried for use. In some manufactories, the mixture is made with three quarters water and one quarter urine, which answers as well.

Private individuals who wish to wash small quantities of wool, in order to manufacture it at home, may employ *Gilbert's* method, or that recommended by the manufacturer of Montjoie; whichever be adopted, it must be succeeded by the wash with urine just mentioned. If no river nor rivulet be near at hand, baskets filled with wool may be plunged into tubs of clean water, which must be constantly renewed. This operation is indeed long; and I do not recommend it unless the quantity of wool is small.

*Sale of the Wool.*

Two opposite interests meet in the sale of wool, that of the proprietor of the flock and that of the manufacturer: if they deal by an intermediate agent, that is, by means of a merchant or a broker, a third interest arises, distinct from both. It is best for the manufacturer to purchase immediately from the proprietor; they thus save between them the profit which would have gone to the third person: but it is difficult to effect this. Those who raise flocks are not acquainted with the manufacturers, and have no way of applying to them; they are therefore obliged to wait until traders come to them; and thus they deal with none but merchants, who afterwards dispose of the wool to the manufacturers.

The manufacturers, however, send their agents into the country to purchase wool at a low price, by persuading the country-people that what they offer is the current price, and that it is for their advantage to accept their offers. The want of money, and the fear of losing by delay, induce them to sell at a low price. Some great proprietors of flocks obtain better information; they learn the prices of wool in Spain, know the vents for manufactures, and, being less in haste, bring the manufacturers nearly to the just price.

It is customary to give four pounds of wool over and above every hundred; the manufacturers call this a *gift*: this custom is to the disadvantage of the vender; it would be better to make the bargains for a real and precise quantity without any addition. This custom has arisen from the allowance which was formerly made for the weight of the bands; the manufacturers have since insisted upon the gift of four per cent and an allowance for the bands besides: the proprietors of flocks should consent to neither of these reductions; the weight of the bands is nothing, if pack-thread or rushes be employed.

The vender derives an advantage from disposing of his wool immediately after shearing; because, in drying, the weight is diminished. It is also profitable to the purchaser to obtain it as soon as possible after it is shorn, because it can be cleaned better, as it contains more grease; the season is besides more favourable for washing. If it be sold ready washed, the above advantages do not result from selling it at one time rather than at another.

Many French manufactories had contracts, for a certain number of years, with proprietors of flocks in Spain, for the

purchase of their wool: it was usual for the latter to give credit. Nothing hinders similar bargains from being made in our own country. Flocks remarkable for the fineness of their wool, would undoubtedly find manufacturers desirous of securing it for themselves.

By experiments made with great care and exactness in 1807, which I myself witnessed, it is proved that the wool of French merinos is equally as strong and elastic as that of Spanish merinos. By an attentive comparison, it has been discovered that, when employed in manufactures, their products are strictly equal in quality and in quantity; consequently, the price of French merino wool ought to be regulated by that of the Spanish merinos.

### *Of Selling Sheep.*

The sale of the wool is one of the profits resulting from flocks; that of the sheep is another. In the preceding article I showed that, in bargains for wool, the purchaser, particularly if treating with farmers, may easily deceive, without running any risk of being deceived himself; for he knows the quality of the wool, the use to which it may be applied, and the true price: the vender is at his mercy. Persons who buy wool may easily have an understanding among themselves, by means of their mutual communications and their meetings which take place at the exchange. The venders, on the contrary, being very numerous and at a distance one from another, have no means of entering into a general agreement.

The reverse of this takes place in the sale of sheep: here the purchaser is exposed to the danger of making a bad bargain, as he may buy animals which have some secret defect or latent disorder which he cannot easily discover. In truth, the vender himself may be ignorant of it, and this is commonly the case; but, unfortunately, some persons make no scruple to sell, for sound, sheep which they know can be of no service to the purchasers.

It is customary in the government-establishments to sell annually, at times determined by the peculiar circumstances of the places where they are situated, a certain number of sheep of both sexes; these sales are announced in the public papers and by bills of advertisement. On the appointed days, the animals are exposed successively to the examination of the purchasers, and set up at auction. All such as have any material defect are carefully kept away: if however any such get among the others,

either through accident or by any other means, as soon as the persons who direct the sale discover it, the animal is removed, and another substituted in its stead. When the defects are such as not to prevent the animals from producing perfectly sound young ones, they are not excluded, but proper care is taken to give notice of them. Several times at Rambouillet, sheep have been exchanged for others, bought at the sales, which were found incapable of producing, when the fact has been clearly ascertained; they have even gone so far as to replace sheep which died shortly after leaving the establishment, upon proof being afforded that the purchaser was not in fault. This example has been followed by other establishments belonging to government, and by some individuals who to honesty add an ardent desire for the improvement of our flocks.

The rams and wethers may be sold at any season of the year. As for the ewes and young lambs, the sale of them must be deferred until the young are weaned, until the mothers no longer suffer any inconvenience from their milk, and until the lambs eat grass readily, unless they are to be removed to a very short distance.

In the establishments belonging to government, the animals are always sold with their wool on. The quality of the wool might indeed be known, even after the sheep are shorn, by the inspection of the skin; but it is more convenient to be examined when long: besides, the purchasers, in the first place, have the benefit of the fleeces, and, in the second, they enjoy the pleasure of shewing, in the places where they introduce the merino breed, that it yields much more and far better wool than the common breeds. Many proprietors, when they sell sheep, demand an extraordinary price for the fleeces, unless, like the government, they make public sales.

On account of the responsibility of the overseers of the government-establishments, all the sales are there made for cash; between private individuals, no rule on this subject exists. Some persons sell sheep, and afterwards take them on shares; this is a new practice which may have its advantages or disadvantages, according to the conditions entered into.

#### *Means of knowing the age of sheep.*

The age of sheep, during the first five years of their life, may be ascertained by means of their front teeth or incisors. Sheep have incisors only in the lower jaw; a cartilaginous substance serves instead of them in the upper jaw. The first



year, eight incisors appear, which are afterwards shed. The animal is born with these teeth, or, if any of them are wanting, they soon make their appearance. They are narrow and sharp. The second year, the two front teeth fall and are succeeded by two new ones broader than the six which remain. The third year, the two next to the front teeth also fall out; two broad ones grow in their room; so that, there are then four broad teeth and four not shed. The fourth year, the two next likewise disappear, to make room for two broad ones; finally, the fifth year, the two corner teeth fall, and the whole eight are then broad teeth. Merinos, especially when well fed, lose their two first young teeth generally six months before the common breeds.— Is this the case because merinos are natives of the south, or because they are better fed? Both causes may concur to produce this effect.

After the expiration of five years, an estimate of the age may still be formed from the teeth; but it requires much experience and practice. One must then be directed by the wearing away and by the position of the teeth. They wear in two ways; commonly on the inside, by the effacing, in a sloping direction, of two small cavities which are below on the side next the jaw. In the other way, the edges of the teeth look as if filed almost horizontally, and not in an inclined direction, as in the first case; breaches are also to be found, generally between the two middle teeth, or at their extremities. Some judgment of the age may also be formed from the corner teeth, according as they are more or less entire. When the animal is young, the teeth are short; they appear long at an advanced age, because they continue to grow, and the gums shrink.

Lastly, the shape of the teeth, which is in general pyramidal, the base being at the extremity and the apex in the socket, ceases to be so much so in old age, and approaches more to a cylindrical form.\*

Merinos keep their teeth longer than other breeds, although they change them sooner. The habit of living in the midst of flocks, of observing them, of handling them often, teaches other means of discovering their ages, after the teeth no longer afford any certain criterion. When the eyes are less lively, the lips hanging down, the nostrils wrinkled, it may be presumed that an animal is not young. It will readily be believed that

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\* The knowledge of these details is the fruit of a conversation with *Mr. Girard*, professor of anatomy in the veterinary school of Alfort, and of an examination which we made together of a great number of under-jaws of sheep.

Fig. 1



Fig. 2

Fig. 3



Fig. 4

Fig. 5



Fig. 6

Fig. 7

Fig. 8



Fig. 9

Fig. 10

Fig. 11

Fig. 12



Fig. 13

Fig. 14

Fig. 15



these signs alone can afford no more than probable conjectures ; but it is not always an object of importance to determine the age precisely. It has been supposed that the age of rams is indicated by the rings on their horns ; but these rings are not sufficiently regular to afford a certain rule. It should be observed that, when the pasture is coarse, sheep lose their teeth much sooner. This circumstance should be attended to. Sometimes also the teeth of particular sheep wear out very soon.

### PLATE III.

#### *Teeth of sheep at different ages.*

**Fig. 1st.** Lower or posterior jaw of a lamb, with its eight unshed teeth, which remain fifteen or sixteen months, at the expiration of which they begin to fall.

- a. Exterior front of the jaw.
- b. The same in profile.
- c. Interior of the same.

**Fig. 2d.** Jaw of an animal two years old, having six unshed teeth, and the two front ones new.

- a. Manner in which the two new front teeth grow out.
- b. The position of the same some time after they have grown out.

**Fig. 3d** Jaw of a sheep three years old, retaining four unshed teeth, and having the two front ones and the two next to them new.

- a. The two teeth next the front ones beginning to shoot.
- b. The same, after having grown some time.

**Fig. 4th.** Jaw of a sheep four years old, having two unshed outer teeth, and the rest new.

**Fig. 5th.** Jaw of a sheep five years old, having shed all its teeth. The animal in this state is said to be full-mouthed.

**Fig. 6th.** Jaw of a sheep three years old, whose two front teeth are unusually worn.

**Fig. 7th.** Jaw of a sheep four years old, having four teeth in front worn, and a breach between the two middle ones.

**Fig. 8th.** Jaw of a sheep from five to six years old, having all the teeth more or less worn.

**Fig. 9th.** Jaw of a sheep four years old, having the four front teeth not only worn, but broken at the edges.

**Fig. 10th.** Jaw of a sheep four years old, in which the four front teeth are even, and equally worn.

**N. B.** *Figs. 6, 7, 8, 9 and 10* shew the variations observable in the wear of the teeth.

**Fig. 11th.** Inside of the jaw of a sheep in its second year.

**Fig. 12th.** Inside of the jaw of a sheep three years old.

**Fig. 13th.** Inside of the jaw of a sheep four years old.

**Fig. 14th.** Inside of the jaw of a sheep five years old.

**Fig. 15th.** Inside of the jaw of a sheep from six to seven years old.

#### *General remarks upon the diseases of sheep.*

While none but indigenous breeds, of comparatively little value, were reared, sheep were without much regret seen to die of diseases: but the high price of merinos has counteracted this carelessness; diligent inquiry has been made into the means of preserving, deranging and restoring their health. The efforts of the veterinary art, united to those bestowed upon agriculture, afford reason to hope that exact observations and multiplied essays will yield us more light, and that we shall at length be able to guard our flocks from these destructive foes.

The diseases of sheep are distinguished into several kinds; they are epidemical, endemical, sporadic and contagious. By epidemical, are meant such as spread themselves among a great number of animals, without distinction of country, and at all times; for example, the pox, the scab, &c.—by endemical, such as are peculiar to certain countries, and return annually at the same season, such as the disease called *falère* in Roussillon, the rot in low, foggy and wet places: by sporadic, such as happen, without regularity, and in all places indiscriminately, to some individuals only; for instance, the staggers, &c. The word *contagious* implies a quality, and not a distinct disease; it signifies such diseases as are communicated by one animal to another, either by immediate contact, or by intermediate communication; for instance, the carbuncle, the rot, the scab, &c. Among the epizootic and sporadic diseases, some are contagious and some not contagious.

Besides these different classes of diseases, there are some less extensive, which must be regarded as accidental; of this kind

are gatherings, tumours, wounds at the roots of the horns, occasioned by the battles of the rams with one another, wounds made by careless shearers, bites of dogs and fractured legs.

While speaking of the symptoms of diseases, and the manner of treating them, it is proper to confess a truth well known to those skilled in the veterinary art, and which they readily acknowledge. In general, little advantage to ruminating animals, and consequently to sheep, is to be expected from internal remedies, except from drinks much allayed, and from injections.\* It is known that these animals have four stomachs; viz. the *paunch*, the *bonnet*, the *manyplies*, the *red*. The paunch, the largest of the four, receives the aliments, and holds them in a mass, until they return successively to the mouth, to be chewed, and afterwards to pass into the three others. It is easy to conceive that medicines swallowed by an animal, getting mixed among a large quantity of undigested substances, must lose all or a great part of their power, and consequently produce little effect.† In order to have much effect, they must be very subtle; but in this case there is danger that they may touch the coats of the stomach, corrode it, and produce inflammation and even gangrene. Veterinary surgery is almost the only surgery which can be employed; the surgical cases are rare, and unfortunately there are many instances in which it would be desirable to employ some other means. The greatest dependence is to be placed upon preventive medicine; a good diet, much attention and exactness in following the directions which I have given with regard to the food, lodging, leading, &c. of sheep, are the surest means of saving them from diseases. Every thing is to be gained by preserving them in good health; expense and trouble are saved; they acquire a stronger constitution; they produce better; and they increase faster.

The strictness of the police of Paris has preserved the environs of that capital from contagious disorders, by prevent-

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\* See a memoir by *Gilbert* on the effects of medicines upon ruminating animals, vol. III of *Annales de l'agriculture française*. This memoir contains very interesting experiments. In the same volume are reflections upon this memoir which are worth reading.

† Having weighed the four stomachs of a sheep with their contents, together with a small part of the œsophagus and the duodenum, I found their weight to be between 21 and 22 pounds; and after they were emptied, between 3 and 4 pounds. *Gilbert*, in his memoir above cited, says that the aliments contained in the paunch of a sheep which died of hunger after eight days of perfect abstinence, weighed 5 pounds and a half.

ing sheep attacked by them or suspected of them from entering the markets. Besides, a wise law prohibits the butchers of the precincts from pasturing cattle, as they formerly did, in the fields of the farmer, whose flocks were by this practice ruined.

Although I regard migration in Spain and in France as resulting purely from the necessity of leading sheep to parts where they may find nourishment, yet I think that journies and change of place may be of use to preserve these animals from certain diseases; for instance, if the owner of a flock kept in a damp country, could make it pass some months every year in one that is dry, he would counteract the ill effects of the former by means of the latter. Farmers situated in countries of opposite natures, might agree to send their flocks to each other's lands; Sologne and Beauce have made this experiment, and have derived advantage from it.

In treating of the diseases of sheep, it is not my design to enter into very minute details; it is the business of veterinary books to describe them with great accuracy, and to point out the treatment proper for each case, without omitting any.—These books may easily be procured by those who wish to study and understand them. It is my design, in this treatise, to give only a summary of the diseases, and to mention merely what is requisite for the constant use of proprietors of flocks.—My object is not, nor ought it to be, to make a complete treatise upon the diseases of sheep; it is sufficient if my work be not imperfect: it would have been so, if I had limited myself to the manner of forming flocks, of multiplying them, and of treating them in a state of health. I have retrenched whatever was too scientific, with the view of being more concise and clear, and I have studied to advance nothing that is not proved, or at least probable. In difficult cases, recourse must be had to able professors of the veterinary art.

It should be remembered that, to make sheep swallow liquid remedies, which must always be done by force, precaution must be used, for nothing is more easy than to suffocate them: the drink should be poured into their month at several times, and in the intervals they should be suffered to breathe freely.—The same care should be taken if they be exposed to pungent fumigations.

*Of the SHEEP-POX; in French called CLAVEAU.*

This disease has a variety of different names in France. It is dreaded, on account of the ravages which it commits among

sheep: it is one of the most deadly disorders which is known. The sheep-pox sometimes kills more than half a flock ; it spares nothing : it is seen to attack, in every kind of country, flocks fed and managed in different ways ; it distinguishes neither constitution, nor sex, nor age ; rams, ewes, wethers, lambs, strong or feeble, all are liable to it. If it be accompanied with the *rot* or the *disease of the blood*, the danger is increased ; and in such cases, it is always fatal.

A belief generally prevails that a sheep can have this disease but once in its life. I am certain that, it having raged in a flock twice in the course of three years, the animals which had it the first time had it not the second. This fact; it is true, does not prove that they cannot be attacked by it more than once.— However, the exceptions, if there be any, do not destroy the rule.

The progress of this disease is regular ; three very distinct stages may be observed : the attack or inflammation, the eruption and the desiccation. Some veterinaries admit four ; viz. the attack, the eruption, the suppuration and the desiccation : but these four may be reduced to three, the eruption comprehending the suppuration. The animals are at first dull, languid, without appetite, and stand with their hind and fore-feet near to each other ; they do not chew the cud, are thirsty, and heated ; no doubt they have much fever. These symptoms, however, are not to be considered as peculiar to the sheep-pox ; for they are the precursors of several others. In the second stage, pimples appear upon the body, which gradually increase in size, and which at first are red, and afterwards become white : they are sometimes spherical, sometimes flat ; they appear first about the parts not covered with wool, such as the face, the inside of the thighs, the arm-pits, the under part of the tail, the belly, the teats ; they afterwards are formed beneath the wool ; in four or five days, the eruption is complete. In the third stage, the pimples fill with matter, dry, and form a black crust which finally falls off.

This disease, like the small-pox, may be distinguished into two kinds. The one is mild, the other malignant ; the latter is generally confluent ; that is to say, the pimples are small, numerous and close together. The symptoms of this latter species are more violent ; the eruption is incomplete ; the pimples flatten, dry and grow black, without containing any matter ; a thick mucus runs from the nostrils ; the head swells, the eyes close, and the respiration becomes painful : the animals seldom recover. It has been thought that during an

epidemic of the mild species, it is in some individuals confluent. Some persons admit of a third kind, which they call crystalline, and which they place between the mild and the malignant; but it does not appear to me sufficiently marked to admit of being made a distinct species.

When the eruption is complete, and the sheep recover their appetite, a cure may be expected; but if they obtain no relief, & if the pimples are of a deep purple, a fatal issue may be predicted: imposthumes and external gatherings, and the coming out of the wool on the parts where there has been an eruption, are good symptoms. The life of the animals is often saved with the loss of their sight; they are deprived of one or both of their eyes; some of them lose all their wool; the greater part retain indelible scars or marks of the pimples. The bodies of those which die of this disorder putrefy in a short time. Young and vigorous animals resist the disorder best.

This disease is as contagious as a disease can be; a mere nothing communicates it: if a sound flock passes through a place immediately after one which is infected, it is liable to catch the disorder. Yet, in the midst of an epidemic, some individuals are not attacked. It is asserted that a lamb, born before the disease with which its mother is tainted has arrived at a state of suppuration, is not infected with it, and that no fœtus has been found carrying the marks of this disease.

When the sheep-pox breaks out in a flock, it may continue some time, because the animals are attacked in succession. It is commonly said to last about three months; yet I have known it to continue six months. The epidemic is sometimes most destructive at its commencement, sometimes in the middle of its career, and sometimes towards its conclusion.

The admirable discovery of vaccination was no sooner justly appreciated, than the thought presented itself that it might be a preventive against the disease under consideration, as well as against the small-pox. In pursuance of this idea, essays have been made in different countries. Some results have misled credulous persons; they have pretended that this disorder also would finally be extirpated by means of vaccination: but experiments, made with all possible care and attention, have unhappily banished all hope, and left only regret at not being able to extend to brutes this benefit which our age has procured for men.

It being impossible to derive any benefits from vaccination,



sheep-pox itself; its analogy to the small-pox had long since inspired the desire to make attempts. The author of the veterinary dictionary considers the success of this operation probable, and he points out several precautions to be observed. Mr. *Vitet* thinks it possible; but he doubts its being of any advantage. The abbé *Carlier* rejects it, as dangerous. If credit may be given to two printed letters from Mr. *Amoreux*, it is practised in upper Languedoc, in the villages of Mous, Lappardu, Saint-Hilaire, and in all that part of the country called *Corbieres basses*, in the districts of Narbonne, Carcassone and Aleth. Mr. *Thorel*, veterinary professor at Lideve, in a tract entitled *avis au peuple sur le claveau ou picotte des moutons*, says that Mr. *Venel*, a celebrated physician at Montpellier, has successfully inoculated a flock, and that inoculation has also been practised in Saxony. Lastly, in the *Médecine des chevaux* by Mr. *Charlette* are contained some facts relative to this subject. An opportunity having offered, twenty five years ago, of making the experiment, I thought it right to embrace it, with the view of either opening a new source of information, or of confirming the experiments already made.\*

Mr. *Huzard* went from Paris to perform this operation upon the flocks of Mr. *Chaptal* at Chanteloup, and upon one belonging to government, at the château de Clermont, near Nantes. In both instances, he preserved the major part of the animals, which would have been attacked by the disease; and diminished the mortality among those which were already infected.—Inoculation has also been practised in the department of Marne, and particularly by Mr. *Allaire* one of the administrators of the forests: many animals have been saved there. Mr. *de Barbançois*, who owns large flocks in the department of Indre, has inoculated a considerable number of sheep. He says that he has met with success; which he thinks due to the care which he has taken to inoculate with matter taken from inoculated animals, the virulency of which was already mitigated. This fact is worth verifying.

When the sheep-pox breaks out in a flock, a great advantage results from inoculating all the sheep which are not evidently infected; since, as has been said, the eruption is thus rendered more mild on such as are already diseased, and the others are preserved. If inoculation were practised upon lambs after they are weaned, without waiting for the appearance of an epidemic, much pains and uneasiness would be avoided: the

\* The details of this inoculation are in the Memoirs of the royal medical society, for the year 1786.

flocks might then safely travel from the plains to the mountains, and from the mountains to the plains; they might be conducted from department to department without fear of contracting or of imparting this fatal disease; Virgil's idea would then be verified: *Nec mala vicini pecoris contagia lædent*. Another consideration, still more important, presents itself, the butchers would not so frequently offer for sale meat of a bad quality, as is too often the case, especially in the country; for they there kill sheep which have this disease, and sell the meat, without considering that it may be injurious to the health of those who eat it: so entirely does the desire of gain sometimes stifle the love of humanity !

To inoculate for the sheep-pox, slight incisions are made with a lancet in the armpits and under the thighs, so as just to graze the skin, and cut only the epidermis; the same lancet is then dipped in pimples containing the matter of the disease, which is introduced into the incisions, the finger being held upon them, that the vessels may absorb a greater quantity\*: three or four incisions in each limb are sufficient to give the disease. When the virus is taken from animals near to those which are to be inoculated, the operation is more likely to succeed than when it is conveyed from a distance. Yet, if it be good, it may, even in this case, be depended upon. Some precautions are to be observed, which use and habit will teach. I do not doubt that if men of sense and experience direct their attention to this practice, as much benefit may be derived from it to sheep as has been derived to man from vaccination. I know no better preservative.

One precaution is indispensably requisite, if inoculation is not employed; that is, to avoid communication with other flocks; it is therefore prudent, in suspicious places, to let sheep travel only in the morning early, that the infectious matter deposited upon the grass, being wet with the dews of night, may have no power. Neither ought the shepherd of a sound flock to have any communication, direct or indirect, with the shepherd of an infected flock, nor with persons who approach it. Even dogs, if not carefully watched, may introduce the infection.—Clothes, hair, utensils, as well as grass and fodder, are means of communication. I omit the mention of setons, of bleeding, and of different medicines which have been prescribed, some mild and diluting, others tonic, and others antiseptic. Setons, supposing them to be harmless, could not be used upon a nu-

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\* Attempts have been made to inoculate by means of a needle, but pimples of an ugly nature, terminating in gangrene, were the consequence.