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THE

BREEDS, MANAGEMENT,

STRUCTURE AND DISEASES

OF

THE SHEEP:

WITH ILLUSTRATIVE ENGRAVINGS,

AND

AN APPENDIX.

BY HENRY J. CANFIELD.

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PREFACE.

THIS Treatise has been compiled and composed principally with a view to the diseases and management of sheep. In this work, quotations have been made from the works of Messrs. Youatt, Spooner, Blacklock, McKenzie, Livingston, and various other authors. In many cases they have been quoted directly; in other cases, for the sake of brevity, no marks of quotation are used. On many subjects, it is impracticable to write much which is entirely new; therefore, a careful compilation of those materials which are most useful, together with the elucidation of many other things which have not heretofore been explained, I trust, will be satisfactory to the reader, and will need no apology.

CANFIELD, Mahoning County, Ohio,
October, A. D., 1848.

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ORIGIN OF THE SHEEP.

THE SHEEP is classified by naturalists as belonging to the ORDER RUMENANTIA; the TRIBE CAPRIDÆ; and the GENUS OVIS. Of the OVIS, there are three varieties; the OVIS AMMON, or ARGALI; the OVIS MUSMON; and the OVIS ARIES, or DOMESTIC SHEEP. This last variety will form the subject of this work.

[1st.] ASIATIC ARGALI.

Professor Low observes that "the Asiatic Argali is somewhat less than the size of a stag. He has enormous horns, measuring more than a foot in circumference at the base, and from three to four feet in length, triangularly rising from the summit of the head, so as nearly to touch at the root, ascending, stretching out laterally, and bending forward at the point. He has a coat of short hair, covering a coat of soft white wool. The color of the fur, externally, is brown, becoming brownish grey in winter. There is a buff colored streak along the back, and a large spot of a lighter buff color on the haunch, surrounding and including the tail. The female differs from the male, in being smaller, in having the horns more slender and straight, and in the absence of the disc on the haunch. In both sexes, the tail is very short, the eye-lashes are whitish, and the hair beneath is longer than on any other parts of the body. The Argalies inhabit the mountains and elevated plains of Asia, from the Caucasus northward and eastward to Kamschatka and the Ocean. They are very agile and strong, but very timid, shunning the least appearance of danger. Their motion is zigzag, and they stop in their course to gaze upon their pursuer, after the manner of the domestic sheep. They are usually found in very small flocks, and at the rutting season, the males fight desperately, using their horns and forehead, in the manner of the common ram. They are

hunted by the people of the country for their flesh, which is esteemed to be savory, and for their skins, which are made into clothing. In autumn, after having pastured during summer on the mountains and in secluded valleys, they are fat, and in high request; but as winter advances, they are forced to descend from the mountains in search of food. They then lose their plumpness, and are sought after only for their skins. When young, they are easily tamed; but the old ones never resign their natural wildness.

The Argali of America, or, *Rocky Mountain Sheep*, is nearly allied to, or is identical with, the Argali of Asia.—It is described by Spanish writers as the sheep of California, and is familiar to the Indians and fur traders of Canada, and is called by them the *ahsata*, or big-horn. It surpasses the Asiatic Argali in size, and is consequently larger than the largest of our domestic sheep. It is described by Captain Bonneville as follows: "The dimensions of a male of this species are, from the nose to the base of the tail, five feet: length of the tail, four inches: girth of the body, four feet: height, three feet eight inches: the horn, three feet six inches long, one foot three inches in circumference at the base; and the horns are twisted lower than the muzzle. It has the head and horns of a sheep, and it is said to be delicious mutton." Its horns are very large, approaching, but not touching at the base. The horns of the female are small, and slightly curved. Their coat is hairy, and is of a reddish brown color, but becomes paler in winter; and in spring, the old rams are nearly white. The face and nose are white, and the tail and buttocks present the buff colored disc which distinguishes the male of the Asiatic species.—They collect in flocks under the guidance of a leader. They pasture on the steepest parts of the mountains, and on the approach of winter, descend into the plains. They are wild and timid, betaking themselves, on the least alarm, to the summits of the mountains. They are pursued and killed by the Indians for their skins and flesh. They have never been subjected to domestication. The Argali abounds in the Rocky Mountains, from the fiftieth degree of north latitude, quite down to California, generally in the highest regions capable of vegetation. Major Hamilton Smith remarks: "If the American species be the same as the Asiatic, which appears very probable, it can have reached the

New World only over the ice by Behring's Straits: And the passage may be conjectured as comparatively of a recent date, since the Argali has not spread eastward beyond the Rocky Mountains, nor to the south farther than California."

[2d.] THE MUSMON, OR MOUFLON,

Still inhabits the islands of Crete and Cyprus, and the mountains of Greece. It is found in Corsica and Sardinia, where it is familiar to the mountaineers of the interior. It formerly abounded in Spain, and even yet it is said to be seen in the mountains of Murcia. It is also abundant in the mountain ranges of southern Siberia, where it is subject to a cold rather than to a temperate climate. Everywhere, however, it preserves its own characters without alteration, while in its domesticated descendants, the common sheep, (if such they be, and which has yet to be proved,) we see a perpetual series of variations—a multitude of breeds presenting diverse characters.

Wilson, the naturalist, describes the Musmon as follows: "It is usually about two and a half feet in height, and three feet and a half from the nose to the commencement of the tail. The horns never exceed two feet in length: they are curved backward, and the points are turned inwards: the roots of the horns are very thick and wrinkled: the ears are of a middle size, straight and pointed: the neck is thick: the body round: the limbs muscular, and the body short. The color is generally of a dull or brownish grey, with some white on the fore part of the face and on the legs: a tuft of long hair beneath the throat: a dark streak along the back; and the upper part of the face black, with black streaks along the cheeks. The forehead of this sheep is particularly arched. The females are generally without horns, and where they do appear, they are considerably less than those of the male."

The Musmon is smaller than the Argali, and its horns turn in at the points; whereas, those of the Argali turn out at the points. The coat of the Musmon consists of a brownish grey hair of no great length, concealing a short, fine, grey colored wool, which is full of spirals, and which covers the whole body. W. C. Spooner remarks that, "the Musmons resemble the Argalies in several characters; but

they are less powerful and hardy, and inhabit lower ranges of mountains. They are gregarious, assembling in large herds in the summer; but at the rutting season, fierce contests take place between the rams, and the herd divides into smaller bands, consisting of a male and several females. The Musmon is with difficulty domesticated, and is less docile and sensible to acts of kindness, than the domestic sheep."

[3d.] THE DOMESTIC SHEEP.

"It has been considered by some naturalists that the Musmon was the parent stock of the domestic sheep; and in support of this opinion, it is stated that the Musmon has been known to breed with the domestic sheep, and their progeny is fruitful, will reproduce, when copulated together. Pliny mentions such alliances as common, and states that the progeny were termed *Umbri*. Sheep and goats, also, when copulated together, produce a progeny, which will reproduce; * and the only essential differences between them are, that the skin of the sheep is of a loose texture, and in temperate climates, is generally covered with wool, with a small proportion of hair; whereas, the goat has a thick, firm skin, which, in the same climates, is most commonly covered with hair, and has also a beard under its chin, an ornament seldom found upon the sheep. The goat of Cashmere and the Rocky Mountain goat, are exceptions to the general rule, as to the covering of the goat.

These circumstances show a near relation in the characters of the sheep, the goat, and the Musmon. Nevertheless, the domestic sheep, particularly the large, straight horned breeds, if left to themselves, so as to become wild, as they very readily will do, are quite as capable of defending and sustaining themselves, as the goat or Musmon.—And, therefore, it seems most rational to suppose that the domestic sheep has ever been a species distinct from the goat and Musmon, and such it should be considered until the contrary is proved.

The sheep is subject to extraordinary changes in its structure and covering, or coat, from the varied influences of soil, food, and climate; and, therefore, it is impossible to

* Blacklock.

trace the character of the primitive breed of sheep. "No animal," says Blacklock, "varies more than the sheep, and none adapts itself so speedily to climate. It would almost appear that nature, convinced of its great utility, had bestowed upon it a constitution so pliant, as to enable it to accommodate itself to any point, in a wide scale of temperature. For though its natural situation as a wool bearing animal, like that of man, appears to be the wine countries, yet with him it has spread to every quarter of the globe, becoming impressed at every change with some peculiarity, alterable only by a change of situation, and varying, we might affirm, with the weather. Changes, occasioned by climates, are always limited to the fleece, horns, and disposal of the fat, and never extend to those parts on the permanence of which the animal depends for its station in the scale of being, as the teeth, feet, and the digestive organs."

Under such circumstances, it cannot be expected that we can trace the origin of the different breeds of sheep. And as to the qualities and management of any of the ancient breeds, we know only what is furnished by the Bible, and by Roman and Greek writers; and so meagre are the accounts which they furnish of the different breeds, that any thing like a regular history of the sheep is entirely out of the question. But as the sheep has been widely disseminated throughout Europe, Asia, and Africa; as its young are easily tamed, and its milk, flesh, and pelts were extremely valuable to man in all ages, we may well suppose that it was one of the first quadrupeds which was domesticated. And as there is no animal which contributes more to the welfare and comfort of man than the sheep, so, also, there is no one which requires more care and attention from him.

SECTION II.

ANCIENT MANAGEMENT OF SHEEP.

In early ages, flocks of sheep constituted a large proportion of the wealth of the people. It is stated in the Scriptures that Job possessed 14,000 sheep, besides oxen and camels; and Solomon offered 120,000 sheep at the dedication of the temple. The King of Moab rendered a yearly tribute of 200,000 sheep to the Jews, &c. Travelers assert that numerous flocks are still kept up in Western Africa.—Sir John Chardin saw flocks in the neighborhood of Aleppo, of immense numbers; and Dr. Shaw states that several Arabian tribes, who can bring no more than three or four hundred horses into the field, are possessed of more than as many thousand camels and oxen, and treble the number of sheep and goats.

In Western Asia, the customs of these nomadic shepherds have been much the same from the most remote ages; and as scriptural descriptions of the management of sheep by the Patriarchs, are very similar to those which are given by travelers among the Arabs, as to the management of sheep, a few quotations from these writers may be interesting.

It is recorded that, "Abraham and Lot dwelt in tents: that Abraham pitched his tent upon a mountain; and that he often changed his place of residence." D'Arvieux, a French traveler, says, "the Arabs commonly encamp on the tops of some little hills where there are no trees to hinder them from discovering, a great way off, all that come and go, that they may not be surprised, having nothing else to fear. They set themselves down wherever they find springs of water, or rivulets in the valleys, and pasture for the subsistence of their cattle, and then decamp as soon as that is gone, and go and post themselves in another place, every fortnight, or, at most, every month.

"They live all the summer upon these hills, always advancing towards the North; and when winter begins to come on, they go by degrees to the South, as far as Cæsarea, of Palestine, and on the outside of the mountains of Carmel. They have no other lodgings but their tents,

which they call their houses. They are entirely made of black goats' hair, which is an employment of the women. They spin and weave them. They are strong, of a close texture, and so stretched, that the longest and heaviest rains cannot penetrate through them. Their whole families, and all that they have in the world, even to their stables, are there, particularly in the winter. The tent of the Emir is of the same stuff, and differs from that of his subjects only in bigness." Hence, the figure in the song of Solomon, (i–5,) "black as the tents of Kedar," which is the name of an Arabian Nomade or Bedouin tribe, frequently mentioned in the Old Testament. This tribe dwells in tents, with a similar covering, to the present day.

The Prophet, in speaking of the Messiah, says: "He shall feed his flock like a shepherd, he shall gather the lambs with his arm, and shall carry them in his bosom, and shall gently lead those which are with young." The same care and humanity are manifested by the Arabs of the present day. Parsons, the traveler, in speaking of them, says: "It was entertaining enough to see the horde of Arabs decamp. First went the sheep and goats, in regular divisions: then followed the camels and asses, loaded with the tent, furniture, and kitchen utensils. These were followed by the old men and women, and the boys and girls on foot. The children that could not walk, were carried on the backs of the young women, and the boys and girls, and the smallest of the lambs and kids were carried under the arms of the children. The procession was closed by the chief of the tribe, mounted on the very best horse."

Greek, Roman, and Biblical writers inform us, that anciently the milk of sheep and goats was in common use; and Homer, in his Odyssey, relates that one half of the milk was first drawn from the ewe for drink, and for the purpose of making cheese, and the remainder was left for the lamb.

The milk of sheep and goats is used by many of the uncivilized, and, to some extent, by the civilized nations of the Eastern Continents, at the present day, as a beverage, and for making butter, cheese, and curds.

The milk of sheep, in appearance, is like that of the cow, but is generally thicker, and yields a pale yellowish butter, which is always soft, and soon becomes rancid. Culley

remarks, "the cheese from their milk is exceedingly pungent, and for that reason is preferred by many to that from the cow." In Wales, sheeps' milk is mixed with that of the cow, and makes a tart, palatable cheese.

The Syrian Arabs, of the present time, milk their ewes and goats; but they manufacture principally butter from their milk.

Mr. Burckhardt gives the following account of their practice: "The sheep and goats are milked during the three spring months, morning and evening. They are sent out to pasture before sunrise, while the lambs or kids remain in or near the camp. About two o'clock the herd returns, and the lambs are allowed to satiate themselves; after which, the ewes belonging to each tent, are tied to a long cord, and milked one after another. The same process occurs at sunset. From a hundred ewes or goats, (the milk of which is always mixed together,) the Arabs expect, in common years, about eight pounds of butter per day, or about seven cwt. in the three spring months.

The system of cotting was known and adopted, when necessary, by the Israelites, and also by the Greeks, Romans, and Germans. In a very ancient Anglo-Saxon manuscript, (says Turner,) a shepherd is represented as saying: "In the first part of the morning I drive my sheep to their pasture, and stand over them, in heat and in cold, with dogs, lest the wolves destroy them. I lead them back to their folds, and milk them twice a day; and I move their folds, and make cheese and butter."—(Turner's Anglo-Sax., ii–540.)

In olden times, as now in Spain, and in many other parts of the world, sheep-shearing was a time of feasting and rejoicing; it was the harvest of the shepherd.

The shears used for shearing are a very ancient invention. They were termed *forfex* by the Romans. In a collection of antique gems at Berlin, (Germany,) called the "Stosch Collection," is a gem bearing a representation of a newly shorn lamb and the shears, which are exactly similar to those now in use.

The sheep-hook was used from the most remote period, as at the present time, among the nations of Europe and Asia, to seize the sheep, by laying hold upon its legs.

Music was a common amusement of the ancient shepherds; and the instrument most commonly used, was call-

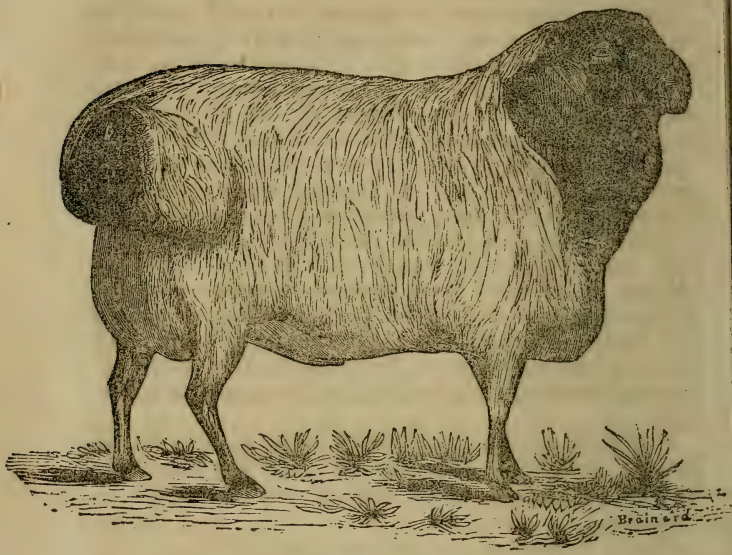
ed the *fistula*, or shepherd's pipes. It is made of seven or more pieces of reed or cane, of unequal length and thickness, joined together, side by side. The hollow parts of each tube, being of different sizes and depths, make sounds corresponding to the different notes.

They are played upon by applying the mouth, and blowing into the ends of the reeds, and moving the instrument back and forth, from side to side, with great velocity, so as to touch the desired notes. "In many parts of the Alps, and even in France, (says Goldsmith,) the shepherd and his pipes are still continued with true antique simplicity.—The flock is regularly penned every evening, to preserve them from the wolf, and the shepherd returns homeward at sunset, with his sheep following him, and seemingly pleased with the sound of his pipe, which is blown with a reed, and resembles the chanter of a bagpipe. Before I had seen them trained in this manner, I had no conception of those descriptions in the old pastoral poets, of the shepherd leading his flock from one country to another. As I had been used to see these harmless creatures driven before their keepers, I supposed all the rest was pure invention."

This mode of using the shepherd's pipes is mentioned in Homer's Iliad, (Book 18th, line 526;) and they are, doubtless, one of the most ancient of all musical instruments.

SECTION III.

ASIATIC AND AFRICAN SHEEP.



FAT-RUMPED SHEEP.

This breed of sheep is described by Dr. Anderson, the traveler, as follows: "The flocks of all the Tartar hordes resemble one another, by having a large yellow muzzle, the under jaw often projecting beyond the upper; by having long hanging ears, and by the horns of the adult ram being large, spiral, wrinkled, angular, or bent in a lunar form. They have slender legs in proportion to their bodies, a high chest, large hanging testicles, and tolerably fine wool mixed with hair. The body of the ram, and sometimes of the ewe, swells gradually with fat towards the posteriors, where a solid mass is formed on the rump, and falls over the anus in place of a tail, divided into two hemis-

pheres, which take the form of the hips, with a little button of a tail in the middle, to be felt by the finger."

There is, also, a hornless variety of the fat-rumped sheep. The annexed cut is a correct portrait of a hornless fat-rumped Persian ram, which belonged to the Zoological Society of London. Sheep of this breed often weigh as much as 200 pounds: and this may be considered as the largest of the unimproved breeds. The soft, oily fat, which forms on the rump, often amounts to from 20 to 40 lbs. In the neighborhood of Caucasus and Taurida, the hind quarters of the sheep are salted as hams, and sent in large quantities to the northern parts of Turkey.

It appears from the above description, that the fat-rumped sheep, in some parts of Russia, bears a fineish fleece; but generally it is coarse, and is much mixed with hair, and is only fit for inferior manufactures. They are very hardy, notwithstanding their bad forms.

This breed of sheep is found, in its purest state, in the deserts of Great Tartary—no other variety being near to contaminate its blood. It reaches far into the interior, and northern parts of Russia, and is much disseminated in China, Persia, Thibet, Hindostan, Asia Minor, and Eastern Africa. It is found in Palestine in greater numbers than any other breed—the largest proportion of the sheep of Northern Asia being of this description.

It is supposed by some persons, and it is not impossible, that this breed may be the same which was bred by the Patriarchs in the days of Abraham and Moses. It is said that, "Moses took the fat, and the rump, and all the fat which was upon the inwards, and burnt them upon the altar, for a burnt offering." And these words seem to indicate a similarity in the shapes of the ancient and present breeds of Western Asia.

The causes of the peculiar deposition of fat upon the tail and rump of different breeds of sheep, will probably ever be a mystery. Fat is a secreted tissue which intermingles with, and surrounds the muscular parts, and envelopes the viscera within the body. Ordinarily, it is dispersed throughout the body; but in many of the sheep of the above mentioned countries, it accumulates principally upon the rump or tail. Professor Pallas conjectures that this character arises, in the fat-rumped sheep, from their feeding upon the

bitter and saline plants, found upon the borders of the Caspian and Black seas. And he asserts, that when they are removed from the places where these plants grow, the fatty excrescence becomes less. But, as the fat-tailed and fat-rumped sheep are varieties which are widely dispersed, it seems more probable that they may have been produced by accident, and may also have been perpetuated by accident, design, or fancy.

BROAD-TAILED SHEEP.

"This race of sheep is more extensively diffused than any other; it is found throughout Asia and a great part of Africa, as well as through the north-eastern parts of Europe. They differ as the ordinary European race, in the nature of their covering. In Madagascar, and in some other hot climates, they are hairy; at the Cape of Good Hope, they are covered with coarse, hard wool; in the Levant, their wool is extremely fine. These sheep are generally

larger than those of Europe, in which circumstance only, and the form and size of their tails, they differ from them."

"The broad-tailed sheep are of three species: In the one species, the tail is not only broad, but long." Dr. Russel, in his history of Aleppo, gives the following account of it, as it appears in Syria: "The dead weight of one of these sheep will amount to 50 or 60 lbs., of which the tail makes up 15 or 16 lbs.; but some of the largest, that have been fattened with care, weigh 150 lbs., the tail alone composing one-third of the whole weight. This broad, flattish tail is mostly covered with long wool, and becoming very small at the extremity, turns up. Animals of this extraordinary size, (150 lbs.) are, however, very rare, and are kept up in yards, so as to be in little danger of hurting their tails from the brushes. The shepherds, in several places in Syria, fix a thin piece of board to the under part, which is not like the rest, covered with wool, and to this board are sometimes added small wheels."

This necessity of carriages for the tails of African sheep, is mentioned by Herodotus, Rudolphus, and others; and, from this circumstance, it appears that this is a very ancient breed of sheep.

"Another species have the tail broad and flat, but not very long, covered with wool above, but smooth below, and divided by a furrow into two lobes of flesh. These are also said to weigh (in some cases) above thirty pounds."

"In a third species, a small, thin tail projects from the centre of this fleshy excrescence." "The composition of this excrescence (of the tail), is said to be a mixture of flesh with a great proportion of fat, and to be very delicate food. But the animal has little other fat, the tail being in him the repository of that fat which lays about the loins of other sheep. In cold climates, the fat of the tail resembles suet; but in warm ones, as at the Cape of Good Hope, Madagascar, &c., it is so soft that, when melted, it will not harden again."—(Livingston.)

Dr. Russell says: "It is entirely composed of a substance between marrow and fat, serving very often in the kitchen instead of butter, and cut into small pieces, makes an ingredient in various dishes."

Mr. Wilde, in his narrative, makes the following observations upon a variety of this breed of sheep, and their

management in Palestine: "These sheep are of a peculiar, and very handsome breed: are mostly low sized: the fore parts of their bodies are of a fawn color, the hinder parts white: they have long, pendent, silken ears, and sweeping tails: their faces more oval and longer than the species in these countries, and they have altogether a more pleasing, docile, and mild expression.

"It is almost incredible, the influence that the shepherds of Palestine possess over their flocks. Many of them have no dogs, but a word is sufficient to make them understand and obey the will of their shepherd. He sleeps among them at night, and in the morning leads them to pasture, always walking before them, guiding them to those places where they can enjoy the best food, and resting, when they have obtained a sufficiency; or, during the heat of the day, in some cool, shady place, where they all immediately lie down around him.

"Shortly after leaving the city, we met several flocks of sheep, preceded by their shepherds, walking towards Jerusalem. These Arabs, clad in the turbans and simple abbas worn by their class, and carrying a wooden crock in their hands, walked in front. After the sheep came some young goats and lambs, and the whole procession closed with about two dozen patriarchal looking goats, which brought up the rear. These goats have long horns, and pendent ears, that hang almost to the ground; and their hair is a glossy black of the finest grain. These shepherds are often to be seen about sunset, slowly approaching the city from all sides, to seek shelter for their flocks, during the night, in some of the deep vallies with which it is surrounded, carrying the lambs in their bosoms. He has generally two or three favorite lambs, which do not mix with the flock, but follow close at his side, frisking and fondling about him like dogs. Indeed, the degree of intelligence that exists between the Arab and his flock, is truly astonishing. "They know his voice and follow him," and "he careth for the sheep." It was probably to such shepherds as these, that the angel announced the glad tidings of the Saviour's birth. And as I met them walking towards Jerusalem, the full force of all the beautiful imagery, and the many touching similes, derived from such scenes and associations, and so often alluded to, came vividly before me."

SHEEP OF PERSIA AND HINDOSTAN.

There are various races of sheep in Persia. A race of sheep exists in Persia, and to the north of it, which deserves to be mentioned as being, perhaps, the nearest in its characters to the wild race or Argali. This peculiar race is proper to the north parts of the country on the Caspian, but is greatly diffused in Persia, and extends across the Indus over a great part of Hindostan. It is covered with a coarse, hairy wool, of a grey color; its horns are bent outward, in the manner of the Argali: and what is worthy of note, its head resembles the common picture of the ram, as depicted in Eastern sculptures.

There is, also, another very remarkable race in Persia which is entirely destitute of tail, and has an accumulation of fat upon the posterior parts. This breed is frequently termed the Persian, but its principal habitation is the shores of the Red Sea, and it seems to be of African, rather than Asiatic origin.

The fat-tailed sheep also abounds in Persia and Hindostan. Of these two last mentioned kinds, the fat-tailed are the most numerous in those two countries. Much wool is grown in those districts of Persia where a majority of the inhabitants lead a pastoral life. The most valuable is found in the province of Kerman. This is a very mountainous country, hot in summer, and intensely cold in winter.—The wool of the sheep is fine in quality, and that which grows at the roots of the hair of the goat, is nearly as fine. The latter is manufactured into various fabrics, which almost equal the beautiful shawls of Cashmere. The fine felt carpets, for which Persia is so celebrated, are manufactured from the wool of the sheep, either in Kerman or Koprasan. Although those districts are remotely situated from each other, the wool of the sheep nearly corresponds, and "is remarkable for being spirally curved, and of a grey or mixed black and white color. The sheep are below the ordinary size, the horns of the ram curved back, and spiral at the tip, the ears pendulous, and the tail not very broad." —(Fraser's Travels.)

And the shepherds of those countries lead a wandering life, much like that of the Arabs of Syria and Palestine.

Some parts of Persia, and also Astracan, on the Caspian Sea, are noted for the fine furs which they produce; but

these furs are the skins of lambs, taken from the mothers, and slaughtered before the natural birth.

THIBETIAN SHEEP.

The sheep of Thibet are very numerous, and are chiefly a small variety of the fat-rumped Persian and Abyssinian breed, with black heads and necks. Some are hairy, with short wool underneath; while others bear a long, soft, and fine wool. It is from the latter that many of the costly Indian shawls are made. Much of this peculiar wool finds its way to Hindostan, and is there manufactured. The mutton of these sheep is said to be peculiarly well flavored.

CHINESE SHEEP.

In China are a variety of breeds. The fat-tailed and fat-rumped varieties abound extensively in the southern parts of China; and in certain districts a small breed is found, which resembles in form the European breeds, and which produces a fine, and very useful long wool.

But one of the most singular breeds in that country, is the long-legged sheep, so called on account of the extraordinary length of their legs. This breed have horns which are of a middle size, and curved: the forehead is arched: the neck short, with a collar of hair reaching from the nape of it to the shoulders: the legs, head, and mane are of a reddish brown color: the tail is long, and the wool short and coarse.

EGYPT.

In Egypt, both varieties of the fat-tailed sheep prevail: but those with long tails, reaching nearly or quite to the ground, are more numerous than the broad-tailed breed.—They are of a large size, mostly with black heads and necks, an external coat of hair, and well-flavored flesh.

ETHIOPIA,

Has sheep similar to those of Egypt in most respects, with black heads and necks, and the remainder of their bodies white. Others are quite white, with tails reaching nearly to the ground, and curved at the extremity.—(Dapper's Africa.) Here, also, appear the fat-rumped sheep, with black

heads and necks, but of a smaller size than the Persian breed.

ABYSSINIA.

In this country, the sheep are taller than those of Egypt, and are all black; their heads large, and their ears remarkably short and small. They, also, like the other native sheep within the tropics, have an external covering of hair. It is in this region that the many-horned sheep is found; many having four, and some writers have asserted that individuals have been seen with six horns.

MADAGASCAR.

Dr. Anderson states that the sheep of this Island all have broad tails, like those of Africa; that they have a close, thick coat of short hair, very smooth and thick, like the coat of a well-dressed horse, but the hair stiffer, and thicker set on the skin, and the color a fine nut brown: that all the sheep on this island are of this kind.

CAPE OF GOOD HOPE.

"The native sheep of this region are of the broad-tailed breed. They are of every variety of color, black, brown, bay, but mostly spotted: their necks are small, their ears long and pendulous. They are covered with strong, frizzled hair, of which little use is made, except for cushions and mattrasses."—(Barrow.) Since this colony has been ceded to England, Merinos have been successfully introduced into it, and much good wool is now sent from thence to England.

ANGOLA,

Is situated on the south-western coast of Africa. It possesses a singular kind of sheep, which is thus described in the "Animal Kingdom:" It is called the Zenu. Its legs are long and slender, but arms and shanks are muscular and strong. There is a slight elevation at the withers, the chest is narrow and flat, and falling in between the arms; the false ribs project, and give to the carcass a strong resemblance to the Zebu. The fat is most singularly disposed. It is taken from the tail or rump, and is distributed

over three parts of the animal. A small portion of it is spread over the posterior part of the loin, and the commencement of the haunch. A more decided accumulation is found on the poll, and precisely of the semi-fluid character, which the fat assumes in the tail, or the rump of other Eastern sheep. This mass commences from the base of the ears, and extends backwards, in the form of a rounded projection, half way down the neck. Under the jaw, extending downward, and covering the larynx, is a third collection of soft fatty matter."

This variety of the sheep is found in no other part of the world.

GUINEA.

In this country are two kinds of sheep: "One of the kinds is small, and, in some respects, resembles European sheep. Their coat is hairy, like that of the goat, with a sort of mane, like the lion, on the neck, and so on the rump, and a bunch at the end of the tail.

"The most numerous breed in Guinea, is of a different character. The male is horned, the horns generally forming a semi-circle, with the points forward: the females are hornless; the ears are pendulous, and black spots are distributed on the sides of the head and neck, as well as body." —(Animal Kingdom.)

NORTHERN AFRICA, OR BARBARY.

"Marcus Columeda, (uncle of L. J. M. Columeda, who wrote an excellent treatise on husbandry,) a rich colonist who lived at Cadiz during the reign of the Emperor Claudius, and made Agriculture his pleasure and pursuit, was struck with the beauty of the wild rams that were brought from Africa, to be exhibited at the Roman games. He coupled those with Taventian ewes, which were celebrated for the softness of their wool, and procured, by this means, a race whose fleeces resembled that of their dam in softness, and that of their sire in the color and fineness of the wool." This circumstance shows that north-western Africa, in those days, possessed a breed of very fine wooled sheep; and that country, at this time, possesses a superior breed of sheep, which are indigenous to it, and whose wool is glossy and nearly as soft and fine as that of the Merino;

but it is straight, that is, it wants the spiral curve; and this deficiency renders its wool less valuable than that of the Merino.

SECTION IV.

EUROPEAN SHEEP.

ICELAND SHEEP.

The sheep of Iceland are of two kinds: The first termed the native, or original breed, is much like the Argali. They are of small size, and their color is from dun to almost black. The second kind is larger, the fleece white, and is supposed to have originated from more southern climes. The fleece of these breeds consists of two coats; one of extremely coarse hair, which hardly merits the name of wool, and another beneath it of a softer and finer quality, but so mixed as to make it difficult to separate them. This

fleece is very thick and impervious to cold and wet; but is of inferior value for manufacturing, and is used for horse collars, and some wool is exported to other countries for this use. These sheep have four and some of them five horns, of considerable size, and are always spiral. They are very hardy, and are never stabled, but seek their food by following the horses, and eating the grass and moss which they uncover—their own feet being too feeble to dig in the snow. Their shelter is the jutting rock or mountain's caverns. At the approach of a storm, they run violently towards the sea, and are sometimes precipitated into it by each other. If they are surprised by a snow storm before they can reach the coast, they then turn their heads towards each other, and patiently expect under their fleecy covering, the aid of their owners, who do not fail to search for and relieve them as soon as possible. They distinguish the spot on which they are buried by an exhalation which arises from their breath. If this aid is so long delayed as to subject the sheep to the danger of starving, they reciprocally feed upon each other's fleeces. This race is extended to the Danish Islands, where it is equally neglected through the winter, and their instincts improve by this neglect. They keep each other warm by pressing closely together when the bleak winds pinch them, and those from the centre relieve in turn those which, in the outer part of the circle, are exposed to the severity of the blast. Thus, necessity sharpens the inventions of beasts as well as those of men."—(Livingston.)

RUSSIAN SHEEP.

The following not very particular account of Russian Sheep is supplied by Mr. Youatt:

"Far more attention continues to be made to the breeding of sheep than of cattle, through the whole of this immense Empire. All the wandering tribes possess a great number of sheep. Many of the inferior boors and Cossacks have flocks consisting of many hundreds.

"The characters of the sheep differ materially in the various districts. Towards the North, they are small, short-tailed, and bear a coarse and harsh wool. About the river Don, and still more towards the centre, and on the banks of

the Dnieper, and in some districts of the Ukraine, they yield a better wool; and thence the greater part of the material for the inland cloth manufacturies is supplied. In the neighborhood of the Baltic, a still superior breed of sheep is found, and the Dago and Oesel Islands are celebrated for their wool. The half cloths that are manufactured from it, have often as fine and close a substance as that which is imported from Great Britain.

"The finest of the Russian wools are exported from Odessa, on the Black Sea. It is the produce of all the neighboring provinces, but principally of the Crimea. There is no district of the Empire so fitted by nature for the pasturage of sheep. There are three kinds of sheep in the Crimea, and in Taurida. The common breed is white, or black, or grey, with very coarse wool, and a long tail covered with fat. They are kept in exceedingly large flocks. A rich Tartar will frequently possess 50,000 sheep. The grey sheep produce the grey lamb skins, 30,000 of which are exported every year. Fifty or sixty thousand black lambs' skins, which are also much valued, are exported from the Crimea.

"The mountain sheep are smaller than those of the plains. Their wool is beautifully fine, and, even before the improvement which many of the flocks have undergone, used to find its way to the French manufacturies.—The Crimea was scarcely in the possession of Russia, ere many attempts were made to improve the sheep, naturally so valuable. Merinos were, in process of time, introduced here, as in every part of Europe. A few have been cultivated as a pure flock; more have been employed in improving the native breeds; and the consequence is, that the wool exported from Odessa is increasing in quantity and value every year."

EUROPEAN TURKEY AND GREECE.

"The sheep of these countries do not correspond with their ancient form. They are of small size, and indifferent form. They are often of the flat-tailed variety, exhibiting, in this respect, an affinity with the sheep of Asia Minor and the adjacent countries. In the Islands of the Archipelago, few sheep are reared. Some of them are of the Syrian breed, having long flat tails. But there is a peculiar

race existing in some of the Islands, which have several horns, and long hairy wool."—(W. C. Spooner.)

SWITZERLAND.

There are several varieties of the native sheep of this country. The valley sheep are much like the English long wooled breeds. The mountain breeds have shorter and finer wool than the valley breeds, and have been much improved by crosses with the Merino.

HOLLAND AND BELGIUM.

The original breeds of these two countries are mostly long wooled, and are very similar to the English lowland breeds.

CRETAN, OR WALLACHIAN SHEEP.

The Cretan sheep is said to be common in Wallachia, Hungary, Austria, and the Western parts of Asia; but along the Danube is its principal habitat. It is of the long-tail-

ed variety, though without any tendency to a fatty enlargement of the tail. On the face, the hair is short and of a rusty black. On the body, the wool is white and long, perfectly straight, (that is, has no spiral curve,) thick set, and wiry, and is much mixed with hair. Its horns are very large, adding greatly to its striking and picturesque appearance. The horns of the male rise almost perpendicularly from the skull, making a series of spiral curves in their ascent, while in the female they diverge, taking a lateral direction, and then ascending. But there is probably some little variation in the horns of this breed, as in those of most other breeds.

This breed of sheep is vicious and unruly, and of great strength. In certain characteristics it has considerable resemblance to one variety of the Persian sheep, and to the Black-faced Heath breed of Scotland.

AUSTRIAN AND HUNGARIAN

Sheep were formerly altogether coarse wooled; but in the year 1775, the Empress Maria Theresa imported Merinos from Spain, and placed them at Mercopoil, in Hungary, where an agricultural school was established. Other importations of Spanish sheep were afterwards made into the Austrian dominions. Within the last thirty years, great improvements have been made in the sheep of those countries, and much of their wool is nearly or quite equal to the best Saxon.

SWEDISH SHEEP.

The native sheep of Sweden, Denmark, Norway and Northern Russia, are an inferior race in all respects, and nearly correspond in their appearance and qualities. Their head is long and thin; the neck arched; the eye small; the countenance mild; the legs and tail without wool; the wool coarse, but useful for inferior manufactures.

The Swedes are stated to have been the first nation in Europe which imported Merino sheep, with a view to naturalize them; though the most northern part of this country is burnt up by a sun which never sets, and the whole is desolated by a winter of six months, during which the ground is covered with uninterrupted snow. Notwithstanding this,

Mr. Alstroemer imported a flock of Merino sheep into Sweden, in 1723; and being successful in the management of them, the government instituted a school of shepherds in 1739, and granted bounties to the sellers of good and fine wool; and these bounties were continued until 1792. At present, Sweden raises fine wool sufficient for its own consumption.

Their system of management is as follows: "Both the native and imported sheep, after having been pastured during the day, are usually housed at night at all seasons, on account of the great number of wolves. The peasantry and small farmers have these houses too confined. The more attentive cultivators lodge their sheep in large airy buildings, the windows of which are always open, and the doors are made of hurdles. The native Swedish flocks are kept in these buildings when the weather is unusually severe; the Merinos are housed during the six winter months; but scarcely any inclemency of the weather will prevent the whole flock being driven out daily, at least a few minutes, in order to breathe the fresh air, while the sheep house is cleaned. The Merinos are seldom used for breeding until they are two and a half years old, and are fattened for the butcher at seven.—(Messrs. Youatt & Parry.)

DENMARK.

The Danes first carried Merino sheep from Sweden in 1789; and in 1797, the government of Denmark imported three hundred sheep from Spain, from the celebrated breeds of Escurial, Paular, Gaudaloupe, Infantado, Montarco, and Negretti. They were placed at Esserum, eight leagues from Copenhagen. The Danes have been successful in the management of these sheep, and their crosses with the native sheep, and Denmark now exports nearly a million pounds of wool, one half of which is represented to be of the finest quality of Merino.

PRUSSIA.

The ancient breeds of this country had coarse wool, valued at from 10 to 15 cents per lb. The first step made towards their improvement, was made by Mr. Fink, an enterprising agriculturist. His first effort was to obtain the na-

tive Silesian breed of the districts of Namslau and Oels, which had long been celebrated for the comparative fineness of their wool. Some improvement was effected; but not being fully satisfied with those sheep, in 1768 he obtained Merinos from Saxony; and in 1779, he imported three rams and twenty ewes directly from Spain. His success, and the great improvement made by crossing these sheep with his native flocks, attracted the attention of the Prussian government. In 1780, the King of Prussia imported 100 rams and 200 ewes from Spain. Afterwards he commissioned Mr. Fink to import from Spain a flock of one thousand of the choicest Merinos; and a school was established to instruct in their management, at the head of which Mr. Fink was placed.—(Lasteyrie.)

At the present day, many of the Prussian flocks rival in fineness the purest Saxon, and command an equal price for their fleeces; and the manner in which they are managed is much the same as in Saxony—the climate of the two countries being very similar.

PRUSSIAN SILESIA.

The native sheep are small, with long necks and legs, and the head, belly and legs devoid of wool. In the districts of Namslau and Oels, was a superior breed, so far as the wool was concerned. Merinos were introduced into this province by the Count Von Maguis, soon after their importation into Prussia. The management of them in Silesia is very similar to that of Saxony; only that more intelligence and care has been bestowed upon them, and, consequently, many of their flocks excel those of Saxony.—Men of the greatest experience are employed, who make it a business to go from farm to farm, to examine sheep, and to select the best animals of each sex for breeders. After about forty years of careful experiment and practice, Silesia has obtained a breed of sheep whose fleeces are of extremely even fineness, being equally fine on the neck, back, and sides.

At a meeting of the New York Farmer's Club, Mr. Heischman communicated much valuable information as to the management of these sheep, and exhibited six specimens of wool from the most celebrated flocks of Prussian Silesia, where the finest and best wool in all Europe is

grown, and one was from a ram that was sold for $4,000. In the fine or perfect staple, there are about 80 spiral curves to the inch, and the fleece is about one and a half inches thick. It took many years to obtain this fineness of wool, or the perfect staple. The number of fibres of wool to a square inch of a German coarse-wooled sheep, is 5,500; in a mixture of the Merino with this breed of the tenth generation, about 18,000; in the twentieth generation, the fine wool predominates—the color is darker, and there is plenty of yolk; in this generation there are 27,000 fibres to the square inch; and in the thirtieth generation, from 40,000 to 48,000 fibres. Folds in the skin were found on these fine-wooled animals.

To obtain this extra quality of wool, the sheep are kept at a nearly uniform temperature—60 of Fahrenheit, or below, and are never allowed to be much exposed to rain or dust—both of which are injurious to the fleece—nor to midday heat of the summer's sun, and are regularly supplied with water and varieties of food.

SAXON SHEEP.

The original sheep of Saxony consisted of two varieties: one bearing a wool of some value, and the other yielding a fleece applicable only to the coarsest manufactures. Both of these breeds have been extensively crossed with the Merino, and very many mixed flocks now exhibit fleeces little inferior to those of the purest Escurial sheep.

In the year 1765, Augustus Frederick, Elector of Saxony, introduced Merino sheep into his dominions by a grant from the King of Spain. One hundred and nineteen ewes and one hundred and ten rams were selected, principally from the Escurial flocks, then the King's private property, under the care and management of the monks of the Escurial monastry, and which were considered to be the finest sheep in the kingdom. These sheep were shipped at Cadiz, in the month of May, 1765, and all arrived safe in Saxony, except eight which died on their passage. They were accompanied by two Spanish shepherds, who remained with and took care of the flock till the middle of the next year. During this time they instructed Saxon shepherds in the care and management of sheep.

In order to render these sheep beneficial to the country, the Elector appointed commissioners to superintend the sheep establishments which were formed at Lohmen, Rennersdorf, and Stolpen.

At the end of ten years they were found to have had all possible success—the sheep of pure blood preserving every valuable quality. In the year 1777, the Elector procured another importation of one hundred and ten Merinos from Spain, which were selected from the best flocks of Leon, Escurial, Cavagnon, Negretti, Montareo, and Sorian.—These sheep exceeded the first importation in beauty of form, and quality of wool. The cost of them was forty rix dollars per head.

Nevertheless, the pure Escurial breed—the kind which Mr. H. D. Grove imported from Saxony into America, in the years 1827 and 1828—are the most valued, and are the kind which are generally called Saxon sheep in the United States. The Escurial breed have longer legs, necks, and heads than some other breeds of Merinos, with rather narrow but deep chests; but they are generally well proportioned, and are good milkers. Specimens may be selected from the best flocks which rival in symmetry of form any other breed whatever. Compared with other breeds of Merinos, they are small, and their fleeces are light. One cause of their lightness is, that they have less yolk in their wool than most other breeds of Merinos, and therefore they do not bear exposure to cold rainy weather so well as some other breeds. The weight of the ewe fleeces is from 1½ to 2½ lbs., and on wethers and rams, from 2½ to 4 lbs. The finest and purest flocks yield heavier fleeces than those which are crossed with coarse-wooled sheep.

According to Mr. Carr, (a large sheep-owner in Germany,) the Infantado Merinos are also cultivated in their purity in Saxony, and are described by him as having a shorter body than the other, (Escurials) and the head and neck comparatively short and broad; the nose (*of the ewes*) short, and somewhat turned up, and the body round. The wool is often matted upon the neck, back, and thighs, and grows upon the head to the eyes, and upon the legs to the very feet. The yolk is almost pitchy, so as to render the washing difficult. The average weight of their fleeces is, on

ewes, from 2½ to 3¼ lbs.; on rams and wethers, from 4 to 6 lbs.

Mr. W. C. Spooner observes: "Many attempts have been made to amalgamate these breeds, but without success; the advantages of each one can only be retained by preserving them pure."

This statement agrees with the experience of those in the United States, who have crossed the Escurial Saxon with other breeds of Merinos; a tender breed has generally been the result of the cross.

Also some of the breeders of Merino sheep in Spain have latterly sent to Saxony for Escurial rams, and crossed with them upon their flocks, and with the same results. The size of their sheep was lessened, and the constitution of their flocks was injured.—(See A. Agriculturist for 1846, pa. 15.) Nevertheless, crosses of the Escurial breed with coarse-wooled sheep of British origin, produce hardy animals—hardier than the pure Escurials.

Mr. Carr observes: "These sheep cannot thrive in a damp climate, and it is quite necessary that they should have a wide range of dry and hilly pasture, of short and not over nutritious herbage. If allowed to feed on swampy or marshy ground, even once or twice in autumn, they are sure to die of liver complaint (*i. e., the rot,*) in the following spring. If they are permitted to eat wet grass, or are frequently exposed to rain, they disappear by hundreds with consumption. In these countries it is found that the higher bred the sheep is, especially the Escurial, the more tender. They are always housed at night, even in summer, except in the very finest weather, when they are folded in the distant fallows, but never taken to pasture till the dew is off the grass. In the winter they are kept within doors altogether, and are fed with a small quantity of sound hay, and every variety of straw which has not suffered from wet, and which is varied at each feed. They pick it over carefully, eating the finer parts, and any corn which may have been left by the threshers. Abundance of good water, and rock salt in their cribs, are indispensables."

Dr. Bright remarks: "Baron Geisler was, some years since, one of the most successful breeders of Merino sheep, and for many years he has exercised unwearied assiduity by crossing and re-crossing, so that by keeping the most

accurate registers of the pedigree of each sheep, he has been enabled to proceed with a mathematical precision in the regular and progressive improvement of the whole stock. Out of seventeen thousand sheep, comprising his flock, there is not one whose whole family he cannot trace by reference to his books." He considers purity of blood the first requisite towards perfection in the fleece. He adopts pretty nearly the same system mentioned by Mr. Carr, and keeps the old separate from each other. And among his regulations we find the following: "For fourteen days before the coupling season, the rams should be daily fed with oats; and this food should be continued not only during that particular period, but for fourteen days afterward; and one ram will thus be sufficient for eight ewes, provided great care and attention is paid to him in every other respect during the whole season.

"During the lambing period, a shepherd should be constantly, day and night, in the cote, in order that he may place the lamb, as soon as it is cleaned, together with its mother, in a separate pen which has been before prepared. The ewes which have lambed, should, during a week, be driven neither to water nor to pasture; but low troughs of water, for this purpose, are to be introduced into each partition, in order that they may easily and at all times quench their thirst.

"It is also very useful to put a small quantity of barley-meal into the water; for, by this means, the quality of the ewes' milk is much increased. When the lambs are so strong that they can eat, they are to be separated by degrees from their mothers, and fed with the best and finest oats, being suffered, at first, to go to them only three times a day—early in the morning, at mid-day, and in the evening, and so continue till they can travel to pasture, and fully satisfy themselves."

The following observations of Mr. H. D. Grove, will further illustrate their management: "The Germans keep their sheep under comfortable shelter during the winter.—By this means, they do not require, in the first place, so much provender; secondly, the tip ends of the wool do not get weather-beaten, which is an injury; thirdly, a great quantity of manure is saved. They hurdle their sheep during summer, for the purpose of manuring the land, which

makes it more productive. They raise large quantities of roots, such as ruta baga, mangel wurtrel, carrots, turnips, &c., to feed out during the winter. Combined with straw, it is considered an economical mode of wintering sheep.—Moreover, they enrich their land by this course of management, which enables them to keep still more sheep and cattle, and raise more grain. Many farmers in that country keep their sheep from nine to ten months of the year in the yard: some, only part of their flock, and others their whole flock. For this purpose, they sow red and white clover, lucerne, and esparette, which is mowed and fed to them in racks three times a day, and in weather, a foddering of straw. It follows, as a matter of course, that the stables are well littered with straw every day. It is considered that an acre thus managed, will maintain double the number of sheep or cattle that it would to turn them out to pick for themselves. By this course of management, they are enabled to keep large numbers of sheep without infringing much on their grain growing, and are able to come in competition with the wool-growers of other countries. As there are no fences in that country, the sheep are attended by dogs. One shepherd, with his dog, will manage from five to eight hundred, in the summer, all in one flock."

From these statements, it is very evident that in Saxony, Merino sheep are subjected to great confinement in stalls and yards during winter, and in summer also, on many farms. And though, upon the authority of Messrs. Youatt & Lasteyrie, Merinos are generally suffered to run out in yards some part of every day in winter, except when the weather is severe, and are occasionally led into fields of grass, or other green food, to obtain some portion of their sustenance, when the ground is bare or has little snow upon it; yet, as the snows in those northern climes are generally deep in the winter, it is very evident that Merinos cannot, in those countries, obtain that exercise which is natural to them, and which is necessary to form vigorous, healthy animals. Moreover, the climate of those northern countries is very moist in summer, compared with that of Spain or the United States. Such a climate has a strong tendency to produce too succulent grasses, and rot in consequence. From this cause it is estimated that in Great Britain at least one

million of the native sheep die annually from rot, on an average, and in some seasons, more than twice that number. Hence, we may conclude, that though the pure Escurial is a healthy breed in the dry climate of the United States, Mr. Carr's statement as to their morbid tendency in Saxony, though rather highly colored, is very nearly correct.

Different modes of washing sheep before shearing are used in Saxony, but always with special care that the fleeces are thoroughly cleansed.

The shearing is conducted in the most skilful manner. each shearer, generally, being limited as to the number of fleeces he is to clip per day, in order to ensure a greater degree of care in his work, and thus prevent their skins from being injured by the shears.

"After the shearing season is over, the wool is bought of the small proprietors by agents of wool merchants, and transported to Hamburg, Breslau, and Leipsic, where it is sorted and re-sold for exportation. The large proprietors of pure flocks effect their sales by samples, subject to sorting, which is an art well understood in Germany. The fleeces of the same quality are opened and spread flat against each other, when packed, and each bale is made to contain from 400 to 500 lbs.

At the annual fairs of Leipsic, millions of pounds of wool are often sold in a single day; and an immense amount of wool is exported from Germany. England receives annually between twenty and thirty millions lbs., and France several millions.

"Thus, the greatest care is taken in the management of their flocks in Saxony, and in the selection of the progeny intended for breeding, so as not only to preserve, but also to improve the quality of the wool: the improvement of the carcass is altogether a secondary matter, the fleece being the primary consideration. So successful have been these endeavors, that the wool of Saxony stands unrivalled for the manufacture of the finest cloths.

"To such an extent have these improvements of the Escurial breeds been carried in Saxony, that though superior rams are becoming more numerous every year, yet some distinguished rams have, within a few years past, been sold at from 100 to nearly 300 pounds sterling each."—(W. C. Spooner.)

FRANCE.

The indigenous breeds of France are varied as the face of the country, and have generally coarse and rather light fleeces. Formerly the sheep of Roussillon and Berry were most esteemed for their wool; but for mutton, those of Brittany, though extremely small, were in the highest estimation.

"At the present time, probably none surpass, form and fleece combined, those of Arles, which embraces the districts of Crau, Camarque, and Le plain du Bourg. About 250,000 sheep are kept in these districts. All these sheep are migratory, being driven from the plains of Arles, in the spring of the year, towards the Alps, which divide Provence and Dauphine from Italy, and are driven back in November. These migrations have continued from time immemorial; and laws have been enacted, limiting the road for their passage to 36 feet in breadth. The flocks vary in number from 10,000 to 40,000; and to every 1,000 sheep, three shepherds are allowed, each of whom has his dog.—The sheep are led by goats, which are trained for the purpose, and have bells round their necks. The discipline in which these animals are kept, and the intelligence which they display, is very great. They halt or proceed, at the direction of the shepherd. They come to the centre, at the close of each day's march, and there wait in the morning for the proper order, when they repair to their station at the head of the troop, with the greatest regularity. If they come to a stream, they halt until the word of command is given; and then they plunge immediately into the water, and are followed by the rest of the flock. The journey usually lasts from twenty to thirty days. When they arrive at the mountains, each shepherd has his appointed boundary marked out; and the proprietors of the land are usually paid about twenty sous per sheep for their pasture during the summer. The shepherds sleep with their flock in the open air, and live almost entirely upon bread and goat's milk."—(Annals of French Agriculture.)

Spanish sheep were imported into France at an early period. But the first person who paid any systematic attention to the improvement of the wools of France, by means of Merino sheep and their crosses, was M. Daubenton, who, in 1776, obtained part of 200 Merinos, which

were imported by Mons. Trudain, intendant of finances.

In 1786, 376 Merino sheep were presented by the King of Spain to Louis XVI. Sixty of them died on their passage to France. The remainder were placed at Ranbouillet, in the neighborhood of Paris, where was an agricultural establishment expressly devoted to the improvement of domesticated animals.

"This royal present having been chosen for their superior form and fleece, from various Spanish flocks, differed much in size and shape; but these characteristic differences have been melted into each other by crossing them, and a race has been produced which differs from any of the original breeds, but is equal to the best of them in form and fineness of their wool, and superior in weight of carcass and fleece, and with less jar (or hair) than the original breeds."

In order to perfect the undertaking, a publication was drawn up by M. Gilbert, under the patronage of Government. A practical school for shepherds was instituted at Rambouillet, and two other depots were established—one at Pompadour, and another at Perpignau.

Dr. Parry considers that the improvements in the Spanish sheep at Rambouillet, have been accomplished in the four following ways:

1st—By choosing, for breeding, the finest and best wooled rams and ewes.

2d—By never allowing them to propagate till they have attained their full growth, which, at the earliest, is not till nearly three years of age.

3d—By separating the weak from the strong.

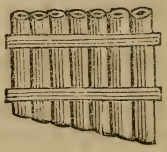
4th—By giving them good food, and plenty of air and exercise.

A public sale of part of the flock is made at Rambouillet, in the month of May, annually. "At the sale of Merinos, in 1834, the average price of the rams was 328 francs, and the greatest sum given for the best, 510 francs. The average price of the ewes had sunk to 108 francs, and the highest price of the best was only 210 francs."—(Youatt.)

This flock was visited by Mr. Trimmer, an English writer, in the year 1827. His remarks relative to them are,—"These sheep, in size, are certainly the largest pure Merinos I have ever seen. The wool is of various qualities, (*the natural consequence of a mixture of breeds,*) many sheep

carrying very fine fleeces, others middling, and some rather indifferent: but the whole is much improved from the original Spanish Merinos. Individuals are found in this flock with dewlaps down to the knees, and folds of skin on the neck, like frills, covering nearly the head. Several of these animals possess pelts of such looseness and size, that one skin would nearly hold the carcasses of two such sheep. The rams' fleeces were stated at 14 lbs., and the ewes' fleeces at 10 lbs. in the grease. By thorough cleansing, they would be reduced half, thus giving 7 and 5 lbs. each."

N. B. The sheep which were brought to Rambouillet in 1786, from Spain, were selected from six different cavanas or breeds, viz: the Negretti, the Paular, and the Escurial, and also from the cavanas of the Marquis de Iranda, of the Marquis de Perales, and of the Count de San Rafæl. These different breeds differ very widely in size, form, and qualities of their wool; and this mixture was made with very little regard to what are now well established principles of breeding.



THE SHEPHERD'S PIPES.

SECTION V.

ITALIAN AND SPANISH SHEEP.

ITALY,

"Once so renowned for its sheep, can now boast little of this production of her bounteous clime. The Roman, whose dress was woolen, cultivated, in an especial degree, the fineness of the fleece; and it was not until the days of the Empire, that the silk and cotton of the East began to supersede the ancient raiment of the Roman people.

The finest wools of ancient Italy were produced in Apulia and Calabria, being the Eastern parts of the present kingdom of Naples. Pliny informs us that the best wool was that of Apulia, on the Adriatic Sea: and the next best was further to the South, on the Gulf of Tarentum; and the Milesian, or Asiatic sheep, carried the third prize; and that, for whiteness, there was none better than that produced on the Po.

The care of the Romans in causing the wool to grow fine, exceeded, in the case of certain breeds, any thing that is now attempted. The sheep were kept in houses, and continually clothed, so that the filaments of the wool might become delicate; the skin was smeared with fine oil, and moistened with wine; the fleece was combed, so that the wool might not become matted, and the whole was washed several times in the year."—(W. C. Spooner.)

They also improved their sheep, by obtaining from other countries the best kinds. "Strabo assures us that in his day, (in the reign of the Emperor Tiberius,) they gave more than one hundred and fifty pounds sterling (or about 750 dollars,) for a ram of the breed of the Coraxi, a Pontic nation believed to have the finest fleece in the world."—(Blacklock.)

"The excessive care which the Romans took of their sheep, proved rather injurious to them, rendering them tender, and more disposed to disease. With the fall of the Empire, these choice breeds were neglected and lost. And though there are a few fine-wooled sheep in Italy, they are neglected, and badly formed. This is also the case with regard to Sicily, which was once celebrated for the fine-

ness of its wool, and still retains some fine-wooled sheep, which migrate like those of Spain, but are inferior to them in the quality of their wool."

In 1789, Arthur Young traveled through the northern parts of Italy, and found only very coarse-wooled sheep.

In 1793, Prenn Maserino imported into Piedmont 150 ewes from the best flocks of Segovia. So that, at the present time, we may suppose that the wools of some parts of Italy are, in some measure, improved.

SPAIN.

In Spain, there are two kinds of sheep, which differ widely from each other, both of which have long existed in that country. Those called the Choaroes, are much longer, larger, and higher upon the legs, than the Merinos. Their heads are smaller, and deprived of wool: their wool is from five to eight inches long, and of inferior value. This race extends through all Spain, even into those provinces in which the Merino is most perfect, and is the favorite of the peasant and small proprietor.

The other kind is the Merino, or fine-wooled sheep. The word Merino, in the Spanish language, is an adjective, and signifies wandering, roving about, and seems to be derived from the Spanish verb, *menear*, which signifies to wander, or rove about.

Pure unmixed Merino sheep, are distinguished from the coarse-wooled breed, by their males having large spiral horns, while the females seldom have any: by their faces and noses being entirely free from black or smutty spots: by their frequently having a large dewlap hanging from their throat: in having wool on their foreheads and cheeks, and frequently upon their legs to the hoof: their wool is fine and soft, and lengthwise assumes a spiral form, and generally contains much yolk. Their skins are of a fine carnation red: and they are not subject to an annual decidence of wool, like coarse-wooled sheep: their fleeces may be kept on for several years, if desired; and their longevity far exceeds that of any of the coarse-wooled breeds. There are, also, in Spain, several intermediate breeds, among which are the Pyrenean races, with remarkably fine wool, and somewhat resembling the South Downs of England. In general they are polled; but some have horns

which turn behind the ears, and in the males, project forward half a circle. Their legs are short, and are white or reddish. Their faces are speckled, and, on some kinds, a small tuft of wool grows upon their foreheads. Their color varies from white to a reddish color, and in some instances they are black.

There is, also, a race of coarse-wooled breeds in Biscay, which have from four to six horns.

The origin of the Merino breed, like that of most other kinds, is somewhat uncertain. Strabo, an ancient writer, who wrote in the first century, in speaking of the beautiful woolen cloths which were worn by the Romans, says that the wool was brought from Truditania, in Spain, which is a part of Spain bordering upon the Mediterranean Sea, and is intersected by the Gaudalquiver river.

Dr. Parry, in investigating this subject, states many facts which go to show that the present Merinos are derived from the ancient Tarentine sheep of Apulia, in Italy, and that they may have been translated from Italy into Spain, during the time in which the Romans possessed Spain.—They first obtained possession of the south part of Spain 201 years before Christ, and continued masters of it 600 years: during which time, they fully established their language and customs in that country, and probably their best breeds of animals: even the hogs of Spain and Naples, and of the south parts of France, are black, as in ancient times. Black is the color which Columeda approved as being the best for hogs.

Varro, Columeda, Pliny, Martial, Palladius, Petronius, and Calpurnius Siculus agree in stating that the sheep which produced the finest wool in the Roman territories, were those of Apulia and Calabria. A pound avoirdupois of this wool is stated to have cost £1, 1s. 7d. sterling, or about $4,80, United States currency.

And even in those days, Spain was not without breeds, which were memorable for bearing fleeces naturally of different tints. Columeda speaks of them as bearing blackish, or tawny-colored fleeces. Pliny, who lived somewhat after him, adds, that they were occasionally of a reddish or gold color. And Martial compares them with the golden, or red hair of women.

Dr Parry observes, that the perfection of both the pres-

ent Spanish Merino, and the ancient Italian race, seem to have consisted in certain qualities, which were common to both. "The favorite ewe of ancient Italy, was to have a large carcass, capacious belly, short legs: and the ram, a wide breast, shoulders, and buttocks, a long and deep body, and a broad and long tail. The fleece was to be thick, soft, and deep, especially about the neck and shoulders; the ears and forehead of the ram were to be involved in wool; and no individual, of either sex, was tolerated, of which the wool did not clothe the whole body. Also, it is a memorable circumstance, that the rams had horns, and the ewes had none: still, however, the polled rams were most preferred. And now, at the present time, there is not, as far as he had ascertained, any short-wooled breeds of sheep in Europe, except the Merino, and those of Italy, of which the males have horns, and the ewes have none."

He also mentions several customs in the management of sheep, in ancient Italy, which are still used in Spain:

1. The sheep of Apulia and Calabria had their summer and winter quarters in the same manner as the Merinos of Spain now have. And Sicily, to this day, possesses a breed of fine-wooled sheep, which migrate like those of Spain; but are inferior to them in the quality of their wool.

2. It was the practice, in Italy, to give salt to their sheep, as to the Merinos in Spain.

3. It is stated by Tebullus, that it was the custom among the Romans, to have their flocks led by goats. And the same custom prevails in Spain to this day.

4. It was the practice, among the Romans, to kill off a considerable number of lambs, shortly after they were dropped, in the same manner as is done among the Spaniards of the present day; and from precisely the same motives, that as the wool was the valuable produce of the flock, each lamb might acquire more strength by having two nurses.

5. Varro and Columeda state, that the Romans excluded rams, with spotted mouths or tongues, from breeding, in order to avoid variegated fleeces in their offspring. And Lasteyrie affirms that the same custom is adhered to by the modern Merino shepherds.

6. The flocks of Italy were followed and guarded by dogs, as those of Spain are at this day; and the qualities, uses,

and treatment of these dogs are minutely described by Varro and Columeda.

7. Flocks of sheep were penned with woven hurdles by the Romans, in the same manner as now used in Spain.—(Horace Epodes, ii–45th.)

8. The Merino Mayoral corresponds with the *magister puoris* of the Romans. This agreement of the ancient fine-wooled sheep of Italy and those of Spain, in so many important particulars of form, fleece, constitution, and general treatment, goes for to show that the Merino race was derived from Italy; and if, at this time, it differs in any respect from the fine-wooled sheep of Italy, this difference may have been produced by a difference of soil and climate.

Much has been said of the crosses which were made between the African sheep, and the fine-wooled Tarentian sheep of Italy, by Marcus Columella, a Spaniard of distinction, who removed to Rome about 1800 years ago, and who, as also his nephew, L. J. M. Columella, made aggriculture the study and business of their lives. And it has been conjectured that the Merino race may have been formed by these crosses. But the final result of these crosses is entirely unknown.

Don Pedro IV, King of Spain in the 14th century, and also Cardinal Ximenes in the 16th century, imported considerable numbers of sheep from Africa, either for the purpose of improving the sheep of Spain by crossing, or to form flocks of a different kind.

Barbary possesses sheep whose wool is glossy and fine: but it is straight, that is, it wants the spiral curve of the Merino. And, therefore, it is not probable that the character of the Merino fleece was changed by those importations from Barbary. For there was one flock which was called the Muros or Moorish flock, which was purchased by the family of Acquierres from the Moors, at the time when they were expelled from Spain, which was A. D., 1610, and which flock they had doubtless long possessed. They had been in possession of the south part of Spain 900 years.—And this flock did not differ from other Merinos of Spain; and if we make proper allowance for the pertinacity with which people of those countries adhere to ancient customs, this circumstance will be considered as strong evidence of the great antiquity of the Merino sheep.

The Moors of Spain were distinguished for their luxurious customs, and a fine and expensive wardrobe was regarded as an object of essential importance. Hence, in the 13th century, Spain became renowned for her woolen manufacturies; and Seville alone contained 16,000 looms. And the manufacture of the finest fabrics, an art scarcely known in the rest of Europe, was the source of much national wealth, as large quantities were exported to various parts of Europe, as well as Africa. But after the expulsion of the Moors, by Ferdinand V, and Philip III, the 16,000 looms of Seville dwindled down to 60, these manufactures became nearly extinct, and their fine wools were mostly exported.

The perpetuation of the Merino race of sheep in all its purity, amidst the convulsions which changed the political aspect of Spain from time to time, may be explained by the fact, that invading armies, in those times, fought to obtain possession of the country, and to enjoy its productions, and not to utterly destroy them. Moreover, flocks of sheep could be removed to mountains, distant from scenes of contest, and thus be saved with less difficulty than most other property.

In Spain, there are two classes of sheep: the estantes, or stationary sheep, the most of which are coarse-wooled; and the transhumantes, or migratory flocks.

But there are, (says Burgoanne,) both in Estramadura, and also in the neighborhood of Segovia, flocks which never leave those districts, and whose wool is as beautiful as those which migrate. And the proprietors of these stationary flocks have privileges which greatly resemble those of the Mesta. The stationary flocks of fine-wooled sheep are most numerous in the central parts of Spain, where the pastures are less apt to be scorched by the heat of summer, as in Segovia and the mountain ranges north of Madrid.

The transhumantes flocks migrate annually from the southern to the northern parts of Spain, and back again.—These periodical journies are made necessary by the severity of the drouth in Spanish Estramadura, and some other southern parts of Spain, which almost invariably parches the plains, from the close of April till near the first of October, to such a degree as to almost entirely prevent the growth of pasture.—(W. Jarvis.)

The rains commence falling about the autumnal equinox,

and continue, with intermissions of a few days only, until the latter part of March. In a few weeks from their beginning, the plains assume a beautiful verdure, and so continue till the approach of the dry season; and during this time, the thermometer rarely falls below 40 degrees of Fahrenheit. Whilst the plains are thus parched up in summer by drouth, on the mountains and hilly regions they have sufficient rains; and thus, these numerous migratory flocks are supported the entire year on grass.

Hence, doubtless the inhabitants of the south of Spain were, from necessity, ever obliged to drive their flocks northward, in summer, from the plains into the mountains, where the pastures were fresh, in order to keep them alive. And anciently, such migrations were common, as they now are in Asia. Virgil says, in his Georgies, (Book III, 339th line,) "Why should I trace in song the shepherds of Lybia, and their cottages where scatteringly they dwell. Their flocks often graze both day and night; and for a whole month together, and repair into long deserts without any shelter; so wide the plain extends. The African shepherd carries his all with him—his house, his household god, his Amyclæn dog and Cretan quiver."

So that their present migrations are probably only the continuance of an ancient custom upon an enlarged scale. The flocks are doubtless driven farther north than in ancient times.

In process of time, these flocks fell into the hands of wealthy individuals, grandees of Spain, and religious communities, who obtained from the Crown of Spain, about the year 1450, the grant of large privileges, and were associated into a company or corporation, called the Mesta, for the purpose of defending themselves in the enjoyment of these privileges. And they have used these privileges greatly to the injury of the stationary farmers, by engrossing the pastures of the Kingdom to a considerable extent, and also, by causing the cultivators to abandon some of their most fertile lands, and vexing them in the enjoyment of others.

The soil of the districts where the sheep are pastured, both in Estramadura and in Castile, is, in general, dry and stony, and the grass is fine and short.—(Burgoanne.) So that as the temperature in which they are kept is very even, great perfection of wool is obtained.

A considerable part of Estramadura, Castile, Leon, and the neighboring provinces, is appropriated to the maintenance of these flocks; as are also broad green roads, leading from one province to another. And these roads are, at least, two hundred and fifty feet wide. No person, not even a foot passenger, is suffered to travel upon these roads, while the sheep are in motion, unless he belongs to the flocks. And along these roads are extensive resting places, where the sheep are baited.

All questions and difficulties between the shepherds and the occupants of the lands through which the roads pass, are decided by special courts, which perform a kind of circuit, and sit at stated periods to hear and decide.

The country in which the sheep are pastured, both in the northern and southern provinces, is set out into divisions, which are separated from each other by landmarks only, without any kind of fences. Each of these divisions is called a Dehesa, and is of a size capable of maintaining about one thousand sheep. Each proprietor must possess as many of these dehesas, in each province, as will maintain his flock; and, of course, must have a greater number of dehesas in the south, where the lambs are reared, and fewer in the north country, where the sheep arrive after the flock has been sheared and culled.

A flock, in the aggregate, is called a Cavana. This is divided into as many subdivisions as there are thousands belonging to it.

Before the French invasion of Spain, the number of transhumantes sheep, in Spain, were estimated at five millions, and the number of shepherds at least twenty-five thousand.

By the laws of the Mesta, each Cavana must be governed by an officer called a mayor or major. He is the chief shepherd. The chief shepherd must be well skilled in everything which relates to his business. He has absolute control over the shepherds and dogs of which he has charge. For each subdivision of a thousand sheep, five shepherds and four dogs are appointed. Some of these inferior shepherds obtain the office of Rabadan, or Zagal. The duty of this officer is the general superintendence of the flock, and to prescribe and administer medicine to the sheep. At the time of traveling, and when the ewes are yeaning, one or

two extra shepherds are allowed to each thousand sheep.

The salary of the chief shepherd does not exceed two hundred dollars a year, and a horse: that of the first under shepherd of a tribe of a thousand sheep, ten dollars a year: the second, seven: the third, five: the fourth, three: the fifth, (a boy,) two dollars a year. The ratio of each is, two pounds of bread a day, with the privilege of keeping a few goats in the flock for milk. They are also entitled to the skins and carcasses of the culled sheep and lambs: and each shepherd receives from the chief shepherd a "regalito" of three-fourths of a dollar in April, and the same in October. And it is remarkable that these shepherds seldom marry, or change their calling, to which they are strongly attached, and that the families to which they belong, reside entirely in Leon. They are allowed to spend one month with their families annually: at other times, they are entirely exposed to the weather, and sleep in miserable huts made of stakes and branches of trees, or often sleep "under the stars" only. They carry with them every thing relating to their business—the skins of sheep, that serve for their beds; a kettle, a leather bottle, a knapsack, a spoon, a lancet to bleed their sheep, a scissor, a hatchet, a knife, and bread and oil, or suet, on which they subsist, and a few drugs for their sheep.

These articles, with the skins of sheep which die in migrating, are carried by a few beasts of burthen (asses or mules,) which accompany the flock. And these animals also carry the materials for forming the mighty folds (hurdles) for the sheep when traveling.

The dogs are generally black and white, of the size of a wolf, with a large head and thick neck, and are somewhat allied to the mastiff breed. They are allowed two pounds of bread a day, and as much milk and flesh as can be spared. The dogs assist to prevent the mingling of tribes, to keep each tribe upon its own dehesa, to guard stray sheep, and to guard against wolves, which frequently follow at a distance, and migrate with the flocks.

In winter, the Merino flocks cover the plains of Estramadura, Andalusia, and other southern provinces of Spain.

When first the sheep have arrived at their winter quarters, the first thing which the shepherds provide, are the pens, into which the sheep are to be gathered at night, in

order to prevent their straying, and falling into the jaws o. the wolves. These are made with stakes, called, in England, hurdling stakes, and with a net-work, which is made of a soft rushy shrub, called "Esparto," (Lygeum Spartum,) or Spanish brown. Mats, ropes, and baskets are made of it in the southern parts of France and Spain. And it was used by the ancient Romans for similar purposes. This net-work is made with meshes a foot in width, and of the thickness of a finger, and, in England, is called a hurdle, and in the Spanish language, "Rediles." When made, it is fastened around the stakes, which are placed in a circle, or other position, so as to form a pen.

In December, the ewes bring forth their lambs. At this time the shepherds separate the barren ewes from those which are pregnant. As the lambs are dropped, they are led out with their dams to a more comfortable place—giving to those which are dropped last, the best pastures, so that they may grow faster than the others, and be able to migrate northward with them at the same time. And the lambs are allowed to run with the ewes till they wean themselves.

Each proprietor keeps as many sheep as his land will support; and, consequently, the sheep are generally rather low kept. And if all the lambs were reared, their lands would shortly be overstocked, as there is but little sale for these sheep, unless some neighboring cavana has been reduced by mortality. Therefore, as soon as the lambs are dropped, the largest proportion of them, and those principally males, are killed off; and each of those which is preserved, is made to suck two or three ewes: the shepherds say that the wool of an ewe that brings up her lamb without assistance, is reduced in its value. And thus, much the largest proportion of each cavana consists of ewes.—The number of lambs slaughtered is sometimes so great, that they are sold to the neighboring villagers for less than half a franc each. Most of the skins are sent into Portugal, and thence find their way into England, where they are used for the manufacture of gloves.

In the month of March, the shepherds perform four operations upon the lambs, about the same time: they cut off their tails for the sake of cleanliness; they brand them upon the nose with a hot iron, making a permanent mark, to

show to what cavana they belong; they saw off the tips of their horns, to prevent the rams from hurting one another, or the ewes; and lastly, they castrate those lambs which are destined for docile bell-weathers to walk at the head of the flock. This is done by turning the testicles with the fingers twenty times round in the scrotum, twisting the spermatic cords, as a rope; and the parts wither away without danger.

When the herbage is wasted by the increasing heat of the sun, which generally happens in April, or the beginning of May, the flocks commence their journies to the mountains of Leon, Castile, Navarre, Arragon, Segovia, Burgos, and other elevated districts. At this time, the sheep become restless, and manifest a strong desire to be off; and frequently, a tribe will steal a march upon the shepherd, who finds them by following their usual route towards their summer pastures; and there are numerous instances of several hundred sheep straying a hundred leagues, to the very pastures where they fed the preceding year.

The sheep of the transhumantes flocks are composed of two great divisions—the *Leonese*, and the *Sorians*. Those which go to Leon and Castile, pass the Tagus, at Almarez, and direct their course towards Trecasas, Alfaro, and L'Epinar, where they are shorn before they proceed to their summer quarters. The Eastern, or *Sorian* division, pass the Tagus at Talavera, in their journey to Arragon and other eastern provinces, and are shorn at their journey's end.

Each tribe of 1000 sheep is led by six tame weathers, called "Mansos," which wear bells, and are obedient to the voices of the shepherds, who give them small pieces of bread occasionally, to encourage them along. The sheep feed freely in all the wilds and commons through which they pass, and often travel 15 or 20 miles a day, in order to get into the open wilds, where the shepherd walks slowly to let them feed and rest. But they generally travel two or three leagues a day, ever following the shepherd, and ever feeding, or with their heads towards the ground, until they arrive at their journey's end; and make few stops, except to be sheared.

Their whole journey is often more than four hundred miles, which cannot be traveled in much less than forty days. Each subdivision, or tribe, is attended by its own

shepherds and dogs, and is conducted by the shepherds to precisely the same dehesa where it fed the preceding year. And this course is pursued, in order to prevent a variation in the wool. Each sheep is well acquainted with the situation of the dehesa to which it belongs, and will, at the end of the journey, go straight to it without the guidance of the dogs. Here, the flocks graze all the day under the eye of the shepherds. When evening comes on, the sheep are collected together, and soon lie down to rest; and the shepherds and dogs lie on the ground around them. And this they do all the year, either in huts or "under the stars."

The first thing which the shepherds do after the flocks reach their summer pastures, is to give them salt. Each owner allows about two and a half pounds to each sheep yearly, which is consumed by them in about five months, while they are among the mountains at the north. No salt is given to them on their journeys, nor at their winter quarters; for it is a prevailing opinion that it produces abortion, when given to ewes which are forward with young.—The shepherd places a quantity of flat stones about five paces apart, and puts salt on these stones for them. When the sheep are feeding on lime-stone soils, no salt is given to them.

They have found, by experience, in Spain, that water, which is made cold by the melting of hail in summer, is injurious to man or beast, and carefully keep their sheep from drinking such water.

On the last of July, the shepherds put four or five rams with each hundred ewes. After the ewes are tupped, the shepherds collect the rams into a flock by themselves again.

Towards the end of September, the shepherds perform the operation of smearing the sheep with a heavy irony earth, which is common in Spain. It is first mixed with water, and then is smeared upon their backs, from the neck to the rump. This earth is probably used instead of tar, to shed the winter rains from their backs. After this operation is performed, the sheep are led back to the southern provinces of Spain, in the same order in which they came.

The season for sheep-shearing is a time of great festivity and rejoicing, both to the proprietor and the workmen. At this time, the shepherds, shearers, and a multitude of unnecessary attendants, are fed upon the flesh of the culled

sheep. And it seems that the whole of the sheep that are slaughtered or culled, are consumed in this manner. But, in settling the wages of the shearers and washers at the Esquileos, allowance is made for the mutton with which they are fed.

A hundred and twenty-five workmen are necessary to every thousand sheep; and these workmen, including shearers, &c., are divided into classes, each of which has its distinct employment.

The operation of shearing commences about the first of May, and is performed in large buildings called "Esquileos," which are built in the form of a parallelogram, four or five hundred feet long, and one hundred feet wide. As many sheep as can be sheared the following day, are driven at evening into a long narrow passage called a "sudadeo," or sweating place, in order, as the shepherds say, to soften the wool, and make it cut easy; but, in reality, this is done to increase the weight of the fleeces. For the fleeces, when shorn, are put immediately into a damp warehouse, all the doors and windows of which are closely shut, so as not to admit the transmission of any vapor till the merchant comes to weigh the fleeces. The Spanish flocks occasionally suffer much from shearing; and that of the Count del Campo Alange is reported to have lost five or six thousand in a single night.—(Dr. Parry.)

This is a barbarous practice: it injures the sheep while they are in the "sudadeo," and exposes them to take cold after they are shorn.

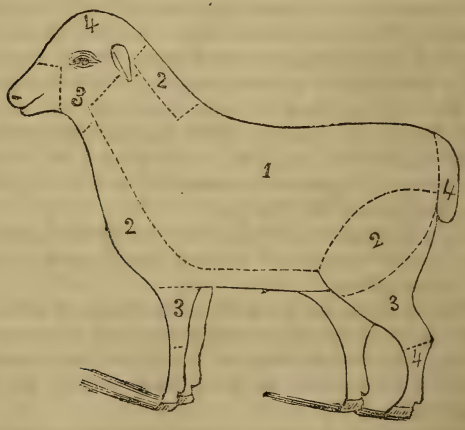
The shearers shear from 12 to 15 daily, or about two-thirds as many as are ordinarily shorn in the United States. And if any are wounded by the shears, the shearers drop a little powdered charcoal on the wound, to keep off the fly and make it heal.

As fast as they are sheared, the shepherds cull out, for the butchery, all the sheep which have lost their teeth, and on the others, they brand a tar-mark, which usually consists of the first letter of the name of the proprietor: and this tar-mark they place upon different parts of the body, so as to show to which dehesa each sheep belongs. After the sheep are shorn, they are taken daily to their pastures to feed, and at night are returned to the yard in front of the shearing house, and if the weather be cold or cloudy, are

housed at night; so that, by degrees, they recover from the effects of being sweated, and are able to bear the weather: after which, their first day's journey towards the mountains is short.

As the sheep are sheared without washing, it is computed that three rams' fleeces will weigh, in the yolk, twenty-five pounds: and that, on an average, three rams' fleeces are equivalent to those of four wethers or five ewes. Hence, to some persons, rams may be the most profitable stock.

The wool, after shearing, is packed up and placed in the warehouses ready for sale; or is taken to the scouring places, where it is given to the "Apartadores," or sorters, whose business it is to divide it into parcels of four different qualities, as denoted by the annexed diagram.



That which is taken from the back, sides of the body, and sides of the neck, is considered of the first quality: that from the breast, belly, sides of the haunches, and from the back of the neck, the second quality: that from the cheeks and throat, the fore legs above the knees, the hams, and back part of the haunches, the third quality: that which is taken from the forehead, from the tail and legs below the

knees, is of the fourth quality, and was formerly sold to buy masses for souls in purgatory.

The other sorts, having different value, are sold accordingly, or, in some provinces, it is customary to sell the whole pile together at a mean price.

When the wool is sorted, it is spread upon wooden hurdles, and beaten with rods, in order to deprive it of the loose dirt.

In selecting a situation for a scouring place, a valley open to the sun is preferred, through which runs a stream of pure water, and where there are inclined meadows large enough for drying the wool. The apparatus for scouring, consists of one or more copper cauldrons set in an arch, and provided with appropriate cocks, pipes, gutturs, &c., for conducting the hot water into the square pits or wells, (one for each sort of wool,) lined with masonry about three feet deep. These pits are then filled about half full of wool.—The water is heated to a temperature of from 120 deg. to 140 deg. of Fahrenheit's thermometer, or even hotter, if necessary: the finer the quality of the wool, and the dirtier it is, the hotter must be the water. The wool is then stirred with a fork for five or six minutes. It is then taken out and spread on wooden hurdles, which are a yard or more in width, and which are placed near the pits, so that the filth may be drained off, before the wool is rinsed in cold water. By the side of the hurdles is a narrow aqueduct formed of stone or masonry, through which flows a current of cold water, into which the wool is next thrown. It is received at the head of the aqueduct, and is carried along its length by the force of the current, being rubbed, in its passage, by the feet of one set of men, until it is at last thrown out by another set upon an inclined plain formed of masonry or stone, where it is left to drain. At the lower end of the aqueduct, is placed a small net for catching such locks of wool as may accidently escape from those whose business it is to throw the wool out of the aqueduct.

As soon as the wool is well drained, it is spread upon the grass, and in the course of four or five days, is generally dry enough to be packed. It is usually put up in canvass bags of various sizes, on each of which are marked an initial letter indicating its qualities, and other letters or marks, denoting the cavana and dehesa from which the wool is

shorn; so that the inexperienced wool-buyer may judge, at first sight, as to the quality of the wool.

It is a well established fact that, if wool remains in the yolk for a period of six months or a year, and then be scoured, it will yield a greater weight of wool than if washed when newly shorn; but the articles made from it are more loose, and less uniform in their texture, and are weaker and less durable, than those which are made from wool which is washed soon after being shorn.

In the ordinary process of scouring in Spain, there is left of yolk in the wool, from 4 to 7 per cent. of the weight of the wool as packed.

According to Vauquelin a, French chemist, if wool be kept a long time in its yolk, the yolk will cause the fibre of the wool to swell and split, and lose its strength. But in America, where wool is washed upon the sheeps' backs, no complaints have been made by wool-holders of damages sustained in consequence of the yolk contained in it.

The first quality of wool is marked R., for Refina, or superfine; the second, F., Fina, or fine; the third, T., Tercera, or coarse; and the fourth, C. or K., Cayda, or refuse.

A set of bags containing the whole of the three first sorts, is called a pile; the proportion of which, many years ago, was R., 15 parts, F., 4, and T., 1 part.

According to the laws of the mesta, the care and management of the sheep is confided entirely to the shepherds, without admitting any interference on the part of the proprietor; and no profit of the flock comes to the proprietor, except what is derived from the wool. The carcasses of the culled sheep are consumed by the shepherds and their assistants; and it does not appear that any account is rendered by them, to their employers, of the value of the skins and tallow. So little are Merino sheep considered an article of food for the large towns of Spain, that though immense flocks of them pass through or near Madrid twice every year, the mutton of that capital was formerly supplied from Africa, as their beef and pork were from the neat cattle and pigs of France.

The profit derived by a proprietor from a flock, is estimated, on an average, at about twenty-two cents a head per annum; and the capital vested in a flock is said to fluctuate between five and ten per cent.

DIFFERENT BREEDS OF MERINOS.

Mr. Livingston's remarks upon this head are as follows: "The Merinos of Spain differ widely from each other in beauty of form, and fineness of wool. Those of Soria are very small, with very fine wool. Those of Valentia, which, like the last, do not travel, have fine wool, but of very short staple. Castile and Leon have the largest, with the finest coats. Those most noted, are the sheep of the Escurial, of Guadaloupe, Paular, of the Duke D'Enfantado, Montarco, and of the Negretti. The first, for fineness of wool, is the most perfect of all the traveling flocks of Spain: the second, (Guadaloupe,) for form, fineness, and abundance of the fleece: the third, (Paular,) with similar fleeces, are longer bodied. The lambs of this stock, and that of the Duke D'Enfantado, are commonly dropped with a thick covering, which changes into very fine wool. The Negretti are the largest breed in Spain."

The following description of some of these breeds, extracted, in part, from the writings of Mr. William Jarvis and others, will more fully exhibit their qualities.

The Paulars "were undoubtedly one of the handsomest flocks in Spain. They are of a middling height, round bodied, well spread, straight on the back, the necks of the bucks rising, in a moderate curve, from the withers to the sitting on of the head; their heads handsome, with an aquiline curve of the nose, with short, fine, glossy hair on the face, and generally, hair on the legs; the skin pretty smooth—that is, not rolling up, or doubling about the neck and body, as in some other flocks; the crimp on the wool was not so short as in some other flocks; the wool was somewhat longer, but it was close and compact, and was soft and silky to the touch; and the surface was not so much covered with yolk, as in some other breeds."

The yolk of this breed is white, and their lambs, when first dropped, have a covering of coarse wool. This cavana was originally owned by the Carthusian friars of the Paular monastery. This monastery is situated in a charming valley, 11 miles south-east of Segovia. "These friars were some of the best agriculturists in Spain. This flock was sold by them to Don Manuel Godoy, Prince of Peace, when he came into power. A part of this flock, and all which now remains of this flock, in Spain, is owned by Don

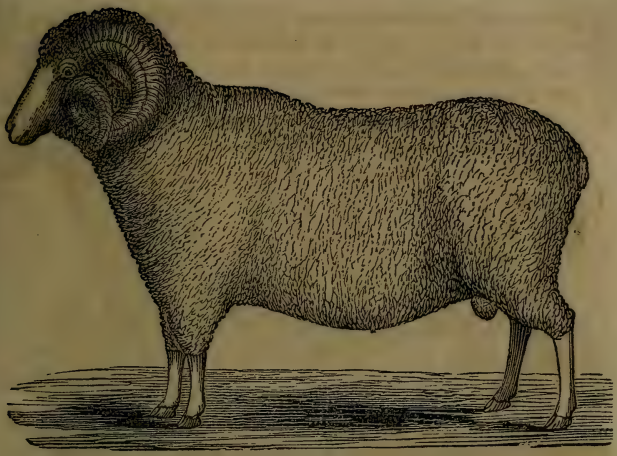
Jose Alvarez, whose residence is near Frugillo. This person was the Administrator of the Prince of Peace, and had the exclusive management of his flock. On the confiscation of the property of the Prince of Peace, a portion of the sheep fell into the hands of Alvarez."—(A. Agriculturist.)

This cavana formerly consisted of 36,000 sheep.

The Negretti "were the tallest Merinos in Spain, but not handsomely formed, being rather flat-sided, roach-backed, and the neck inclining to sink down on the withers; the wool was somewhat shorter than the Paular, and more crimped; the skin was more loose, and inclined to double, and many of them were wooled on their faces and legs, down to their hoofs. All the loose-skinned sheep had large dewlaps." The yolk of the Negretti is white, and their lambs, when first dropped, have a covering of smooth curly wool.

"The cavana of the Negretti was considered to be the finest in Spain, with respect to the strength of the flock, and the weight of their fleeces."—(Burgoanne.) They are remarkable for the even fineness of their wool; the wool upon their bellies and thighs being nearly as fine as that upon their backs. The National flock of France, at Rambouillet, has in it a large proportion of the Negretti blood. This cavana formerly belonged to the society of Jesuits in Spain, and afterwards to the Conde del Campo Alange, and consisted of 60,000 sheep.

The Muros, or Acqueirres "sheep were short-legged, round, broad-bodied, with loose skins, and were more wooled about their faces and legs, than any other flock I ever saw: the wool more crimped than the Paular, and less than the Negretti, but was thick and soft. This flock formerly belonged to the Moors of Spain, and at their expulsion, was bought by the family of the Acqueirres, but in 1809, was owned by the Conde del Campo Alange. The wool, in England, was known as the Muros flock, and was highly esteemed."



ESCURIAL BREED.

"*The Escurials* were about as tall as the Paulars, but not quite so round and broad, being, in general, rather more slight in their make: their wool was crimped, but not quite so thick as the Paular or Negretti; nor were their skins so loose as tha Negretti and Acqueirres, nor had they so much wool on their faces and legs." The yolk of this breed is orange-colored, and their lambs, when first dropped, have a coat of coarse wool. This cavana consisted of 50,000 sheep, and had formerly belonged to the Crown of Spain: but when Philip II built the Escurial Palace, he gave them to the friars, whom he placed in the convent that was attached to the palace, as a source of revenue. The Escurial Palace is 12 miles north-west of Madrid. For a more particular description of this breed, see *Saxon Sheep*.

The Montarcos "were owned by the Conde d Montarco. They bore a considerable resemblance to the Escurials"; but their yolk is more abundant, and more adhesive; it is of a light bluish pearl color, and their lambs, when first dropped, are covered with a thick, coarse wool, resembling hair.

GUADALOUPE BREED.

"*The Guadaloupe* flock is rather larger in the bone than the Escurial and Montarco breeds, about the same height, but not quite so handsomely formed; their wool was thick and crimped, their skins loose and doubling, their faces and legs not materially different from the Escurial and Montarcos, but, in general, they were more gummed than either of the other (*five*) flocks." "The Escurials, the Montarcos, and the Guadaloupes, were not, in general, so heavy-horned as the other three flocks, and about one in six of the bucks were without horns."

"In point of fineness, there was very little difference between these six flocks: and as I have been told by well informed persons, there is very little difference in this respect among the Leonesa Transhumantes in general."—(W. Jarvis.)

M. Lasteyrie says: "The Gaudaloupe have the most perfect form, and are likewise celebrated for the quantity and quality of their wool. The Paulars have much wool

of a fine quality; but they have a more evident enlargement behind the ears, and a greater degree of throatiness."

The Guadaloupe is a large breed of Merinos. Their yolk is white, and their lambs, when first dropped, have a coat of coarse wool, resembling hair.

SECTION VI.

IRISH SHEEP.

"The sheep of Ireland, like those of England, are of two distinct kinds—those of the mountains, and those of the vallies. The vale sheep are large, long-wooled animals, resembling those which existed in the midland counties of England, before the extensive improvements by means of the Dishley breed, were effected. A large share of these long-wooled sheep have been improved by crosses with the Dishley breed, so as to be nearly or quite equal to them in every respect."

"There are, in Ireland, several breeds of mountain sheep, the principal of which are, the Wicklow and Kerry."

"The *Wicklow*, the more valuable of the two, though less numerous, are mostly confined to the Wicklow mountains, on the east coast of Ireland, an elevated locality, but possessing a humid atmosphere. These sheep resemble, in many respects, those of the Welsh mountains. They are little wild animals, without horns, and with white faces and legs, though there is a tendency to become black, which is shown by the number of black lambs which are dropped.

"They are larger towards the base of the mountain, where the pasturage is better, and the wool is tolerably fine and rather long, though mixed with hair. Towards the summit of the mountain, the ground being boggy, and the pasturage scanty, the sheep are smaller, the wool is coarser, and more mixed with hair, which appears in ridges along the spine and back, which thus causes the rain to shoot off their backs. And this provision against the evils of their

locality, is still further secured by the lambs having a sort of hairy covering on those parts which come in contact with the damp ground."

"Their fleeces weigh from two to three pounds, and the fibre is about two inches in length."

"The proximity of Dublin occasions a great demand for early lambs, and these sheep are made available for this purpose, to a great extent. The mountain sheep are purchased by the farmers of better and lower situations, and the rams being put to the ewes in June, the lambs are dropped in November and December. They are generally brought up in pens, being separated from the dams in the coarse of a fortnight, and are forced by suckling those ewes whose lambs have died or have been killed, as well as their own dams. To this is added cow's milk, so that they are fit for market in the course of six weeks.

"The disposition to take the ram so early, the quality of the mutton, and the fact of the ewes being good nurses, stamp intrinsic value on this breed. They are preserved pure only in few places."

"The *Kerry Breed* may be regarded as the type of the various mountain breeds which are found principally in the west of Ireland. Somewhat larger than the sheep of the Wicklow and Welsh mountains, they are, nevertheless, a hardy, though an unthrifty race, feeding slowly, and arriving slowly at maturity. Their fat, when accumulated, is found on the inside, and they never exhibit externally any rotundity of shape. They have coarse hairy wool on the back and haunches, but it is soft and fine on the ribs. They have small, crooked horns, which are sometimes wanting in the female. Their habits restless and active, they resemble, in their general appearance, the antelope races.—They pick up their subsistence amidst the bogs and peats, occasionally stealing provender from the neighboring farms. The only good quality which they possess, is the excellence of their mutton."—[W. C. Spooner.]

SECTION VII.

THE SHORT-TAILED SHEEP.

"The short-tailed sheep are little wild animals, located in the Orkney, Shetland, and Hebrides Islands, where they probably came from the coast of Norway.

"Somewhat similar to the goat in their appearance, they resemble this animal in their habits, their activity, their hardihood, and their partiality for mountainous regions.—Their fleece consists of wool and hair: the former not increasing in length from year to year, as in some other sheep if not sheared, but coming off as the summer approaches, leaving the hair alone at this period of the year. The fleece, therefore, is not sheared; the wool is plucked with the hand, and then readily separated from the hair."—Their wool is very fine; and their fleeces seldom exceeds two pounds in weight.

The purest breeds are found in Zetland; those of Orkney being more frequently mixed with the Dutch, by which admixture it is rendered less fine.

"The pure breeds are of various colors, black, brown, grey, and white, and often spotted: both sexes have horns, but more frequently they are absent in the female. The horns are short and upright, resembling the goat.

"Exposed to every vicissitude of the weather, which, in these remote and sterile Islands, is of the most rigorous kind, neglected by their owners, deriving their subsistence from the heaths, the marine plants, or what little vegetation can be obtained in these barren spots, their size is stunted, and the wethers, when fat, do not exceed six or seven pounds to the quarter. They exceed, perhaps, all other kinds in their power of enduring the rigor of the weather, and scantiness of food. They will even subsist on animal food; and dried salt fish is their common food, when nothing else can be obtained. These little animals are rendered wilder by the neglect of their owners, and vast numbers of them are thereby lost. When a sheep is wanted, it is common to hunt it down with dogs, for which animal they therefore have a great dread. The rams are pugnacious, and will often attack and destroy the ewes: so that,

all circumstances combined, little profit comes to the owner."—(W. C. Spooner.)

The reader will bear in mind that this breed of sheep has been neglected and suffered to run wild in the manner above mentioned, for centuries, and yet they do not change into an Argali or Musmon; a very convincing circumstance to show that the sheep has ever been a species distinct from the Argali or Musmon.

SECTION VIII.

BRITISH SHEEP.

WELSH SHEEP.

"In the vallies and fertile pastures of Wales, there are found many of the improved breeds of English sheep, the Leicester and South Down. But the mountains of this principality possess two distinct varieties, which are naturalized to the soil. Professor Low distinguishes one kind as *the Sheep of the higher Mountains*, and the other as *the soft-wooled Sheep.*"

The Sheep of the higher Mountains are very small, seldom exceeding five pounds to the quarter, with horns in both sexes resembling the goat, whose habits it otherwise resembles. The tail is of the usual length of British sheep; and there is a ridge of hair on the back, throat, and dewlap: the fleece is of various colors, black, brown, and grey. These sheep are extremely wild and active, and prefer the highest spots, and the aromatic plants there found, to the richer herbage.

Like the sheep of Orkney and Zetland, the rams often attack the ewes when in lamb, and thereby diminish their number, as if for the purpose of repressing their too great increase. They have black hair on the face and legs, a character which attaches itself even in their improved state, as in the Radnor, a superior variety of the same race, enlarged by better pasturage. The Radnor sheep fatten to 8 9 pounds the quarter.

The soft-wooled Sheep may be considered as the distinctive breed of Wales, and is distinguished from others by the whiteness of the nose, as well as of the fleece. The fabric known as Welsh flannel, is made of the wool of this breed, and the flesh is still more celebrated, under the well known term of Welsh mutton.

"These sheep are small, seldom exceeding 6 pounds to the quarter, when fat. They are spread throughout the whole of Wales, but delight in lofty situations. Like all mountain breeds, their habits are extremely active, and when enclosed, few fences can confine them: even when removed to distant spots, they will not unfrequently escape, and regain their native mountains."

Their form corresponds to their habits, being slender throughout, and their hind quarters long like those of the deer. The males have their horns curved backward, but the females do not possess any. They have a mixture of hair, though less than other mountain breeds; and this is particularly noticeable on the throat, where it appears like a beard. The fleece weighs between one and two pounds, and partakes of the long-wool character, and is well adapted for flannels and hose, but not for cloths.

SECTION IX.

THE FOREST BREEDS.

The *Exmoor* and the *Dartmoor* are the principal forest breeds in the west of England. *Dartmoor* is situated in the west part of Devonshire, and is about twenty miles long, north and south, and from five to fifteen miles broad. It is situated in the higher parts of the country. The Dartmoor sheep are a hardy race, adapted to the poverty of the pasture which the forest of Dartmoor affords. The Dartmoor sheep are very small, having soft wool, and white faces and legs: they thrive slowly, averaging, when fat, about ten pounds to the quarter. Though bred on heath, they are fattened on plains, and their mutton is highly praised fo. its excellence, and commands a ready sale both in the

neighboring and distant markets. They are wild and restless, and apt to break their pastures, when removed to the more enclosed country.

"The forest of *Exmoor* is situated in the west part of the county of Somerset. The sheep of this forest are smaller than those of Dartmoor, and the males have a beard under the chin, somewhat like goats, and much resemble these animals in their activity and boldness. In other respects, they resemble the Dartmoor. Both breeds take the ram early, and when the ewes are put to the Leicester ram, the lambs grow rapidly to a large size."

SECTION X.

MOUNTAIN BREEDS.

BLACK-FACED HEATH SHEEP.

"This is a peculiar breed, inhabiting the lofty, but barren and heathy hills, which extend from Derbyshire, on the south, to the confines of Scotland, through the counties of Cumberland, Lancashire, Westmoreland, and Yorkshire.—

These tracts of country are much exposed to winds on either side, and this circumstance, with the poverty of the soil, permits only a hardy race of animals to thrive.

"Though this is the native locality of the breed, it has, however, considerably extended itself through the highlands and mountains of Scotland, penetrating even to the Orkney and Shetland isles."—(W. C. Spooner.)

"The male and the female have horns very large and spirally twisted in the male, but sometimes disappearing in the female. The limbs are lengthy and muscular, and the general form is robust: The face and legs are black, or, at least, mottled: the eye is wild and fierce: They are covered with wool about the forehead and lower jaw: the wool is somewhat open, coarse and shaggy, and is much mixed with hard, wiry filaments, called kemps: it is of medium length, and weighs about three pounds to the fleece, when washed, and is fit only for the manufacture of carpets and coarser stuffs.

"The ordinary weight of this breed, when fattened at four years old, is fifteen pounds to the quarter, but sometimes rises to twenty pounds.

"The mutton of this breed is not so delicate as the South Down, or the Welsh sheep; but is more juicy, has more of the venison flavor, and is preferred to every other, by those who are used to it."

In consequence of greater attention to choice selections of individuals for breeding, the form has changed, within a few years, for the better: the carcass has become so short, round, and handsome, as to acquire the name of short sheep, in contradistinction to the Cheviot, or long sheep. The black-faced sheep is one of the hardiest breeds, and the ewes are good nurses: They feed on the loftiest mountains, up to the verge, where the heaths give place to the musca, and other plants of higher latitudes, and are capable of subsisting on the coarsest heaths. A little coarse hay is the only additional food they receive, and this is supplied in sparing quantities, where the frost or snow precludes the possibility of getting any grass. One shepherd has usually about five hundred ewes under his care; and the lambs are weaned when about three months old. The flocks are sheared in July, and a few days previously, are made to

swim across a stream, which is all the washing they receive.

The practice of smearing the sheep in November, with tar and butter, boiled together in the proportion of 8 lbs. of tar to 6 of butter, is generally pursued, and the benefits are considered to outweigh the loss in the quality of the wool.

These sheep are wild and independent in their habits, but they are not so restless as the mountain sheep of Wales and other parts, and can be induced to remain in enclosures, when sufficient food is provided for them.—(W. C. Spooner.)

THE CHEVIOT SHEEP.

The Cheviot hills are a part of that extensive and elevated range which extends from Galloway, in Scotland, through Northumberland, into Cumberland and Westmoreland, occupying a space of 150 or 200 square miles. The majority of them are pointed, like cones: their sides are smooth and steep, and their bases are nearly in contact with each other. These mountains reach to 2658 feet above the level of the sea, and are thus exposed to the severe effects of the weather, and remain covered with snow, long after it has disappeared from the cultivated plains below. The soil, except on the very top, is fertile: the pasturage

abounds with fern and wild thyme, as well as grasses; but differs from that of the native Heath breed, which abounds in Heath, the shoots of which furnish a considerable portion of their subsistence during winter.

"On the upper part of that hill in Northumberland, which is properly termed the *Cheviot*; a peculiar and most valuable breed of sheep is found. They have been there from time immemorial. Tradition says that they came from the borders of Scotland. But they are totally different from the black-faced sheep, and bear no resemblance to the original dun-faced Scottish sheep. How two breeds, so totally different from each other, came to inhabit the neighboring districts of Ettrick forest, and the Cheviot Hills, neither history nor tradition has attempted to explain."—(Farmer's Magazine.)

"This breed has greatly extended itself throughout the mountains of Scotland, and also into Wales and the west of England, and in many instances has supplanted the black-faced breed. They are a hardy race, well suited to their native pastures, bearing, with comparative impunity, the storms of winter, and thriving on poor keep, and may justly be considered as the best mountain breed existing in this country, (Britain). Every mixture of stranger blood has been found to lessen that hardihood, which is the distinguishing character of the race. Though less hardy than the black-faced Heath sheep, they are more profitable as respects their feeding, making more flesh on an equal quantity of food, and making it quicker."

They are described by Mr. Youatt as follows: "They are hornless; the face and legs generally white; the eye lively and prominent; the countenance open and pleasing; the ear large; the body long, and hence they are called long sheep, in distinction from the black-faced breed; they are full behind the shoulder, a long straight back, round in the rib, and well proportioned in the hind quarters: the legs clean and small boned, and the pelt thin, but thickly covered with a short, fine wool, which extends over the whole body and legs."

"The fleece averages about three and a half pounds.—Formerly the wool was extensively employed for making cloths, but having given place to the finer Saxony wools, it has sunk in price, and been confined to combing purpo-

ses. The wool of this breed is not quite so fine as that of the South Down, and is a secondary consideration: mutton being the primary object for which they are reared.—Where the herbage is short and sweet, their wool is finer than in coarse and Heathy pastures."

The Cheviot breed has good fattening properties: the Cheviot wether is fit for the butcher at three years old, and averages from 12 to 18 lbs. per quarter: the mutton being of a good quality, though inferior to the South Down, and of less flavor than the black-faced Heath breed.

The Cheviot, though a mountain breed, is quiet and docile, and easily managed. The food of the Cheviot sheep consists, throughout the greater part of the year, of the herbage of their native hills; hay being allowed only when the ground is covered with snow, or bound with frost. Occasionally turnips are supplied; but it is rarely that the farm will admit of their production, the breeding farms being for the most part in lofty situations.

"The period of lambing is necessarily late, in order that there should be a good supply of food: It therefore does not commence till April—the rams having been admitted in November, at the rate of one to fifty ewes. During the lambing season, greater attention is paid, and the best food is supplied. Though twins are frequently produced, it is rarely that the number of lambs reared equals the number of ewes.

The Cheviot sheep are washed and sheared between the middle of June and first of July. As soon as each sheep is shorn, it is usually branded with tar or pitch on different parts of the body, so that the different kinds and ages of the sheep may be known at a glance. Soon after shearing, the lambs are weaned by a short separation of them from their dams. Smearing is less generally practised than with the Heath breeds, and less than formerly, in consequence of the injury inflicted on the wool by the tar. Spirits of tar and turpentine, or rosin, are sometimes substituted for the tar.

"Vast numbers of these sheep have sometimes been overwhelmed by the snow storms which, in those lofty, exposed situations, descend with merciless severity. Many years ago, as tradition reports, in one winter alone, nine-tenths of the Cheviot sheep were entirely destroyed by the

storms. A graphic and interesting description is related by Mr. Hogg, the celebrated Ettrick Shepherd, of the snow storm of 1794, in which seventeen shepherds lost their lives, and sheep were destroyed by thousands: one thousand eight hundred bodies being found on the beds of the Esk alone, after the flood. The difficulties encountered and surmounted by our celebrated shepherd, are described with the greatest interest, and the disastrous effects of such storms are strikingly portrayed; and though they occur but seldom, yet the losses are often very severe from ordinary bad seasons, and point out the necessity of additional shelter."—(W. C. Spooner.)

SECTION XI.

UPLAND BREEDS.

THE SOUTH DOWN.

SOUTH DOWN RAM.

In the Saxon language, the word *dun* signifies a hill, and from this word is derived the English word *down*. "The South Downs of England, are a long range of chalky hills, diverging from the great chalky stratum, which intersects

the kingdom, from Norfolk to Dorchester. The South Downs occupy a space of more than sixty miles in length, and about five or six in breadth, consisting of a succession of open downs, with few enclosures." They are principally situated in the south part of the county of Sussex, a few miles back from the coast, and lie nearly parallel with it.

"On these hills, a certain breed of sheep, thence called the South Down breed, has been cultivated for many centuries. They can trace a long line of pure descent from a period antecedent to William the Conqueror. It is, says Mr. Spooner, unquestionably the purest, and most unmixed breed in the kingdom. In 1776, Arthur Young speaks of them as having a fine coat, but at the expense of a thin chine, low fore end, and rising back bone. Their fleeces, in their unimproved state, averaged 2½ lbs."

"At the present time, the South Down holds a place, in the esteem of English breeders, inferior to no other breed. It is considered to be first among the short-wooled, as the New Leicester is first among the long-wooled breeds.

"The South Downs have reached their present perfection by constant attention to the purity of the original breed, and by the improvement of their forms. By this improvement, they have become smaller in bone, with greater disposition to fatten, an earlier maturity, and a heavier carcass, while still retaining their former hardihood and capability of doing well on scanty pasture. This constitutes the perfection of the breed: they can endure the rigor of the weather, and preserve flesh, where a Leicester sheep would die.

"The perfection of form which the South Down now exhibits, is owing to the skill of that distinguished sheep-breeder, John Ellman. The improvements effected by him, resulted mainly from the practice of the true principles of breeding: a system of choice selection of the best males and females for this purpose.

"The introduction of the use of turnips, and other artificial food, has tended greatly to increase the number, and improve the quality of the sheep. The improvement of the South Downs has, therefore, been slower in its progress than that of some other breeds; but it has been obtained

without any sacrifice of the intrinsic qualities of the original breed.

"Mr. Ellman describes the perfect South Down as follows: "The head small and hornless; the face speckled or grey, and neither too long nor too short; the lips thin, and the space between the nose and eyes narrow. The under jaw, or chop, fine and thin; the ears tolerably wide, and well covered with wool, and the forehead also, and the whole space between the ears well protected by it, as a defence against the fly. The eye full and bright, but not prominent. The orbit of the eye (the eye cap or bone,) not too projecting, that it may not form a fatal obstacle in lambing. The neck of a medium length, thin towards the head, but enlarging towards the shoulders, where it should be broad and high, and straight in its whole course above and below. The breast should be wide, deep, and projecting forwards between the fore legs, indicating a good constitution, and a dispositon to thrive. Corresponding with this, the shoulders should be on a level with the back, and not too wide above: they should bow outward, from the top to the breast, indicating a springing rib beneath, and leaving room for it. The ribs coming out horizontally from the spine, and extending backward, and the last rib projecting more than the others; the back flat from the shoulders to the sitting on of the tail; the loin broad and flat; the rump long and broad; and the tail set on high, and nearly on a level with the spine; the hips wide; the space between them and the last rib, on either side, as narrow as possible, and the ribs, generally, presenting a circular form like a barrel.

"The belly as straight as the back. The legs neither too long nor too short. The fore legs straight from the breast to the foot: not bending inward at the knee, and standing far apart both before and behind; the hocks having a direction rather outward, and the twist, or the meeting of the thighs behind, being particularly full; the bones fine, yet having no appearance of weakness, and the legs of a dark color.

"The belly well defended with wool, and the wool coming down before and behind to the knee and to the hock: the wool short, close, curled and fine, and free from spiry projecting fibres.

"Their wool is not so fine as formerly, and is much used for combing purposes, for which it is now highly prized.—It is also converted into flannels and baizes." The average weight of their fleeces formerly did not exceed 2½ lbs., and the staple, at that time, was very short. It has now increased to 3 lbs.; and the lowland South Down shears from 3½ to 4 lbs.

"The staple was formerly from 1½ to 2 inches in length, It is now, in many cases, from 3 to 4 inches.

"This breed will endure hard stocking equal to any other; and their early maturity is but little inferior to that of the New Leicesters, the wethers being frequently fatted off at twenty-two months, sometimes at fifteen, and rarely exceeding thirty-two months in England.

"The average weight is from 15 to 18 lbs. to the quarter. But at the age of thirty-two months, they have occasionally reached twenty stones, or 280 lbs., the four quarters. They make more fat internally than the Leicester sheep, and are therefore greater favorites with the butcher. Their flesh is finely grained, and of peculiarly good flavor; and superior to that of the Leicesters."

They are very prolific, frequently producing twins, aud being great milkers, are generally able to nurse them well, without becoming impoverished.

"There are no sheep more healthy than the South Downs. They seldom suffer from hydatid on the brain, nor, on the majority of the farms, are they so much exposed to the rot, as in many other districts."—(Youatt.)

This circumstance shows the influence which the chalk, (*lime*) which abounds in the soils of the South Downs, has in preventing the rot. In New England, it is proverbial that a smutty-faced sheep is seldom diseased.

The South Down sheep are less hardy than the mountain breeds of England, but are sufficiently hardy for the drier climate of the hilly regions of the United States, to which they are admirably adapted.

"In 1800, two of Mr. Ellman's rams were sold to the Emperor of Russia for 150 guineas each. When Mr. Ellman retired from public life in 1829, his flock was sold by auction at the following rates: 770 ewes, $13,04 each; 320 lambs, at $7,92; 30 rams, at $112,50 each—and his best ram, $292,50.

"The county of Sussex, in which this breed was first so much improved, still retains its prominence. Most of the modern flocks are founded on Ellman's."—(W. C. Spooner.)

THE DORSET BREED.

THE DORSET EWE.

"This is a very ancient breed, preserved unmixed from a very remote period, and decidedly the best of all the old horned sheep. Though now found in many parts of Britain, they are principally met with in Dorsetshire. They do not, however, extend entirely over the county, but divide it with the South Downs, and are mostly found in its western part, and particularly in the neighborhood of Dorchester, the county town."

The pure Dorset sheep is larger than the South Down, longer on the legs: is entirely white: the horns of moderate size in both sexes. Their faces are long and broad, with a tuft of wool on the forehead. The shoulders are low, but broad: the back straight: the chest deep: the loins broad: the legs rather beyond a moderate length, and the bone small. The hind quarter is good, but the fore quarter is somewhat deficient; the wethers average from 16

to 20 lbs. the quarter; though in some, this weight will be greatly exceeded. Their mutton is well-flavored. Their wool is moderately fine, and somewhat longer than the South Down, averaging about three and a half or four lbs. the fleece.

"They are a strong, hardy, active sheep, good travelers, and well adapted for folding, though somewhat apt to break through their fences, and by no means so docile as their rivals, the South Downs. Their principal value consists in their excellence as nurses, great prolificacy, and the early period at which they take the ram. They very frequently have twin lambs, and will rear a greater number of lambs than any other description of sheep. They take the ram so early as May and June, and the lambs are usually dropped in October and November; so that they are the principal source of the supply of house and early lamb, which, about Christmas and the following month, is esteemed a great luxury, and accordingly commands a high price.

"The Dorsetshire and Wicklow varieties are most noted for raising early lambs, and are selected for this purpose in the vicinity of large wealthy towns. According to the plan pursued in Middlesex, "the sheep which begin to lamb about Michælmas, are kept in the close during the day, and in the house during the night, until they have produced twenty or thirty lambs. These lambs are then put into a lamb-house, which is kept constantly well littered with clean wheat straw; and chalk, both in lump and powder, is provided for them to lick, in order to prevent looseness, and thereby preserve the lambs in health. As a preventive against gnawing the boards, or eating each other's wool, a little wheat straw is placed, with the ears downwards, in a rack within their reach, with which they amuse themselves, and of which they eat a small quantity. In this house they are kept, with great care and attention, until they are fit for the butcher.

"The mothers of the lambs are turned every night, at eight o'clock, into the lamb-house to their offspring. At six o'clock in the morning, these mothers are separated from their lambs, and turned into their pastures; and at eight o'clock, such ewes as have lost their own lambs, and those whose lambs are sold, are brought in and held by the head, till the lambs, by turns, suck them clean; they are

then turned into the pasture; and at twelve o'clock, the mothers of the lambs are driven from the pasture into the lamb-house for an hour, in the course of which time each lamb is suckled by its mother. At four o'clock, all the ewes that have not lambs of their own, are again brought to the lamb-house, and held for the lambs to suck; and at eight, the mothers of the lambs are brought to them for the night.

"This method of suckling is continued all the year.—The breeders select such of the lambs as become fat enough, and of proper age, (about eight weeks old,) for slaughter, and send them to the market during December, and three or four succeeding months, at prices which vary from one guinea to four, and the rest at about two guineas each.—This is severe work for the ewes, and some of them die from exhaustion. However, care is taken that they have plenty of food; for when green food (viz: turnips, cole, rye, tares, clover, &c.,) begin to fail, brewers' grains are given to them in troughs, and second crop hay in racks, as well to support the ewes, as to supply the lambs with plenty of milk; for if that should not be abundant, the lambs would become stunted, in which case no food would fatten them.

"A lamb-house to suckle from one hundred and sixty to one hundred and eighty lambs at a time, should be seventy feet long, and eighteen broad, with three coops of different sizes at each end, and so constructed as to divide the lambs according to size."—(Middlesex Report.)

"In the county of Wicklow, it is the practice to divide the twenty-four hours by four equal periods, and to feed the lambs with ewe's milk and cow's milk alternately.—When commencing with cow's milk, a quarter of a pint is given twice a day to each lamb, and this is gradually increased to a pint, exclusive of the milk from the ewe. The ewe is thus saved the bad effects of exhaustion, and the lambs are fit for the butcher when six weeks old, or sooner."—(Blacklock.)

"This practice of rearing house-lamb, is not so much adopted as it used to be: there is a greater supply of grass-lamb, and consequently, the price of the former is reduced, and will not repay so great an expense, as well as trouble,

as used to be bestowed on the production of this luxury." —(W. C. Spooner.)

The Somerset Sheep is a larger variety of the Dorset, having more arched profiles, with pink noses, instead of white; the wool somewhat longer.

RYELAND SHEEP.

"This breed of sheep has been preserved pure from a remote period of English history, in the county of Hereford. It has been termed the Ryeland breed, from some sandy spots used in the production of rye in the county of Hereford, and in Hereford, is frequently termed the Hereford breed. These sheep are of small, compact forms, without horns, quiet in their habits, patient and hardy.—The mutton is delicate and juicy; and the carcass from 12 to 15 lbs. the quarter. The wool is white, and extends over the face, and forms a tuft on the forehead. They are principally distinguished for the fineness of their wool, which is superior for carding purposes to all other of English production, the Merino alone excepted. But their fleeces are light, averaging only two pounds. At the present day, very few flocks of this breed are to be found in a state of purity in England—other breeds having been found more profitable."—(W. C. Spooner.)

There are several other old Upland breeds of sheep in England, a description of which would be neither particularly interesting or useful to the reader.

SECTION XII.

LONG-WOOLED BREEDS.

"The long-wooled breeds of sheep are, properly, the natives of the rich and marshy pastures of England, from whence, with the improvement of Agriculture, they have extended to all parts of Britain, encroaching, in many places, on the land previously appropriated to short-wooled sheep; so that, for years past, they have been gradually increasing, while their rivals have decreased, or remained

the same. The cause of this may be found in the fact, that on suitable land they are undoubtedly more profitable than the short-wooled varieties; the much greater weight of the fleece, yielding as much per pound, will account for this, even if the superior aptitude for fattening, and earlier maturity of one particular variety were not also in operation.

"Whilst many of the Upland and mountain breeds have been preserved unmixed from time immemorial, most of the ancient long-wooled breeds have either altogether disappeared, or are preserved by the curious in individual flocks; they have either been altogether supplanted by the New Leicester, or are in a great measure changed by crossing with this improved breed.

"Mr. Low makes a distinction of two classes of long-wooled sheep: one belonging to the marshes and fens, and the other to the inland plains. The former includes the *Lincoln* and *Romney Marsh;* the latter, the *Teeswater*, the *Leicester*, and other varieties."—(W. C. Spooner.)

THE LINCOLN SHEEP.

"The fens of Lincolnshire, extending into Norfolk, Cambridgeshire, and the adjoining counties, are well adapted for the support of a heavy breed of sheep: and this accordingly is the native district of the old Lincoln, a breed in its pure state almost extinct. But a flock is still preserved by Mr. Jex, of Norfolk.

"The Lincoln sheep has no horns: the face is white: they are of large size and coarse form, with flat sides, and hollow flanks: the legs thick, white, and rough: bones large: pelts thick: the wool from 8 to 10 inches in length: their fleeces from 10 to 12 pounds, and upward: the wool is somewhat coarser than that of the Leicester, but is well adapted for worsted goods. The ewes weigh from 14 to 20 lbs. the quarter, and three year old wethers, 20 to 30 lbs. the quarter. The wethers, when fat, have been known to reach the enormous weight of 60 lbs. the quarter; but their mutton is, of course, not so delicate as that of the smaller breeds. They fed slowly, but made much internal fat, and were, therefore, much approved by the butcher.

"The old Lincolns have been greatly modified by extensive crossing with the New Leicester, the effect of which

has been to diminish the size and weight of the fleece, but greatly to improve the form, giving a greater aptitude to fatten, and earlier maturity, and a capability of keeping a greater number on the same extent of land. Nevertheless, the mixed breed now presents the largest sheep in Europe." —(W. C. Spooner.)

"Mr. Clark, of Canwick, in 1827, exhibited two wether sheep in Lincoln market, the fleeces of which had each yielded 12 lbs.: They were slaughtered: the carcass of the large one weighed 251 lbs.: the fore quarters were each of them 73 lbs., and the hind quarters, 57½ lbs. On the top of the rib, the solid fat measured nine inches in thickness!"

The Lincoln sheep are generally sheared in June, about ten days after being washed; and the average weight of the Lincoln fleece, of the present time, is about 7 lbs.—Smearing after shearing is not practiced upon this breed of sheep. They are permitted to have their first lambs when about two years old. This breed, as well as some others, have become much more numerous in England since the introduction of turnip husbandry.

ROMNEY MARSH BREED.

(ROMNEY MARSH EWE.)

"The other breed of sheep proper to marsh land, is that which from time immemorial has been found on the southern coast of Kent, denominated the Romney Marsh. This marsh is nearly on a level with the sea, from which it was reclaimed many centuries ago, and from its encroachment is preserved by means of dikes similar to the land of Holland. It extends fourteen miles in length, and ten in its greatest breadth, and, for the most part, consists of a rich clay soil, well adapted for the production of a large breed of sheep. And, consequently, we find they are more numerous than on any other space of land of equal extent—it being not uncommon for seven young sheep, and as many fattening wethers, to be placed on an acre.

"The native breed of this district were large, coarse animals, though somewhat smaller than the old Lincoln.—They had long, coarse, thick heads and limbs, narrow chests, and flat sides, but with large bellies. They fatted slowly, not being fit for the butcher till three years old: at which age the wethers averaged from 35 to 40 lbs. per quarter, and yielded much internal fat. Their fleeces av-

eraged from 6 to 7 lbs. Their wool is long and not fine. They have much hardihood: they bear their cold and exposed situation well, and they require no artificial food during the hardest winter, except a little hay.

"For the most part, they have been extensively crossed with the New Leicester, and have, in consequence, been greatly improved in form. With less bulk, they have an earlier maturity, and a greater disposition to fatten."—(W. C. Spooner.)

THE TEESWATER.

"This is an ancient breed of sheep, called after the Tees, a river separating the counties of Durham and Yorkshire, and running through a fertile valley.

"The old Teeswater was a large, tall sheep, of very uncouth form, having a coarse head, rounded haunches, and long, large limbs, and being hornless, are supposed to have been originally of the same stock as the Lincoln.—These sheep fattened slowly, requiring good pasture. But they possessed the quality of being very prolific, commonly yielding twins, and supplying them with an abundance of milk. Their fleece weighed about nine pounds, previous to any improvement of the carcass by the cross with the New Leicester; and the wool was remarkably long, coarse, and thinly set on the skin. They have been improved by a cross with the New Leicester, so as to rival them in early maturity, disposition to fatten, as well as quality of fleece."

THE BAMPTON NOTT.

"This is a long-wooled breed of sheep, found in the fertile valleys of Devonshire and Somersetshire, and called Bampton, from a village of that name on the borders of the two counties. They had white faces, long and heavy fleeces, coarse forms, thick skins, and weighed from 30 to 35 lbs. per quarter, at two years old. A smaller variety, having brown faces, crooked legs, and flat sides, were denominated the Southern Notts, and they weighed, at thirty months, 25 lbs. per quarter. The fleece was long and soft, weighing 9 or 10 lbs. Both these breeds fattened slowly, and were long in coming to maturity; but being extensively crossed with the New Leicester, their defects have, in a great measure, been removed, and they now form a large

and valuable breed of sheep: so much so, that a wether slaughtered in 1835, weighed no less than 70 lbs. per quarter."—(W. C. Spooner.)

THE COTSWOLD EWE.

THE COTSWOLD BREED.

The following account of this breed is by Mr. Spooner:

"This is an ancient and celebrated breed, its wool being spoken of very favorably by many old writers. Cotswold signifies a sheep-fold and a naked hill. The Cotswold hills, the native tract of this breed, are of moderate elevation, possess a sweet herbage, and though formerly consisting mostly of bleak wastes, have been latterly much improved. Camden speaks of the breed as having fine and soft wool. Drayton speaks of its fleeces as more abundant than those of Sarum and Leominster. Speed, writing 200 years ago, speaks of the wool as being similar to the Ryeland, and rivalling that of Spain. Indeed, some imagine it was the origin of the Merino sheep, as in 1404, Edward the IV permitted a number to be exported to Spain, where they greatly increased and spread. Spain, however, before this, was celebrated for the fineness of its wool. Markham, in the reign of Queen Elizabeth, speaks of the Cotswold as hav-

ing long wool. And Mr. Marshal, and other writers, consider that they have always been a long-wooled breed.

"It is difficult to reconcile these differences of opinion; for my own part, I am disposed to think that the present race are the descendants of the old race. Be that as it may, we have no evidence, either oral, written, or traditional, of the change having been made.

"The Cotswold is a large breed of sheep, with a long and abundant fleece; and the ewes are very prolific, and good nurses. Formerly they were bred only on the hills, and fattened in the valleys of the Severn and the Thames. But with the enclosure of the Cotswold hills, and the improvement of their cultivation, they have been reared and fattened in the same district.

"They have been extensively crossed with the Leicester sheep, by which their size and fleece have been somewhat diminished, but their carcasses considerably improved, and their maturity rendered earlier. The wethers are now sometimss fattened at 14 months, when they weigh from 15 to 24 lbs. per quarter, and at two years old, increase to 20 or 30 lbs. The wool is strong, mellow, and of good color, though rather coarse; six to eight inches in length, and from 7 to 8 lbs. the fleece.

"The superior hardihood of the improved Cotswold over the Leicester, together with the prolific nature of the ewes, and their abundance of milk, have rendered them, in many places, rivals of the New Leicester, and have obtained for them, of late years, more attention to their selection and general treatment, under which management still further improvement appears probable.

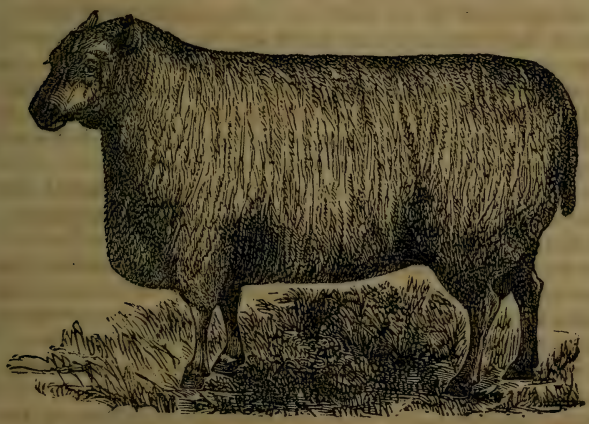
"They have also been used in improving other breeds, and have been mixed with the Hampshire Downs. It is indeed the improved Cotswold, that under the term New or improved Oxfordshire sheep, are so frequently the successful candidates for prices offered for the best long-wooled sheep, at some of the principal agricultural meetings or shows in the Kingdom.

"The quality of the mutton is considered superior to that of the Leciester, the tallow being less abundant, with a larger developement of muscle or flesh. We may, therefore, consider this breed as one of established reputation,

and extending itself throughout every district of the Kingdom.

THE OLD LEICESTER SHEEP.

This breed of sheep is thus described by Mr. Youatt:—"This was a large, heavy, coarse-wooled breed, common to most of the midland counties, and reaching from the south of Yorkshire as far as to Oxfordshire and Gloucestershire. It had a white face, no horns; it was long and thin in the carcass, flat-sided, with large bones, thick, rough, and white legs; and weighing, the ewe from 15 to 20 lbs., and the wether from 20 to 30 lbs. the quarter. It was covered with wool from 10 to 14 inches in length, coarse in quality, and weighing from 8 to 13 lbs. The pelt and offal were thick and coarse: the animal was a slow feeder, and the flesh was coarse grained, and with little flavor."



THE NEW LEICESTER RAM.

THE NEW LEICESTER BREED.

The following selections from the works of Messrs. Youatt, Blacklock, and Spooner, will illustrate the origin, formation, and qualities of this breed:

"The New Leicester is an artificial breed of sheep, which was moulded, as it were, into its present form by the master hand of Bakewell. The actual sources from whence

Mr. Bakewell derived his breed, cannot be accurately ascertained. He himself was very uncommunative on this point, and the knowledge of the origin of the breed perished with him. It is probable, however, that the foundation of his breed was, the best existing specimens of the old Leicester breed.

"It was about the middle of the last century, that Mr. Bakewell undertook his improvements in breeding sheep. Up to this period, very little care had been bestowed upon the breeding of sheep in England. Two objects appear to have engrossed the attention of breeders: first, to breed animals of the largest size; and, secondly, such as should produce the largest possible fleeces; and with little regard to the proportion of food consumed, or any diminution of the quantity of offal, in the animals produced.

"The opinion of Mr. Bakewell was, that the first object to be attended to in breeding sheep (in England, where meat is high priced), was the improvement of the carcass; and that the fleece was a secondary consideration. Finding that animals of a medium size, and symmetrically shaped, consumed less food in proportion to the quantity of useful meat produced, than the largest but ill-formed animals; and that sheep, carrying very heavy fleeces, have less propensity to fatten, than those with lighter fleeces, he selected sheep of only moderate size and compact forms, for the foundation of his flock.

"Having formed his stock from sheep so selected, he carefully attended to the peculiarities of the individuals from which he bred, and, it appears, did not object to breeding occasionally from those which were of near affinity, when, by so doing, he could produce a progeny possessing the characteristics he wished to obtain.

"By systematically and unremittingly carrying out his principles, he at length produced animals which surpassed all others in the qualities sought for by him, comprising, as Mr. Cully observes, in the same apparent dimensions, greater weight than any other sheep, with an earlier maturity, and a greater propensity to fatten, a diminution of the quantity of offal, and the return of most money for the quantity of food consumed.

"And although they are not adapted to the poorest soils, where the herbage is so scanty that the sheep must walk

over a great extent of ground for the purpose of procuring its food, nor to mountainous or bleak situations in northern climes, for which they are not sufficiently hardy, no other sort of mutton sheep, on soils of moderate or superior quality, is more profitable to the breeder, or produces more meat, according to the amount of food consumed: and at the present day, this breed remains the most perfect of any, in the form of the carcass."

The various points of the Leicester sheep have been thus correctly described:

"The head should be hornless, long, small, tapering towards the muzzle, and projecting horizontally forwards: the eyes prominent, but with a quiet expression: the ears thin, rather long, and directed backwards: the neck full and broad at its base, where it proceeds from the chest, but gradually tapering towards the head, and being particularly fine at the junction of the head and neck—the neck seeming to project straight from the chest, so that there is, with the slightest possible deviation, one continued horizontal line from the rump to the poll: the breast broad and full: the shoulders broad and round, and no uneven or angular formation where the shoulders join either the neck or the back, particularly no rising of the withers or hollow behind the situation of these bones: the arm fleshy through its whole extent, and even down to the knee: the bones of the legs small, standing wide apart, no looseness of skin about them, and comparatively bare of wool: the chest and barrel at once deep and round: the ribs forming a considerable arch from the spine, so as, in some cases, and especially when the animal is in good condition, to make the apparent width of the chest even greater than the depth: the barrel ribbed well home, no irregularity of line on the back or the belly, but on the sides, the carcass very gradually diminishing in width towards the rump: the quarters long and full, and as with the fore legs, the muscles extending down to the hock: the thighs also wide and full: the legs of a moderate length: the pelt also moderately thin, but soft and elastic, and covered with a good quantity of white wool, not so long as in some breeds, but considerably finer."

The following is the measurement of a three years old ram of Mr. Bakewell's:

Girth,	5 feet,	10 inches.
Height,	2 "	5 "
Breadth of collar,	1 "	4 "
Breadth of shoulders,	1 "	11½ "
Breadth across the ribs,	1 "	10½ "
Breadth across the hips,	1 "	9½ "

"The various qualifications above mentioned, were not obtained until great and long continued attention had been paid to the peculiarities of individuals, adapting the ram to the ewe, so as to correct the faults which either possessed; and thus, by carefully and progressively getting rid of faults, gradually approaching perfection; which, though it may be rarely or never reached, should yet be the constant aim of the breeder.

"The perfection to which this breed has now been brought, is owing to various other breeders besides Mr. Bakewell; amongst whom may be mentioned Mr. Cully, as one of the first and most successful.

The disadvantages of the Leicester are, compared with many other breeds, a certain weakness of constitution, an inability to bear exposure to the weather, and a greater predisposition to inflammatory diseases; to which may be added, a want of prolificacy in the ewes as nurses, and formerly, a deficiency in weight of the fleece. These points, however, have been much improved since the time of Bakewell, and where the purity of the breed is not an object, they have been altogether avoided, by crossing with those breeds which excel in qualities in which the Leicester is deficient, such, particularly, as the Cotswold and the Bampton Notts.

The wool has considerably increased in length, and has improved both in fineness and strength of fibre: the fibre varies from five to more than twelve inches in length. In sheep sixteen months old, it is soft, but somewhat inferior, for combing purposes, to that of the older races. It is mostly used in the manufacture of serges and carpets.

The lambs of the pure Leicester are rarely shorn (in England) until the second year, when the fleece often weighs 8 lbs., and is very long in the staple, and as teg wool is more valuable. The ewe fleeces average about 6 lbs., and those of the fat wethers, though shorn in May, average from 7 to 9 lbs.

The carcass, however, (in England,) is the principal consideration; and the early maturity of the Leicester breed is such, that the wethers are not unfrequently fattened at fifteen months, and at two years old will often weigh from 25 to 36 lbs. per quarter. The flesh, too, is accumulated most where it is most valuable, and the fat is distributed, for the most part, on and amongst the muscles, and externally, and less within the body and around the kidneys, than in other breeds. The weight of the hind and fore quarters, also, approximate much nearer than those of most other breeds; and the dead weight of the Leicester sheep, is greater in proportion to the live weight than in any other breed.

The kind of meat which they yield is of a peculiar character. When the sheep are not over fattened, it is tender and juicy, but, in the opinion of many persons, somewhat insipid.

The Leicester sheep were never favorites with the butcher, because they had little loose inside fat. It ought, nevertheless, to be recollected, that the smallness of the head and the thinness of the pelt, will, in some measure, counterbalance the loss of tallow: and that the diminution of offal is advantageous to the grazier, for it shows a disposition to form fat outwardly, and is uniformly accompanied by a tendency to quickness of improvement. As the New Leicesters come early to maturity, so also their old age is premature; they are shorter lived than most other breeds. Hence, in England, the ewes are generally fatted off and disposed of at the close of their third breeding season, or when four years and a half old. And all the wether lambs, and also all the ewe lambs, except what may be necessary to keep good the amount of breeding stock, are generally fattened off and sold at or before they are eighteen months or two years old.

The New Leicesters are not so prolific as some other breeds: they seldom produce twins. The object of Mr. Bakewell and his immediate followers was, to produce a lamb that could be forced on, so as to be ready at the earliest possible period for breeding or slaughter; and, therefore, the production of twins was not only unsought for, but was regarded as an evil, as they are but indifferent milkers.

These various advantages in a great measure counterbalance, and, indeed, outweigh the defects of the breed, and sufficiently account for the facts, that in the course of fifty years it had either supplanted, or was crossed with nearly every long-wooled breed in the country, (England,) that it had, in numerous instances, caused the substitution of long for short-wooled sheep, and that it has added greatly to the sheep stock of that country, both as regards the wool and flesh. And after producing these changes, the Leicester, in most respects, maintains its grounds; but of late years, the opinions of breeders have inclined towards producing a larger animal, as being attended with more profit; and thus the improved Cotswold, often denominated the New Oxfordshire, and some of the heavier breeds, are now successful rivals of the pure Dishley breed.

Nevertheless, the improved Leicester still commands a large extent of the most fertile districts in England, and is also cultivated in Scotland with equal care and success, upon similar soils. It has been exported to the continent of Europe, and has been extensively introduced into the North American British provinces and the United States, and when placed in suitable localities in America, has been bred successfully. They appear to be well adapted to the rich and level lands of the Western States, and to be more hardy, and less liable to disease, in the United States, than what they are represented to be in Britain.

Robert Bakewell was born about the year 1725, on his paternal estate in Leicestershire, and died there, October 1, 1795. Though it does not appear that he contributed anything to literature, yet his efforts to improve the breed of sheep and cattle, justly procured him a widely extended reputation. In the year 1760, the first Dishley ram was let for 16 shillings (sterling) the season, and it was not till twenty years afterwards that Bakewell received anything like a remunerating price. It was then only ten guineas; but it afterwards rapidly increased till, in 1786, he realized 300 guineas for one ram; and three years afterwards, he obtained no less than six thousand two hundred guineas for the hire of rams: thus handsomely repaying him for his long-continued and untiring exertions.

MERINO SHEEP IN ENGLAND.

The following remarks of Messrs. Youatt and Spooner will sufficiently illustrate this subject:

"In England, the Merino has received a fair trial, but from causes which can be readily explained, they have not been profitably bred. The first attempt was made by George the III, who was a zealous agriculturist. A flock was first procured clandestinely from Estramadura, in Spain, but they were found to be altogether inferior. In 1741, a small but very superior flock (of the Negretti breed) were presented to his Majesty, and though at first they suffered much from the rot and the foot rot, yet the survivors became naturalized to the soil, and remained healthy, and the wool maintained its quality. The breed became fashionable; they were crossed extensively with the South Down, the Wiltshire, the Leicester, and also upon the Ryeland, by Dr. Parry, and, for some years, the rams were let at high prices. It was thought that by these means, the wool of our (Euglish) breeds would be greatly improved, and their other qualities retained. But it was found that whilst the wool was still greatly inferior to the pure Merino, the other qualities of the sheep were deteriorated to a great extent. The carcass became inferior, the constitution less hardy, and the experiments so unprofitable, that they were almost universally abandoned. The improvement of the wool would by no means compensate for the loss arising from a deficiency in the carcass: for such is the demand for meat of the best quality in this country, and such is the price which it accordingly commands, that the flesh must still remain the principal source of profit, and, indeed, the only one that can meet the heavy expense incurred in raising artificial food. As this cannot be retained in connexion with the finer description of wool, we must be content with possessing it with wool of an inferior quality. Very few, if any flocks, of Merino, are retained pure in England. Mr. Bennet retains a flock in Wiltshire, it is said, in a state of purity, or nearly so. But, in most cases, they are considerably crossed with other breeds, and, in many cases, so largely, that the principal characteristics of the Merino have disappeared."

Mr. Youatt's remarks are as follows:

"In Great Britain, where a system of artificial feeding

is carried to so great a degree of perfection, where the sheep is so early and so profitably brought to market, that breed, however it may ultimately increase the value of the wool, can never be adopted, which is deficient, as the Merinos undeniably are, in the principle of early maturity and general propensity to fatten."

Doubtless the Merino might be bred in England on suitable soils, and with good shelters, with as little difficulty as in Denmark; but the facts above stated are sufficient to show why it cannot be done advantageously.

NAMES APPLIED TO SHEEP.

The following (from Blacklock,) is a condensed arrangement of the names by which sheep are designated at different periods of their existence, in various parts of England and Scotland:

FROM BIRTH TILL WEANING.

Male.—Tup, Ram lamb, Heeder, Pur.

Female.—Ewe or Gimmer lamb, Chilver.

FROM WEANING TILL FIRST CLIP.

Male.—Hog, Hogget, Hoggerel, Teg, Lamb-hog, Tup-hog, Gridling, and if castrated, a Wether hog.

Female.—Gimmer hog, Ewe hog, Teg, Sheeder ewe, Thrave.

FROM FIRST TO SECOND CLIP.

Male.—Shearling, Shear hog, Heeder, Diamond or Dinmont ram, or Tup, and when castrated, a Shearing wether.

Female.—Shearing ewe or Gimmer, Double-toothed ewe, or Teg, Yill gimmer.

FROM SECOND TILL THIRD CLIP.

Male.—Two shear ram, young wedder.

Female.—Two shear ewe, counter.

FROM THIRD TILL FOURTH CLIP.

Male.—Three shear ram, old wedder.

Female.—Three shear ewe, Fronter.

And so on, the name always taking its date from the time of shearing, and not from the birth of the lamb. Broken-mouthed ewes are called *crones* in Suffolk and Norfolk; *krocks*, or *crocks*, in Scotland; and *drapes* in Lincolnshire. In Scotland, ewes which are neither with lamb, nor giving milk, are said to be *eild*, or *yield*.

Concise Description of British Sheep, by Messrs. Cully and Lawrence.

	Names.	Horns.	Color.	Quality of wool.	Weight of fleece.	Price of wool per lb.	Wether per qr.	Age when killed.
No. 1	Teeswater,	No horns,	White legs and face,	Long wool,	9 lbs.	1s. 0d.	30 lbs.	2 years,
2	Lincolnshire,	do.	do.	do.	11	1 0	25	2
3	New Leicestershire,	do.	do.	do. fine,	8	1 0	22	2
4	Cotswold,	do.	do.	do. do.	9	1 0	24	2
5	Romney Marsh,	do.	do.	do. do.	8	1 0	22	2
6	Dartmoor or Bampton,	do.	do.	do.	9	1 0	25	2
7	Exmoor,	Horned,	do.	do. coarse,	6	0 10	16	2½
8	Heath,	do.	Black face and legs,	do.	3	0 8	15	3½
9	Hereford or Ryeland,	No horns,	White face and legs,	Short fine wool,	2½	2 9	1¾	3½
10	Morf, Shropshire,	Horned,	Black and speckled,	do.	1¾	3 0	12	3½
11	Dorsetshire,	do.	White do.	do.	3½	1 6	18	3½
12	Wiltshire,	do.	do.	Short middling,	3	1 6	20	3
13	Berkshire,	No horns,	Black and white,	Long wool,	7	0 10	18	2½
14	South Down,	do.	Speckled do.	Short wool,	2½	2 3	18	2
15	Norfolk,	Horned,	Black do.	do.	2	1 8	18	3½
16	Hardwick,	No horns,	Speckled, do.	do.	2	0 8	10	4½
17	Cheviot,	do.	White face and legs,	do.	3	1 1	16	4½
18	Dunfaced,	do.	Dun do	do.	1½	3 2	7	4½
19	Shetland,	do.	Various colors,	do. fine cottony,	1¾	3 2	8	4½
20	Spanish,	ram horn'd	White,	do. superfine,	3½	6 6	14	2½
21	Spanish cross,			do. fine,	2¾	3 2	16	2

SECTION XIII.

NORTH AMERICAN SHEEP.

The sheep was not indigenous to any part of America, unless the Argali should be considered a sheep; and the only animal which is indigenous to North America, the qualities of whose fleece or covering approximates towards that of the domestic sheep, is a species of goat, which is found about the country of the Flat-Head Indians, among the Rocky Mountains. It is known by the name of the "wooly sheep," and is frequently confounded with the Argali. Captain Bonneville says: "It has white wool like a sheep, mingled with a thin growth of long hair; but it has short legs, a deep belly, and a beard like a goat. Its horns are about five inches long, slightly curved backwards, black as jet, and beautifully polished. Its hoofs are of the same color. The flesh is said to have a musty flavor. Its wool alone gives it a resemblance to the sheep. Some have thought that the fleece might be valuable, as it is said to be as fine as the goat of Cashmere; but it is not to be procured in sufficient quantities. It is not so plentiful as the big-horn (Argali); rarely more than two or three being seen at a time. It inhabits cliffs in summer, but in winter descends into the vallies. This animal is by no means so active as the big-horn; it does not bound much, but sits a good deal upon its haunches."

Hence, in the first settlement of the United States, the colonists were necessitated to introduce the domestic sheep, and it is presumed that they brought with them those kinds of British sheep which were peculiar to those districts from which they embarked. These sheep seem to have been bred promiscuously, so that previous to the importation of the Merinos, they did not fully resemble any one of the old British breeds.

They were generally long-legged, narrow-chested, flat-sided, and comparatively slow in coming to maturity.—They yielded coarse white wool, of a medium length of staple, and the ewe fleeces averaged not exceeding 3 lbs. Their principal recommendation consisted in being prolific breeders and good nurses. But they were untractable, and

impatient of being confined within fences. They have been crossed generally with the Merino or improved British breeds, and have thus disappeared, except in some parts of the Southern States.

The only new breed of sheep which have been formed out of those which were imported into this country by the colonists, which have or had anything peculiar in their character, are the Otter, the Arlington, and the Smith's Island Sheep.

THE OTTER BREED.

This breed was an accidental formation, and it shows how readily the sheep is operated upon by various circumstances, so as to change its form and qualities.

The precise point where this breed originated seems unsettled: Chancellor Livingston states that it was on an island opposite the New England coast. Another writer says it was in Massachusetts, and in a flock belonging to Seth Wright, and occurred in 1791.

An ewe of the long-legged New England breed, being copulated with a tup of the same breed, gave birth to twins, one of which was a male, with extremely short legs, which were turned out at the knees in such a manner as to render them rickety. They could not run or jump, and even walked with difficulty. The body was long and round, but not large, and the breed was well formed, except as to legs. Their wool was similar to other New England sheep, and of a medium length.

Curiosity at first led to the breeding from this ram, and the progeny presented a striking likeness to the size. They were valued only because they could be easily kept within the stone wall fences of New England. But as they were not well formed for moving about in deep snows, or traveling to market, the breed has been abandoned, and become extinct.

THE ARLINGTON LONG-WOOLED SHEEP.

Mr. Livingston notices this breed substantially as follows: "These, Mr. Custis, who was the original owner of them, informs me, were derived from the stock of that distinguished farmer, statesman, and patriot, Washington, who had collected, at Mt. Vernon, whatever he believed useful to

the agriculture of his country; and among other animals, a Persian ram, which Mr. Custis describes as being very large and well formed, carrying wool of great length, but of coarse staple.

"This stock, intermixed with the Bakewell, are the source from which the fine Arlington sheep are derived—some of which carry wool fourteen inches in length, and their wool was fine for the sort, soft, silky, and beautifully white.

"They are formed upon the Bakewell model."

This breed is still held in high estimation among some of the farmers in Virginia and Maryland, but are now much inferior to their ancestors, and the long-wooled British breeds, both for mutton and value of fleece.—(L. A. Morrel.)

SMITH'S ISLAND SHEEP.

This island, and the sheep bred upon it, were the property of Mr. Custis, and the following is extracted from his account of them:

"This Island lies in the Atlantic Ocean, immediately at the Eastern cape of Virginia, and contains between three and four thousand acres. The length of this Island is estimated at fourteen miles, which gives that variety and change of pasture so necessary to the system of sheep-farming. The soil, though sandy, is, in many parts, extremely rich, and productive of a succulent herbage, which supports the stock at all seasons. About one half of this island is in wood, which is pierced with glades running parallel with the sea, and of several miles in extent. These glades are generally wet, and being completely sheltered by the wood on either side, preserve their vegetation, in a great measure, through the winter, and thereby yield a support to the stock. Along the sea coast, also, are abundant scopes of pasturage, producing a short grass in summer, which is peculiarly grateful to the palates of most animals, and particularly to sheep. The access to salt, also, forms a material feature in the many attributes which Smith's Island possesses.

"The origin of the Smith's Island sheep cannot be precisely ascertained, but they are supposed to be the indigenous race of the country, put thereon about twenty years

since, and improved by the hand of Nature. Their wool was very white, and comparatively fine, and was soft and silky to the touch. The staple was from 8 to 10 inches in length, and the fleeces averaged about 8 lbs."

"The descendants of these flocks, though greatly degenerated, are diffused over a wide section of Virginia, and further South."—(L. A. Morrel.)

The accidental formation of this breed of sheep upon this island, shows the influence of rich pasturage upon the quality of the fleece, and the propriety of placing long-wooled breeds of sheep upon the rich level lands of the Western States, in preference to short or fine-wooled breeds.

JAMAICA SHEEP.

The island of Jamaica is situated in about 18 degrees north latitude. Being surrounded by the Ocean, the heat of the torrid zone is tempered by its breezes. On this island has originated a breed of sheep, the descendants of European coarse-wooled sheep, which is thus described in the American Philosophical Transactions, Vol. v., p. 153:

"The Jamaica sheep forms a distinct variety, altogether different from any other I have ever seen. The hair is a substance *sui generis*, and is different from the kemp and stitchel hair of Europe, as from the long tough hair of the Russians, and other hairy breeds. The wool, too, is as different from that of other sheep-wool, as the hair; it is finer than any other, not excepting the Shetland breed, although I should suspect that it is scarcely so soft."

The accidental formation of this breed of sheep, from such an original, shows most conclusively that a mild and rather warm temperature is most congenial to the fine-wooled sheep.

INTRODUCTION OF MERINOS INTO THE UNITED STATES.

Previous to the year 1800, a few, and only a few, improved coarse-wooled sheep had been imported into the United States from Britain and Holland. But as the people of the United States, in those times, were not sensible of the value of superior breeds of sheep, these imported sheep had little influence in improving the breed of sheep in the United States, and comparatively few good sheep existed in

these States. The importation of the Merinos, and the high prices of their wool shortly afterwards, gave the first great impetus in the improving breeds of sheep.

The first importation of Merino sheep into the United States, was by the Hon. William Foster, a merchant of Boston. In April, 1773, being at Cadiz, in Spain, he purchased of a drover from the Sierra Morena, three Merino sheep, on condition that he should bring them down with the drove for the shambles, and deliver them outside the city gate to a certain fisherman, who smuggled them for him on board the ship Bald Eagle, Captain John Atkins, master. With these sheep he arrived safe at Boston.—Soon after, being about to leave the United States for a long residence in France, he presented these sheep to his friend, Andrew Cragie, Esq., of Cambridge, who supposed that, as we had no woolen manufactories in the United States at that time, these sheep were not particularly valuable, and ate them.

Early in the year 1801, Mr. Delessert, a French banker, purchased two pairs of Merinos, selected from the celebrated Rambouillet flock, near Paris, and shipped them the same year to the United States. Three of them perished on their passage; the survivor, a ram, was placed on his farm, near Kingston, New York.

In the same year, Mr. Seth Adams (now of Zanesville, Ohio,) imported a pair from France, in the brig Reward, which arrived at Boston in the month of October.

In the year 1802, Robert R. Livingston, being Minister Plenipotentiary from the United States at the court of France, obtained three or four Merinos of the Rambouillet flock, which he sent to New York, and placed on his farm.

In the year 1801, Col. David Humphrey, being then Minister Plenipotentiary at the court of Spain, purchased two hundred Merinos in Spain, and shipped them to the United States. They arrived early in the spring of 1802. The manner of his obtaining them is thus related by Mr. William Jarvis:

"It was a custom of the Spanish court, when a foreign Minister was recalled, on taking leave, to make him a present of five or ten bars of gold—each bar, if I recollect right, was of one pound weight. But as the law of this country forbids any Minister taking any present from a foreign

court, Mr. Humphreys declined it, but suggested to the Minister that he should be much gratified with a royal license to take out of the Kingdom two hundred Merino sheep.—This, the Minister stated, could not be granted, but intimated that if he wished to take them out, no obstruction should be thrown in his way. These were purchased in lower Leon or upper Estramadura, and driven down the valley of the Mondego to Figueira, where they were embarked for the United States. I never could learn out of what flock these sheep were obtained, but they were unquestionably pure blood Transhumantes, which is the only fact of importance worth knowing."

In the years 1808–9–10–11, large numbers of Merinos were imported into the United States. The following is an extract from Mr. William Jarvis' account of their importation. He says:

"I attempted, in 1806, also in 1807, to obtain some from the most celebrated flocks. But the laws were so strict against their exportation, without a royal license, that I failed of success. After the French invasion in 1808, the law became more relaxed; and in 1809, by special favor, I obtained two hundred Escurials. At the second invasion of the French, under Joseph Bonaparte, the rapidity of the march of the French troops hurried the supreme Junta from Madrid, and they retired to Badajos. Being without money, and being afraid of disgusting the Estramadurans, by levying a tax on them, they were compelled to sell four of the first flocks in Spain, which had been confiscated in consequence of their proprietors joining the French. These were the Paular, previously owned by the Prince of Peace; the Negretti, previously owned by the Conde del Campo de Alange; the Acqueirres, which had been owned by the Conde of the same name; and the Montarco, owned by the Conde de Montarco; and were such sheep as could not have been got out of Spain, had it not been for the invasion of the French, and the distracted state of the country, growing out of this invasion.

"When the Junta sold, it was upon the express condition of their granting licences to carry them out of the Kingdom. Four thousand of the Paular flock were sent to England for the King: and Col. Downie, a Scotch officer in the British service, but who also held the rank of Gen-

eral in the Spanish service, and I, purchased the remainder of the flock, between three and four thousand more: And of this purchase, I took fourteen hundred, and he sent the rest to Scotland, with the exception of two or three hundred, which he sold to come to this country.

"Sir Charles Stewart purchased the Negretti flock, and sent them to England, with the exception of two or three hundred, which I got out of his flock after they reached Lisbon.

"I purchased about seventeen hundred of the Acqueirres flock of the Junta, and the remainder were sold, and sent to England. The Montarco flock was bought by a Spaniard and a Portuguese, and about two thousand seven hundred were shipped to this country. I shipped to the United States the fourteen hundred Paulars, one thousand seven hundred Acqueirres, two hundred Escurials, and one hundred Negrettis, and about two hundred Montarcos. Of this number, one hundred was sent to Wiscasset and Portland; one thousand one hundred to Boston and Newburyport; one thousand five hundred to New York; three hundred and fifty to Philadelphia; two hundred and fifty to Baltimore; one hundred to Alexandria; and two hundred to Norfolk and Richmond.

"Besides those which I shipped to the United States on my own account, there were about three hundred Guadaloupes, purchased by others, and two to three hundred of the Paular stock, sold by Gen. Downie, shipped to Boston: and of the Montarco flock, shipped by others, about two thousand five hundred were sent to Boston, Providence, New York, Philadelphia, Baltimore, and Savannah. The Guadaloupes, Paulars, and Montarcos, which were shipped to Boston by others, were for the account of Gorham Parsons, Esq., Gen. Sumner, D. Tichenor, and E. H. Derby, Esq. All these sheep were shipped in the latter part of 1809, and the early part of 1811, and were the only Leonesa Transhumantes, if we include Col. Humphrey's and Chancellor Livingston's, (which I have no doubt were of the same stock,) that were ever shipped to the United States.

"Badajos is but little over one hundred miles from Lisbon, and all the sheep purchased there, and in that vicinity, were shipped at Lisbon. I was then Consul there, and

from my office, was actually acquainted with all the shipments, as certificates of property from me always accompanied them."

In the years 1827 and 1828, Mr. Henry D. Grove imported into the United States 195 pure Escurial sheep, from the celebrated flock of Macherns, in Saxony. Mr. Grove's flock was found to be hardy in the climate of New York, and he was successful in propagating them.

In the years 1824–5–6–7, large importations were made from Saxony of Escurial sheep into the United States, much the largest proportion of which were only grade sheep; and, at this time, only a small proportion of pure Escurials are to be found in this country.

In 1840, Mr. D. C. Collins, of Hartford, Connecticut, imported 20 ewes and 2 rams from the Rambouillet flock of France.

SOUTH AMERICAN SHEEP.

Neither the Argali nor the sheep are indigenous to any part of South America. But the natives of Chili and Peru possessed, from time immemorial, a valuable substitute, in the various species of the Lama. These animals strongly resemble the camel in their general form, except that they have no hump upon their backs; and hence, they are classed by naturalists with the Camelidæ. There are three species of the Lama—the Guanico, or Lama, the Paco, or Alpaca, and Vicuna.

The *Vicunas* are not very unlike goats in their appearance, except that they have no horns, are larger, are of a leonine color, or more ruddy. The wool is very fine, resembling silk, or the fur of the beaver, and is held in high estimation. They live on the highest mountains and groves, and particularly love those cold regions of solitude, called *punahs* by the Peruvians. Frost and snow do not annoy them, but appear to be favorable to them. And such is their timidity, that at the sight or wild beasts, they instantly hurry into inaccessible retreats, and thereby elude their pursuits. They were formerly plenty, but are now become rare, in consequence of being freely hunted and destroyed.

The *Lama*, properly so called, and the Alpaca, are found in Peru, both in a wild and in a domesticated state.

The Lama and Alpaca are both hornless, and strongly resemble each other in figure, disposition, and general properties. But the Lama, in a wild state, is uniformly of a chestnut color; whereas, the domesticated lamas are of various colors. Both the Lama and Alpaca are used as beasts of burthen by the natives; and, for this purpose, are very valuable to them. Their obstinacy, when irritated, is well known.

The *Alpaca*, when full grown, is about thirty-seven inches high at the tip of the head. It is smaller in stature than the Lama; its legs are shorter, with larger muscles, and its wool finer and more abundant; but it is less robust in its habits, being able to carry a continuous burden of only 50 or 70 lbs.; and is less used as a beast of burden than the Lama.

The Alpaca weighs, when full grown, from 160 to 200 lbs. The flesh is said to be wholesome and nutritious: the skin may be used for book binding, &c. It yields annually a fleece of from 10 to 14 lbs., or more. In Peru, they are generally shorn every third year, when the wool is about 8 inches long. It usually grows three inches in a year; but if shorn every year, grows 6 inches or more in a year. As the Alpaca does not shed its wool like the sheep, it sometimes attains the length of 30 inches.

Nine-tenths of the wool of the Alpacas is black; but some of them are entirely white, or red, or grizzled. It is soft and glossy like hair, and is fitted for the production of fabrics, differing from all others, and which are of a medium quality between silk and wool. It is now mingled with other materials, in such a manner that while a particular dye will affect those, it will leave the Alpaca wool with its original black color, thus giving rise to great diversity.

The Alpacas breed in their third year: their period of gestation is nearly twelve months: they usually live ten or twelve years.

Both the tame and wild Lamas and Alpacas are found in large herds on the Andes. Here, at an elevation of from 8,000 to 12,000 feet above the level of the sea, the Peruvian tends his Alpacas and Lamas, allowing them to range at the foot of the snowy cliffs, called *punahs*, or to wander on the *paramos*, or heaths, where they derive subsistence from the moss and licheus growing on the rocks, or crop

the grasses and tender shrubs, which spring up upon the flats which are favored with moisture. But its favorite food is the *ycho*, a sort of rushy grass or reed, which grows in rich abundance on its native hills, where, it is said, these animals are never known to drink, so long as they can obtain a sufficiency of green, succulent herbage.

They are as gentle and docile in their dispositions, and are as readily restrained, as the common sheep, with which, it is said, they perfectly agree.

They will adapt themselves to almost any soil and situation, and are seldom subject to disease, provided the heat is not oppressive, and the air is pure. They will live and thrive on the same kinds of food as are eaten by cattle and sheep; but the inferior kinds of browse, grass, or hay, with a due proportion of potatoes, or other succulent roots, are preferred to rich pasture and farinaceous grains, and are more healthy for them.

From these qualities of the Alpaca, we may infer that it can live best in situations so bleak, that the sheep would starve or perish; and that, consequently, the Alpaca would be well adapted to the higher mountainous regions of the United States; to which localities it may, at some future day, be a valuable acquisition, and far more useful than the best kinds of long-wooled sheep.

The Lamas and Alpacas not being adapted to the lower hills and plains of South America, the Spaniards introduced coarse-wooled sheep into their various territories, both of North and South America.

The soil of the vast plains east of the Andes mountains, which are drained by the river La Plata, are very fertile, and the climate salubrious both to man and animals.—Hence, on those plains, these coarse-wooled sheep multiplied rapidly, and became so plentiful that their carcasses were often used as fuel for burning bricks: and very considerable quantities of coarse wool are exported from Buenos Ayres. During the years 1841 and 1842, seventeen millions pounds of wool were exported from Buenos Ayres. to the United States.

Of late years, the South American farmers have turned their attention to the improvement of their flocks by the importation of fine-wooled sheep from Europe and the United States. In the years 1837 and 1838, 1101 sheep, of the

average value of $9,60 each, and therefore presumed to have been Merino bucks, were exported from the United States to Buenos Ayres.

The largest sheep estate is that of Mr. Sheridan, an Irish gentleman, who has 150,000, all of them from one half to full blood Merinos. This estate lies about fifty miles south of Buenos Ayres, contains seven leagues square of land, and is devoted entirely to the raising of sheep, which are divided generally into flocks of 3000 to 5000 each. The South Down sheep are the hardiest, and increase the fastest. Don Faustius Xemenes has 60,000 on his estate, twenty miles from the city of Buenos Ayres; but generally, the proprietors have crossed with the Saxon breed.

"The price of government lands there is ten cents per acre. It is laid off into "Estancias" a league square, containing 5,700 acres, English: the face of the country almost a dead level, no timber, but a luxuriant coat of grass.

"A cottage is erected in the centre of the farm for the shepherd, and an ample yard enclosed by driving the trunks of the common peach tree into the earth, and wattling the interstices with the branches. An estancia will support 3000 sheep. which is about the size of their flocks. The only care they require is to guard them at night, and during a storm. They will seldom wander beyond the landmarks during the day. At the approach of a storm, they turn their backs to leeward, and feed on until turned by their keeper to a place of security. The shepherd does not remain with the flock, but at the cottage, having a horse already saddled and bridled (ready for a sudden call,) always at the door in the day time."—(Cultivator.)

The shearing season commences in October, the shearing being mostly done by women. Some of them will shear 15, and even 20 sheep in a day. The level nature of the country, and the absence of water, makes it impossible to wash the wool on the sheep's back. It is therefore sold in the dirt. The common wool, after being washed, is worth 6 cents the pound only. The soil of these plains is impregnated with salt petre; and this, by many, is supposed to be the cause why sheep are not subject to foot rot, and are little subject to other diseases. The greatest drawback to the production of wool on the pampas, is the small burr which adheres to the wool: it is the seed of a species

of clover, of which they are very fond. The wool from Cordova, one of the interior States of the confederation, is free from burrs, and is a much cleaner kind. In the year 1845, it was estimated that there were four millions of sheep in the province of Buenos Ayres.

All that tract of country south of the Parana river, and extending west to the Andes, goes by the name of the Pampas, (or plains,) and is a level country, formed apparently by the washings of the great tributaries of the La Plata, without a stone, or a rock, or a hill, more than a gentle elevation of a few feet, so level that a carriage can go over the fields in any direction, and without a single tree or bush. The winter's night is rarely so cold as to form ice of the thickness of glass, and snow is never seen. The Thermometer is never below 30 deg., or above 90 deg. of Fahrenheit. The climate is delightful.

These plains are one vast meadow covered with luxuriant grasses and flowers, and immense quantities of thistles in many parts, which spring up 6 or 8 feet high. But they are subject to excessive drouths, which, at times, are so severe, that large numbers of horses and cattle sometimes perish for want of water. Hence, as the sheep can subsist on green food, without water, with less difficulty than any other domesticated animal, the South American farmers have, from this circumstance, a strong inducement to extend their sheep husbandry; and as the climate and soil are extremely favorable to the production of sheep, we may expect that that country will eventually compete strongly with every other in the production of wools of superior quality.

AUSTRALIAN SHEEP.

The Island of New Holland comprises much the largest proportion of Australia or Australasia, and is situated in the Indian Ocean, between the 11th and 39th degrees of south latitude. It being surrounded by the Ocean, the climate is more temperate than that of the United States, in the same latitudes north of the Equator. But it is subject to drouths, which, though not very frequent, are more serious, and of longer continuance than those of South America. "The great drouth (in New Holland) which commenced in 1826, did not terminate until 1829. Very little rain fell during

the whole of this period, and for more than six months there was not a single shower."—(McCulloch's Com. Dictionary.)

Nevertheless, there is generally a supply of food, and extensive ranges of pasturage; and the climate being mild and rather dry, that country is extremely well adapted to raising heathy sheep and fine wool.

The sheep not being indigenous to that country, the colonists, at first, supplied themselves with inferior, coarse, hairy-wooled sheep, from Bengal. The change of climate and pasturage shortly improved these sheep, so that their fleeces lost their hairiness. Soon after, South Down and Leicester sheep were imported from England. These were crossed upon the Bengal sheep, and improved the quality of their mutton and fleeces.

Previous to the year 1800, Merinos were introduced by Capt. McArthur and others; and at this period there were about 6,000 sheep of all kinds in the colony. In 1813, the number was 65,000, and in 1828, 563,000.—(Wentworth's New South Wales.) In 1843, the export of wool of all kinds amounted to 16,226,400 lbs.—(W. C. Spooner.)

By these data, it must be evident that the increase of sheep in Australia, has been extremely rapid, and that the fine-wooled sheep of that country must be principally composed of grade Merino and Saxon sheep, bred by crossing the Merino and Saxon with long coarse-wooled sheep.

Hence, though the best of these grade wools are as fine as the pure Merino, and are tough and strong, they are longer in the staple, and inferior in sofiness to pure Escurial wools.

As to the management of sheep in Australia, Mr. Cunningham states in his book, entitled "Two Years in New South Wales," that where the country is destitute of timber, the sheep are very easily managed, and as many as a thousand sheep may be trusted to a single shepherd; but in general they are divided into flocks of about three hundred breeding ewes, or four hundred wethers. Every flock has a shepherd, who takes his sheep out to graze before sunrise, and brings them in at evening. He keeps always before the flock to check the forward among them from running onwards, and wearing out the old, sick, and lame;—making all thus feed quietly, so as to keep them in good

condition. In summer he sees, too, that they have water during the heat of the day; and in drawing up under a tree for shade, when it is too hot for feeding, he passes occasionally gently among them, spreads them out, and makes them take a fresh position, in as small groups as possible, under another tree; because, when they remain too long together in one place, they become broken winded. It is a rule that the sheep should never remain in one spot so long as to paddle the ground much with their feet; and hence, in riding round your sheep stations, you have something whereby to judge whether or not your instructions are attended to. The shepherd takes out his victuals with him, and is required to be on the alert all day long, to prevent the sheep from being lost in the woods, or wild dogs from pouncing in among them.

"These flocks are always penned together under the charge of a watchman, who counts each *in* regularly at night, and the shepherds again count them *out* in the morning; so that they form a regular check on each other, and prevent losses from carelessness or depredation. The watchman has a small weather-proof watch box to sleep in, and is assisted by a watch dog; he keeps up a good fire, which generally deters all native or wild dogs from approaching the fold. The hurdles are made of light swamp oak, iron bark, or gum, measuring seven feet long, with five bars, so close together that a young lamb cannot creep through. They are shifted to fresh ground daily, being sloped outward, and propped together by means of forked stakes, driving a stake through between the bars here and there, to keep the hurdles firm, and prevent the wind from blowing them over. Bells are attached to the necks of the stoutest leaders, to keep the flock together, and give warning of any thing going wrong within the fold.

"The breeding season is, in some instances, at the commencement of summer; in others, at the commencement of winter; but, in general, it is in March or April, (*the Australian autumn*,) the rams having been put to the ewes in October. This deviation from our practice is owing, according to Mr. Cunningham, to the breeders finding that the pasture is particularly good in the autumn, from a sort of second spring taking place; while the lambs stand the

cold better than the heat, and are less annoyed by the gad flies."

Sheep shearing takes place at the beginning of their summer. The usual plan of washing is by rinsing them in streams; but of late it has become customary with some proprietors to wash them with a spout. But it is not likely that this plan will be generally adopted, as it requires particular facilities with regard to water, and is, besides, a plan fraught with danger to the sheep. It ought to be kept in mind that a stream of water playing on the body, produces a very stunning (*chilling*) effect, which may destroy life in an inconsiderable time, and has, in this way, been often employed for putting criminals to death."—(Blacklock.)

"The average weight of the fleeces of the improved breeds, is from two to two and a half pounds.

"The range of pasture is so extensive that the sheep are liable to comparatively few diseases. The dryness of the climate keeps the fleece always in so comfortable a state, that they are almost never struck by the fly, which always deposits its eggs on the moistest part of the skin," (*or wool.*)

Notwithstanding the equilibrity and mildness of the climate, bad seasons occasionally occur, and lead to sickness among the flocks; and they are liable to be pastured on improper grounds, by which they become affected with diarrhea, braxy, rot, foot rot, &c., as in other countries.

That portion of the work of Mr. W. E. Spooner which treats of the structure and physiology of the sheep, and which is included within the ten next sections, is very lucid and satisfactory upon the various subjects therein treated, so far as it extends, and, therefore, is inserted with some few corrections and additions.

SECTION XIV.

GENERAL VIEW OF THE STRUCTURE OF THE SHEEP.

The body of the sheep is composed of solids and fluids. The organization of the frame is effected by means of the solids; they surround and contain the fluids; at least one half of the animal system being composed of water.

Late anatomists consider that animals are composed of three forms of tissues, which they have denominated the *fibrous*, the *lamellar*, and the *globular*. The two former are exemplified in the structure of the cellular substance, which composes the greatest proportion of the animal fabric: the fibrous is characteristic of the muscular and ligamentous structures: the fibrous, united with the lamellar, is exhibited in the texture of the glands, and in the medullary substance of the nervous system; and the globular is shown in the composition of the chyle, the blood, and several of the secretions. These several textures, combined together in different proportions, compose the various organs of the body.

To give support to the animal frame, and afford fixed objects for the attachments of the various parts, is the use of the *skeleton*, which, in the sheep, is composed of nearly two hundred bones of various sizes and shapes. These bones, in order to admit of motion, are connected, one to another, by means of strong bands, called ligaments; the ends of the bones being constructed in various ways, so as to admit of motion. In many we have the form of the hinge; in others, that of a ball and socket.

The motion of the limbs is effected by means of the muscles or flesh, which, although to a casual observer appearing as a homogeneous mass, is really separable into a great number of distinct bodies, of various forms and sizes.—These muscles have commonly two separate attachments, which are usually bones, and by contracting in length, they bring these points of attachment nearer to each other.—Muscles are composed of a vast number of fibres, which on being acted upon by the nervous influence, diminish in length and increase in bulk, and thereby approximate the objects to which they are attached. They are usually fas-

tened to bones by means of a strong white substance, called *tendon*, which, however, possesses in itself no power of contraction, but merely communicates the contractile force to the object to be acted upon. Where the two objects of attachments are distant from each other, the greater portion of the distance is occupied by the tendons, the advantage of which is owing to their diminished size in proportion to their strength. Thus we find the legs of the sheep below the knee are light and slender, from the absence of muscular and the substitution of tendinous substance.

The greater part of the muscles are voluntary, being under the influence of the mind; but some are involuntary, such as the heart and the diaphraghm. Muscles are supplied with vessels of various kinds, such as *arteries* for their nourishment, and *veins* for the return of the blood, after this purpose is effected. They have likewise nerves, which are the medium of sensation, and also communicates to them the mandates of the will.

These nerves proceed either from the brain or spinal cord; the brain being the fountain of sensation, and the residence of the mind.

The *brain* is a soft pulpy substance contained within the head, and the spinal cord is somewhat similar in structure, and extends from the brain to the tail, through a hole in the bones which form the spinal column.

The *body* is divided into two principal cavities, the *chest* and the *abdomen*, which are separated by a muscular partition, called the *diaphraghm*. The former contains the *heart* and *lungs*, whose uses are principally to purify and distribute the blood, by means of the *respiration* and the *circulation;* and the latter contains the *stomach* and *bowels*, in which the functions of digestion are carried on, besides several important glands, such as the *liver*, *kidneys*, and *pancreas*, and other organs. Both the small and large intestines are fastened to the spine by means of a strong membrane, called the *mesentery*, which, besides veins and arteries, is furnished with a vast number of small vessels, called *lacteals*. These lacteals open into the intestines, and there absorb the nutritious part of the food, which is a milky fluid, called the *chyle*, and convey it to a vessel running along the course of the spine, which vessel empties itself, near the heart, into the circulating system. Thus, by

these means, the blood becomes enriched with nutriment, and is thus enabled to supply the constant waste which passes from the system.

The *blood*, being furnished with nutriment, requires to be purified before it is fit for circulation. For this purpose, it passes into the right side of the heart, by the muscular contraction of which, it is sent to the lungs, where it is exposed to the action of the atmosphere, by which it is changed from a dark to a light red color, and being freed from impurities, it enters the left side of the heart, and from thence is sent, by means of the *arteries*, to all parts of the body, supplying every part with nourishment, and furnishing each of the glands of the body with materials for the secretion of their *peculiar* fluids. Thus the salivary glands separate the saliva from the blood; the pancreas, a juice somewhat similar; the testicles, the semen; and the kidneys, the urine. The urine being secreted by the *kidneys*, is conveyed by two small tubes into the bladder, whence it is excreted from the body.

The *liver* separates the *bile* from the dark impure blood which is conveyed to it by a large vein.

The contents of the bowels are passed onwards by their vermicular motion, and after the nutriment is extracted from them, are excreted from the body generally in a solid form.

The *cellular membrane* is a very elastic subject, and enters very largely into the composition of the body; it connects the various glands together, forms frequently a covering for the muscles, as well as for various vessels, and exists in the form of cells, which have communication with each other.

The *adipose membrane* is found in various parts of the body, and secretes the fat, which is deposited in a liquid form, and in small circumscribed bags. The *fat* thus contained, often performs the important office of affording a cushion for parts that would otherwise be exposed to injury; thus the socket of the eye is abundantly furnished with this material.

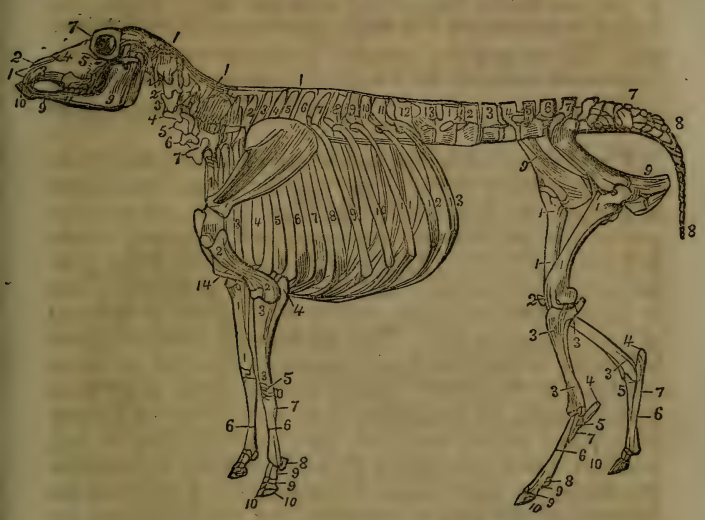
There are two other important membranes which are extensively found in animal bodies: they are the *serous* and *mucus* membranes. Whenever an internal part has an external opening, we find that it is furnished with a mucus mem-

brane, which secretes mucus for its protection; but when the cavity has no external opening, then it is lined with a serous membrane, which secretes a thin watery fluid, to lubricate the parts, and preserve them from injury by friction. Thus, from the entrance of the mouth and nostrils to the anus, throughout the whole internal surface of the bowels, a mucous membrane exists, by which the fluid is secreted, the nature of which gives a name to the membrane, and which protects it from injury, either by the external air, or by the contents of the bowels. The bladder and urinary organs are similarly lined.

On the other hand, the cavity of the chest and abdomen, with their contents, as well as the internal surface of the blood vessels, are furnished with a serous membrane, which secretes a watery humor. These different membranes are frequently the seat of disease, and are subject to severe and dangerous inflammation.

The admirable manner in which the various organs are packed away in their proper cavities, is worthy of particular notice. The lungs, heart, and contents of the abdomen, are so shaped and disposed, that while each organ has full room for the performance of its functions, there is no vacant space whatever.—(Spooner.)

SECTION XV.



SKELETON OF THE SHEEP.

THE HEAD.

1. The intermaxillary bone.
2. The nasal bones.
3. The upper jaw.
4. The union of the nasal and upper jaw bones.
5. The union of the molar and lachrymal bones.
6. The orbits of the eye.
7. The frontal bone.
9. The lower jaw.
10. The incisor teeth, or nippers.
11. The molars, or grinders.

THE TRUNK.

1. 1. The ligament of the neck supporting the head.
1. 2. 3. 4. 5. 6. 7. The seven vertabræ, or bones of the neck.
1—13. The thirteen vertabræ, or bones of the back.
1—6. The six vertabræ, of the loins.
7. The sacral bone.

THE FORE LEG.

1. The scapula or shoulder blade.
2. The humerus, bone of the arm. or lower part of the shoulder,
3. The radius, or bone of the fore arm.
4. The ulna, or elbow.
5. The knee with its different bones.
6. The metacarpal or shank bones —the larger bones of the leg.
7. A rudiment of the smaller metacarpal.
8. One of the sessamoid bones.
9. The first two bones of the foot—the pasterns.
10. The proper bones of the foot.

THE HIND LEG.

1. The thigh bone.
2. The stifle joint and its bone—the patella.
3. The tibia or bone of the upper part of the leg.

8. The bones of the tail, varying in different breeds from twelve to twenty-one.
9. The haunch and pelvis.
1—8. The eight true ribs with their cartilages.
9—13. The five false ribs, or those that are not attached to the breast bone.
14. The breast bone.

4. The point of the hock.
5. The other bones of the hock.
6. The metatarsal bones, or bones of the hind leg.
7. Rudiment of the small metatarsal.
8. A sessamoid bone.
9. The first two bones of the foot—the pasterns.
10. The proper bone of the foot.

The skeleton of animal bodies is formed of bone, a substance possessing firmness and stability for the attachment of muscles, the protection of the vital organs, and the support of the softer parts. It is composed of animal matter and earthy salts; the former consisting of cartilage, gelatine, and fat, or marrow; and the latter of phosphat of lime in considerable proportion, with a small portion of carbonat of lime, and other salts. The cartilage of bones is formed before the earthy matter, and constitutes the nidus, in which the latter is deposited. Bones can be freed from their earthy portion, by immersion in an acid, by which process the gelatine is also dissolved, and pure cartilage is left, which is elastic, but retains the original figure of the bone. On the other hand, bones, by exposure to great heat, are deprived of the animal substance, and the earthy part remains.

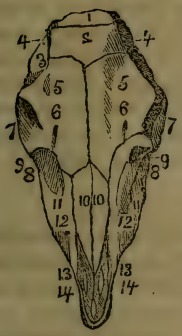
The use of the *marrow* is, more particularly, to prevent the too great dryness and brittleness of bones. To the animal portion of their composition, they are indebted for their shape, and what degree of elasticity they possess, and from the earthy portion they derive the important qualities of strength and durability.

Every bone is covered by a membrane called the *periosteum*, which also lines the internal cavities, and secretes the marrow. Its use is to circumscribe the form of bones, and protect them by its tenseness, as well as to afford the medium whereby they are furnished with their vessels.—The shape of particular bones intimately corresponds to the purpose for which they are intended; where, for the purpose of protection, we find them flat, and where, for the purpose of motion, long and cylindrical, as in the extremities.—(Spooner.)

THE BONES OF THE HEAD.

In order to afford space for the attachment or origin of the horns, the frontal bones project, both forward and laterally, which gives the peculiar breadth of forehead and prominence of the eye to the sheep. This form of the upper part of the face is retained in breeds from which the horn has long ago disappeared. The breeds without horns are denominated *polled sheep*.

THE SKULL OF A POLLED SHEEP.



1. The occipital bone depressed out of the reach of danger.
2. The parietal bones, the suture having disappeared, and also out of danger.
3. The squamous portions of the temporal bones—the buttress of the arch of the skull.
4. The meatus auditorious—or bony opening into the ear,
5. The Frontal bones.
6. The openings through which blood vessels pass to supply the forehead.
7. The bony orbits of the eye.
8. The zygomatic or molar bones.
9. The lachrymal bones, very much developed.
10. The bones of the nose.
11. The upper jaw bone.
12. The foramen, through which the nerves and blood vessels proceed to supply the lower part of the face.
13. The nasal processes of the intermaxillary bones.
14. The pelatine processes.
15. The intermaxillary bone, supporting the cartilaginous pad, instead of containing teeth.

The bones of the skull are thus disposed of in the sheep: the frontal bones occupy the whole of the broad expanse on the top of the head, extending from eye to eye. (See fig. 5.) They are prolonged as far below the eye as above it, encroaching upon and materially shortening the nasal bones (10.10.). Above, they reach much to the parietal bones (fig. 2.); but before they arrive at this point, the head takes a sudden inclination downward, and a little of the posterior part of the frontal bones—that which is most concerned in covering the brain—is out of danger.

The concussion is tremendous when these animals rush against each other in good earnest; but from the peculiar form and strength of the bones which come in contact here,

and the depression of the brain far below, serious mischief is seldom effected. The horn is occasionally broken; the ribs, the limbs, may sometimes be fractured; at the rutting season, the contest may end only with the death of one of the combatants; but it is comparatively seldom that the skull is fatally injured.

The parietal bones of the sheep (fig. 2.), although not elevated to the summit of the arch, as in the horse, yet resume the function of which they are deprived in cattle.—They constitute an important part of the posterior and slanting division of the skull, and have the same dense and firm structure which they possess in the horse. At an early period of the life of the animal, they are formed, as in the horse and cattle, of two distinct bones; but the suture soon disappears in the sheep, and they become one continuous bony arch over the greater part of the brain. Considerable strength is necessary here, in order to sustain or neutralize those violent concussions which may occasionally be propagated from the frontal bones above.—(Youatt.)

THE IMPORTANCE OF THE SIZE OF THE HEAD.

The head of the sheep constitutes one of the principal points by which his quality and profitableness [*as a mutton sheep*] may be judged of. Compared with his general size, it should be small, and, particularly, not wide between the eyes: too great width of forehead is an invariable proof of inaptitude to fatten, at least externally. The sheep with a large head will be a favorite with the butcher, because, in proportion to the slowness with which he gets into condition, will be the accumulation of fat within, even if there was no natural tendency to produce tallow: in other words, there will be more profit to himself (the butcher), at the expense of the grazier and consumer. The head should be small, thin, and short. It is possible, yet not probable, that this may be carried to too great an extent; but that head must be disproportionably small, which can be considered as a proof of too great delicacy of constitution. There is considerable danger in lambing when the head of the sheep is large.—(Youatt.)

THE BONES OF THE BODY.

The *neck* is formed by seven bones, which, with the ex-

ception of the two first, are very much alike. The first is connected with the occipital, or bone of the skull, with which it forms a joint possessing much motion in a vertical direction. In the human head it is termed the *atlas*, from its supporting the head. It forms a joint behind with *the dentata*, as the second bone is termed, from its having in the front part a process like a tooth, which, however, affords the head considerable lateral motion. All the bones of the neck are extremely irregular in shape. They all possess a large hole through the centre for the passage of the spinal marrow, and small ones at the sides for the exit of nerves and arteries. They have also projections on each side and above, for the attachment of muscles; and each one forms a joint, both before and behind, which affords that great flexibility to the neck, which most animals possess.

The *back*, or *chine*, is composed of separate bones, called *vertebræ*, of which there are thirteen belonging to the back alone. They all possess, like those of the neck, a a hole through the centre, for the passage of the spinal cord, as well as a small one at the side, for the exit of the nerves. The superior projection, or processes, are much higher than those of the neck, but considerably shorter than we find in the horse; and thus, we have high withers in this animal, and low ones in the sheep; and they are also shorter in the improved breeds than in the wilder races—a channel between the shoulders and along the back being justly regarded as a sign of a disposition to fatten. These processes serve for the attachment of muscles, as well of a strong elastic substance, which is attached to all the bones of the neck, and also to the occiput, and serves to support the head, and thus relieves the muscles to a great extent.

The *ribs* are attached to the vertebræ by means of a joint —one rib is joined to two vertebræ, and *vice versa*, thus affording the ribs a certain extent of motion. There are thirteen ribs on each side, eight true and five false: the former are attached to the sternum, or breast bone, and the latter are merely joined to the former at the lower parts, which is formed of cartilage. The ribs should spring from the back bone as horizontally as possible, as thereby the rotundity of the frame is increased.

The *loins* are formed by five bones, which partly resem-

ble the bones of the back; but instead of ribs springing from the sides, there are fixed bony processes, several inches in length, which afford a protection or roof for the abdomen. These processes, in a well formed sheep, should be long and horizontal.

After the loins, the spine continues in the *sacrum*, which, in the lamb, is composed of separate pieces, but is consolidated into one bone in the sheep. This bone is perforated for the passage of the spinal cord, which, however, diminishes in size, and terminates at the end of the sacrum, in several nerves which run to the tail. The bones of the tail are numerous, but are not perforated.—(Spooner.)

THE BONES OF THE FORE EXTREMITIES.

The joints, or articulations of the extremities, are the same as those of the horse, but the limbs, on reaching the fetlock joint, become divided, and the four bones, situated below the fetlock, are consequently double. The *scapula*, or blade-bone, is similar in shape to that of the horse, having a spine or ridge down its middle, for the attachment of muscles; but in sheep, the bone is not so long in proportion to its width. It is attached to the ribs by muscular substance, by means of which the body is suspended, or hung, like a carriage, between the fore legs, and concussion is thereby materially diminished.

From the more circular shape of the ribs, the shoulder blades are attached to them with much less mechanical advantage, as far as the speed is concerned. They are placed wider apart, both above and below, but particularly at their lower parts, so that the limbs spread open, at a greater angle, much more like a pair of compasses, than do those of the horse, and even the ox, thus giving the sheep that rolling walk so peculiar to that animal, and so disadvantageous with regard to speed.

The *humerus*, or shoulder bone, strong and cylindrical, forms, with the blade above, the shoulder joint, the action of which, with that of the elbow-joint below, is much more limited than that of the horse.

The *radius*, or bone of the fore arm, is comparatively shorter than that of the horse; and we find that it is always long in animals of speed, and short where speed is not required. This bone is also strong and cylindrical.

The *ulna*, or bone which forms the elbow, does not support the weight, but serves for the attachment of the powerful muscles so conspicuous in a shoulder of mutton, and which are generally divided by the first cut. For this purpose, it is attached to the radius, and rises above the elbow joint, the back of which it forms, but does not reach the knee. This joint, the *carpus*, is composed of seven bones, arranged in two rows, the upper of which articulates with the radius, and the lower with the cannon, or metacarpus.

The *metacarpus*, or shank, much resembles that of the horse, until it reaches the fetlock, where it is to some little extent cloven, so as to articulate with the double arrangement of the bones below. Instead of the two small metacarpal or splent bones that we find in the horse, there is merely one, and that of small extent and use.

The small bones, situated at the back of the fetlock, called the *sesamoids*, and which serve as levers for the attachment of ligaments, and the action of the sinews, are double those of the horse, being four in number.

The bones below the fetlock, viz., the large pastern, or *os suffraginis*, the small pastern, or *os coronæ*, the *os pedis*, or coffin bone, and the *navicular bone*, are all double, and like the same parts in the ox, somewhat resemble the bones of the horse sawn in two.

All these joints have less extent of motion than we find in the horse, and the bones, therefore, present a more upright appearance.—(Spooner.)

THE HIND EXTREMITIES.

The *haunch* is formed by three bones in the young subject, but these bones soon become consolidated into one, and are called the pelvis, or basin, withinw hich is situated the bladder and parts of the organs of generation. Viewing this bone from below it, it appears pretty nearly circular within, but externally, the circle is broken by various irregular processes, two of which project upwards on each side of the spine, which lies between them; these two other bones extend backward below the tail, and are called haunch bones, and two project laterally, and are termed hips.—These bones project but little in a well formed sheep, being altegether clothed with flesh and fat.

The bones of the pelvis extend downwards and back-

wards from the spine, and toward the inferior part form on each side a deep cap or socket, into which fits the upper thigh bone, which is formed like a ball, so as to fit into the socket.

The thigh bone, or *foemur*, extends forward, and is relatively longer in the sheep than in the horse. It is the flesh surrounding this bone which composes the bulk of a leg of mutton. Its lower part forms, with the *tibia* below, the stifle joint, which is singular, from having two cartilaginous bodies within it; and is protected in front by a small bone called the *patella*, or knee-pan, which bone becomes a sort of pulley, receiving the insertions of the very strong muscles above, and is attached below to the tibia by strong ligaments.

The *tibia*, or leg-bone, runs backward from the stifle, and is not so long in proportion as in the horse. It corresponds to the radius in the fore extremity, and it forms the upper part of the *hock* joint.

This joint is composed of six bones, arranged in rows so as to form three articulations, but motion is confined to that formed by the *astralagus*, or knuckle bone, and the tibia. The other bones serve as cushions to diminish concussions, with the exception of the *os calcis*, situated at the back, which acts as a lever, receiving the insertions of the powerful muscles which straighten the hock. This bone is much shorter than in the horse, speed not being required. The bones below the hock correspond with those found below the knee in the fore extremity.

BIFLEX CANAL.

The large pastern-bones are not connected together by ligamentous substance, and it is not till the pastern-joint, that the foot becomes exteriorly disunited. At the situation of this joint in front, we can detect a small opening sufficiently large to admit a small probe. This is the entrance of a small canal, which presently enlarges, and passes first downwards, and then winds round in a semi-circular direction, ending in a sort of *cul de sac*. On cutting into this canal, it appears to be a duplication of its skin. Its internal surface is lined with hair, and there is found a considerable of detached hair, mixed with an oily secretion in the canal, secreted by various small glands which empty into

this *cul de sac*. The hair is, no doubt, excreted from the internal surface, and which, from the smallness of the opening, cannot escape, or rather, is detained for a useful purpose. The use of this canal thus stuffed with hair, is self-evident. The motion possessed by the pastern-joint is so great as to threaten to chafe the skin, by the friction of one side against the other. It is to prevent, or ward off this friction, that these biflex canals, or rather, hair-stuffed cushions, are provided; and also, to secrete an oily fluid which serves to lubricate the parts between the hoofs. This part occasionally suffers from the insinuation of dirt and sand, and is subject to inflammation and ulceration, which sometimes prove very troublesome.

HORNS AND HOOFS.

The horns of sheep are composed of two distinct parts: one is the bony part, which is a highly vascular prolongation of the frontal bone of the upper part of the head. This part is covered over by a portion of the *vera cutis*, or true skin, which runs under the other, or outward part of the horn. This outward part of the horn, which is the part usually called horn, is an elastic sheath of agglutinated hairs or filaments, which are secreted from the skin which covers the bony part of the horn, and which serves to defend the parts underneath from external injury. This sheath, at its base, is thin, being composed of only one layer of filaments. Farther on in its growth, additional filaments are continually added, underneath the layer first formed, so as to increase the thickness. The sheath grows faster than the bony part, and is gradually crowded off from it, and, beyond the bony part, becomes solid, in consequence of the additional filaments which are added. The external filaments may be distinctly seen by the naked eye.

The fleece, or covering of the sheep, consists of hair or wool, or both; and the form of the horn is always in unison with the quality of the fleece. Thus, if a sheep is covered with wool which has many spiral curves, as the Merino, its horns will be spiral; but if the wool or hair is straight, as on the Wallachian sheep, the form of the horns will correspond.

The growth of horns on the sheep appears to be subject to a lunar influence. Frequently, twelve distinct rings, or

protuberances, are formed, in a corresponding number of lunar months of the year, particularly in the third year of their growth, when the growth of horns is most active. This may be ascertained by marking the horns, in the summer of their third year, at which time this fact appears most distinctly.

The horny part of the hoof consists of the crust, or true-horn, and the sole. Both the sole and the horny part are secreted from the vera cutis, or true skin, which runs under and around the bones of the feet. The horse is thinnest at its uppermost edge, and is increased in thickness by additional filaments as it grows downward, and becomes solid at the toes, in the same manner as the horns of the head; so that the sole and crust form a defence to the skin and bones of the feet.

Sometimes a small horn is secreted from the skin of the ear of the sheep. This circumstance shows that it is the skin alone which secretes horn from the animal system.

By the appendix, it will be seen that according to the analysis of Schever, the composition of wool, hair, and horns, is similar; and their odor, when burned, is similar; but they differ in the proportions of their component parts.

SECTION XVI.

THE MUSCLES, OR FLESH.

Although the shape of the body depends materially on that of the skeleton, so that if the latter is any wise faulty, the former will not be perfect; yet there is a very great contrast between the appearance of the skeleton, and that of the body itself, of which it forms a part. Whilst the former is angular and extremely irregular, the latter is round and smooth; so that, though the good shape of the animal depends on the skeleton, yet it requires the eye of the anatomist to detect, in the conformation of the latter, the good points which, in the body itself, are readily observed.

The bulk of the body is formed of flesh or muscles.—Their principal use, when living, is to effect the movement

of the limbs: when dead, to afford nutriment to man. The motion of the body is occasioned by the contraction of the muscles, which, being fastened to different bones, draw these bones towards each other; and thus, the limbs are bent whenever particular muscles shorten or contract.—These muscles which bend the limbs, are called the flexors; whilst an opposite set, which straighen them again, are denominated the extensors; the latter, however, are mostly smaller and weaker than the former. The size and shape of muscles are very diversified, some being so minute as to he scarcely visible, as those within the ear; whilst others, namely, those of the loins and buttocks, are large enough to afford a feast to several persons; some muscles are thin, and spread out like a fan; others are thick and bulky; some are extremely short; others are long and cylindrical. Muscles are furnished with nerves both of motion and sensation: the former convey the mandates of the will, and are thus the cause of motion: the latter communicate the sense of feeling, and are the medium both of pleasure and pain; but the flesh possesses much less feeling than the skin. The muscles are composed of fibres, and are bound together by cellular membrane, and they are, in sheep, mostly clothed with fat, which is also deposited amongst the fibres. It is the capability of containing this fat, and the abundance and laxity of the membrane containing it, which distinguishes a sheep of a good, from one of a bad breed, and gives to the former that softness and elasticity, or resiliency, which is felt on handling it, even when poor. The former sheep, too, possesses large muscles, particularly at those parts where the meat is most esteemed. Thus, the loins of a good sheep are broad, and abundantly covered with flesh and fat, and so likewise are the buttocks and shoulders, whilst the head and neck are small. The muscles that are in most constant use, are more interlaced with tendinous fibre, and, consequently, are much less tender, as meat, than those which are less actively engaged. The muscles of the lower part of the legs, between the knees and hocks and the joints above, as well as those of the neck and head, are instances of the former kind: whilst the muscles of the loins, and more particularly those within the pelvis, are examples of the latter, and afford the most tender meat in the body.

SECTION XVII.

THE BRAIN AND NERVES.

The brain, the seat of the mind, and the fountain of sensation, is a soft body, situated in a cavity of the skull, called the cranium. In man, it occupies by far the greater portion of the skull; but in the sheep, from its much smaller size, and from the large space devoted to the face, its cavity, the cranium is much the smaller part. It is closely invested by a membrane called the *pia mater*, whilst the cranium is lined by a firm, strong membrane, called the *dura mater*. Between these, there is another delicate membrane called the *tunica arachnoides*. The *dura mater*, by its duplications, forms several processes and sinuses: the former, by descending between its divisions, serves to secure the brain in its position, and the latter acts as reservoirs for the venous blood, thus preventing the brain from being injured by any temporary impediment in its passage.

The *pia mater* closely embraces the brain, and dips into its convolutions. The brain consists of three parts—the *cerebrum*, the *cerebellum*, and the *medulla oblongata*.

The *cerebrum* is considerably the largest, and is divided into two hemispheres, each of which corresponds with its fellow.

On cutting into the cerebrum, we find that it consists of two portions—the medullary, or white, and the grey, or costical part. The latter is mostly situated towards the centre, but both appear to run into each other. Within the hemispheres, there appear to be various cavities, canals, and membranes, which, in this work, it is unnecessary to describe.

The *cerebellum*, or little brain, is situated behind the cerebrum, than which it is considerably smaller. It appears to consist of medullary and costical subbstance mingled together.

The *medulla oblongata*, the smallest division, is situated at the base of the brain. It is medullary in its structure, and gives origin to the greater part of the cranial nerves. It is by far the most sensible part of the brain; for whilst

portions of the cerebrum have been cut away, in some animals, without giving any apparent pain, the least pressure on the medulla is productive of injury or death. The brain is largely supplied, by means of the carotid arteries, with blood, which is returned to the heart by the jugular veins.

The *spinal marrow* may be considered as the continuation of the brain, running from the medulla oblongata, throughout the spinal canal, to the tail. It is enveloped by the same membranes as the brain, and continues to the sacrum, where it ends in several nervous cords. Its form is cylindrical, and it has been found to consist of six bands, in the centre of which there is a sort of canal. The nerves arising from the brain and spinal cord, in sheep, are forty pair, ten of which proceed from the brain, and the remainder from the cord, and are, therefore, called the spinal nerves. These forty pair of nerves include all the nerves of sensation and motion.

On examining a nerve, we find that it consists of a vast number of white filaments, each having its particular covering, and yet bound together and invested by membrane. —(Spooner.)

There are certain cavities in the brain which particularly deserve notice. They are called ventricles, and are four in number. They are very irregularly shaped cavities, situated in the medullery portion of the brain; and their surfaces are kept constantly moistened with a fluid, which sometimes collects in too great quantities, and forms one species of the disease called *sturdy*.—(McKenzie.)

CHAPTER XVIII.

ORGANS OF MASTICATION.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

"Sheep have no teeth in the upper jaw, but the bars or ridges of the palate thicken, as they approach the fore part of the mouth; there, also, the dense, fibrous, elastic matter, of which they are constituted, becomes condensed, and forms a cushion or bed, that covers the converse extremity of the upper jaw, and occupies the place of the upper incisor, or cutting-teeth, and partially discharges their functions. The herbage is firmly held between the front teeth in the lower jaw and this pad, and thus partly bitten and partly torn off. The rolling motion of the head is proof of this fact. The teeth of the sheep are the same in number as in the mouth of the ox. There are eight incisor, or cutting-teeth, in the fore part of the lower jaw, and six molar teeth in each jaw above and below, and on either side.—The incisors are more admirably adapted for grazing than in the ox. The sheep bites closer and gathers nourishment where the ox would be unable to crop a single blade. The sheep, by his close bite, not only loosens the roots of the grass, and disposes them to spread, but by cutting off the short suckers and sproutings—a wise provision of Nature—causes the plant to throw out fresh, and more numerous and stronger ones, and thus improves and increases the value of the crop. Nothing will more expeditiously,

or more effectually make a thick permanent pasture, than its being occasionally and closely eaten down by sheep.

In order to enable the sheep to bite thus close, the upper lip is deeply divided, and free from hair about the centre of it. The part of the tooth above the gum is not only, as in other animals, covered with enamel, to enable it to bear and to preserve a sharpened edge, but the enamel, on the upper part, rises from the bone of the tooth nearly a quarter of an inch, and presenting a convex surface outward, and a concave within, forms a little scoop, or gouge, of wonderful execution.

"The mouth of the lamb newly dropped is either without incisor teeth, or it has two. The teeth rapidly succeed to each other, and before the animal is a month old, it has the whole of the eight. They continue to grow with its growth until it is about fourteen or sixteen months old. In the accompanying cut, fig. 1, will give a fair representation of the mouth of a sheep at this age. Then, with the same previous process of diminution as in cattle, or carried to a still greater degree, the two central teeth are shed, and are replaced by new ones, which attain their full growth when the sheep are two years old, Fig. 2 gives a delineation of the mouth at that age.

Between two and three years old, the next two incisors are shed; and when the sheep is actually three years old, the four central teeth are fully grown (see fig. 3.); at four years old, it has six teeth fully grown (see fig. 4.); and at five years old, all the teeth are perfectly developed (see fig. 5.).

In examining a flock of sheep, however, there will often be very considerable difference, in the teeth of the hogs, or one shears; in some measure to be accounted for by a difference in the time of lambing, and, likewise, by the general health and vigor of the animal. There will also be a material difference in different flocks, attributable to the good or bad keep which they have had. Those fed on good land, or otherwise well kept, will take the start of others that have been half starved, and renew their teeth some months sooner than these. There are, however, irregularities in the times of renewing the teeth, not to be accounted for by either of these circumstances; in fact, not to be ac-

counted for by any known circumstance relating to the breed or the keep of the sheep.

The want of improvement in sheep, which is occasionally observed, and which cannot be accounted for by any deficiency or change of food, may sometimes be justly attributed to the tenderness of the mouth, when the permanent teeth are protruding through the gums.

After the permanent teeth have all appeared and are fully grown, there is no criterion as to the age of the sheep. In most cases the teeth remain sound for one or two years, and then, either on account of the hard work in which they have been employed, or from the natural effect of age, they begin to loosen and fall out; or, by reason of their natural slenderness, they are broken off. Causes, of which the farmer is utterly ignorant, or over which he has no control, will sometimes hasten the loss of teeth. One thing, however, is certain—that close feeding, causing additional exercise of the teeth, does wear them down; and that the sheep of the farmers, who stock unusually and unreasonably hard, lose their teeth much sooner than others do.—(Youatt.)

The sides of the mouth are formed by the *cheeks*, which are composed of skin and membrane sufficiently loose to admit the limited motion of the jaws. They are connected with the powerful massiter muscles, which form the greater part of the bulk of the face, and principally occasion the grinding motion of the jaws. In the skull, we find the lower jaw considerably narrower than the upper; but in the living animal this does not appear, the space being occupied by the masseter muscles.

The mouth is principally filled with the *tongue*, which is muscular in its structure, and very flexible, being, indeed, the principal agent in swallowing. It possesses both the power of feeling and tasting, and is covered by a mucus membrane, like that of all other parts of the mouth. The mouth is abundantly supplied with a watery fluid, called *saliva*, particularly during mastication, when it is secreted in considerable quantities.

This fluid is principally secreted by three pair of glands, the largest of which are the *parotid*, situated at the root of each ear; the *submaxillary*, situated under the jaws; and the *sublingual*, situated under the tongue. Besides these,

are other small glands connected with the cheek and bottom of the mouth.

There is, thus, from these various sources, an abundant supply of saliva, more copious than most animals possess, and which is rendered necessary by the hard and woody nature of the food consumed in a natural state: and it has been found that a large supply passes into the stomach, independent of mastication, and is there required for softening and macerating the dry food; for, when deprived of this supply by an experiment, it has been found that the contents of the paunch remained dry.—(Spooner.)

SECTION XIX.

ORGANS OF DIGESTION.

The digestive organs of the sheep, like those of graminivorous animals in general, have a far more difficult and elaborate office to perform than those of carnivorous animals. To meet these peculiarities, the digestive organs are much more spacious and complicated than those of the carnivora: means are afforded for detaining the food until the nutriment can be properly extracted, and a larger amount of chemical and vital force is employed.

The natural food of the sheep is embraced by the apposition of the incisor teeth of the under jaw, and the cartilaginous pad on the upper jaw, and is torn off by the motion of the head. The food being moderately chewed by the molar teeth, or grinders, to which it is conveyed by the tongue, is, by the same organ, carried to the back of the mouth, and being softened by the saliva, and thereby mixed with atmospheric air, enters a fleshy bag called the *pharynx*, or gullet.

This *pharynx* is lined by the same membrane as the mouth, and is surrounded by, and, in fact, composed of various muscles, which contracting force the food forwards into a long tube called the *æsophagus*, which leads to the stomach. The *pharynx* is situated immediately above the *larynx* or cartilaginous box which forms the entrance to the

windpipe, and the food in entering the gullet passes over the entrance to the larynx, which it is prevented from enering by a triangular lid termed *epiglottis*, which in the act of swallowing shuts down on the *larynx*, but otherwise leaves it open for the purpose of respiration. The food after leaving the gullet enters the *æsophagus*, a very long tube lined internally by a white insensible membrane, and externally by muscular coats, which, by contracting, force the food onwards to the stomach. The æsophagus passes down the neck towards its left side and somewhat above the windpipe, with which it enters the chest between the two first ribs; it then takes an upward or ascending course through the cavity of the chest over the base of the heart, passes the midriff or diaphragm, and then descending soon afterwards reaching the stomachs. On entering the chest it somewhat diminishes in size, but again expands in the abdomen. It does not actually terminate in either of the stomachs, but in what is called the *æsophagean canal*, which is about four inches and a half in extent, and is formed above by a continuation of the æsophagus, and below by a sort of muscular pillars—duplications of the upper portions of the first and second stomachs. Thus the æsophagean canal is a sort of lobby or passage having entrances to the different stomachs, and which, with the exception of the second and fourth, are the only entrances these stomachs possess. By the annexed cut it will be seen that the food duct commences at the entrance to the rumen, and for the space of three inches its floor consists of muscular pillars or lips, formed by the upper part of the second stomach, the entrance to which is between these lips. The pillars then continue within the cavity of the third stomach for the space of an inch and a half to the entrance of the fourth stomach, the third being principally situated above, forming the roof of the æsophagean canal. The entrance, however, to the third commences before the opening into the second stomach ceases. The entrance to the fourth stomach is two inches and a half in extent, and is formed by duplications of the mucous and muscular coats of this viscus, which meet so as to close the entrance when either the will of the animal or the necessity of nature requires.

The usual course of the food is into the *rumen* or *first stomach*, whose entrance is close to the termination of the

æsophagus and the entrance of the canal. This stomach is of enormous extent, occupying, indeed, when full, nearly three-fourths of the abdomen. It lies towards the left side extending to the flank, and by a sort of muscular band it is partially divided into two principal compartments. It is lined externally by the peritoneal membrane, in common with the other contents of the abdomen, and internally by an insensible membrane, called the cuticular, between which there are two other coats—the mucous, which secretes the fluid found in the stomach, and external to this the muscular coat, which is formed of two orders of fibres running in opposite directions. Its interior aspect presents a number of pouches or compartments, which are formed by muscular bands thrown across from one part to another; and the surface presents an innumerable number of papillæ or eminences, not sharp, but blunt-pointed, which are formed by the mucous coat and merely covered by the cuticular. These papillæ are coarser in the lower compartment of the viscus than in the upper. We have said the rumen consists of two compartments, but with greater propriety it may be stated that there are three, a smallar one being situated immediately below the termination of the æsophagus and adjoining the second stomach. The use of these partial divisions is very evident. They relieve one portion of the stomach from sustaining the whole of the weight of the food, and they afford a sort of steps or resting-places for the food that has undergone maceration, the upper and smaller compartment being that into which the food is raised just previous to being ruminated. The rumen is partly attached to the second stomach, but only communicates with it through the common opening into the æsophagean canal.

The second stomach is called the *reticulum;* its size is considerably less than the rumen, but it possesses much strength in its coats, and its muscular fibres are more developed. It is globular in shape and somewhat larger than the maniplus, and is familiar to us in *tripe*, not only from its cellular structure, but from its being thicker than the others. Its internal aspect is very singular, having a vast number, indeed several hundred, of shallow cells somewhat like a honeycomb. These cells are much smaller at the part of the viscus nearest the entrance, and gradually in-

INTERNAL VIEW OF THE STOMACHS.

DESCRIPTION OF THE CUT.

A. The lower part of the *œsophagus*, showing its external coat.
B. Its internal coat at its termination.
C. The upper compartment of the *rumen*, or first stomach, showing its internal coat.
D. The strong musculer band which divides the lower from the upper compartment.
E. The lower compartment of the rumen.
F. Another muscular band.
G G. The external coat of the rumen.
H. The entrance to the rumen cut open, and its opposite part reflected back, so as to exhibit an internal view of the second stomach.
I. The external coat of the *reticulum*, or second stomach.
J J J J. The muscular pillars forming the floor of the *œsophagean canal* when close, but now spread open to show the second stomach.
K K. An internal view of the *reticulum*, or second stomach, showing its peculiar honeycomb structure.
L L. The continuation of the æsophagean canal at the entrance to the third stomach.
M M. An internal view of the *maniplus*, or third stomach, showing its peculiar folds or plaits.
N N. The fleshy lips, which act as valves to guard the entrance between them to the fourth stomach.
O. The termination of the æsophagean canal.
P P. The external coat of the *abomasum*, or fourth stomach.
Q Q. The internal coat of the abomasum, or fourth stomach.
Both these coats are displayed by slitting open the stomach and then pinning the duplications together, at its upper part.
R R. The valve formed by puckerings of the internal coat, and guarding the entrance into the small intestines.
S. The internal coat of the small intestines.

crease in size from this point. The sides of these cells consist of ridges formed by the mucous and cuticular coats, and smaller ridges are also observed running across within the cells. Most of them are pentagonal, but many have six sides, and on their surface we observe an immense number of sharp-pointed papillæ much smaller in size though sharper than those of the rumen, and which secrete a mucous fluid. This viscus has the same coats as the rumen, but the muscular coat has two layers of strong fibres arranged both transversely and longitudinally. The opening into this stomach is of some extent compared to its size; the duplications or lips which form it are indeed the floor of the greater portion of the æsophagean canal. Though in the ordinary state the roof or upper part of the reticulum is the floor of the æsophagean canal, yet if air is pumped into the œsophagus so as to distend the stomachs, the situation of the reticulum will become reversed, rising up

towards the æsophagus; and thus if this viscus is distended in hoove, as from its free communication with the rumen it probably is, it must press upon the diaphragm with very considerable force, greater in proportion even that the rumen itself. The contents of this stomach are more liquid than those of the others.

Somewhat before the end of the entrance of the second, the canal terminates, as it were, in the third stomach, the *maniplus* or *manifolds*, so called from its curious internal structure, which is formed by a great number of plaits or folds arranged longitudinally in a direction from the entrance of the stomach; so that although it is not large, externally not exceeding the reticulum, its internal surface is increased in more than a tenfold degree. These plaits are very curiously arranged, being in the form of seven or eight groups of six leaves, each leaf dissimilar in length, the longest extending almost from the upper to the lower part of the stomach. These leaves are studded with numerous small papillæ, much harder than those of the reticulum, and some on the edge of the plaits of the shape of a bent cone, thus  , the point directed towards the entrance. It has been found in certain cows that would never retain their food, but were continually scouring, that these plaits were unusually short.

The maniplus has but one opening, but this opening is in direct communication with both the canal and the fourth stomach, as may be seen in the sketch, page 134. The plaits are studded with numerous minute papillæ, somewhat similar to those found in the reticulum. The maniplus possesses four coats like the others, and its external appearance is globular. Its contents are generally found of a much harder consistence than those of the other stomachs.

The stomach, when full, is found above the æsophagean canal, forming, indeed, a portion of its roof, and its longest leaves fall down, as it were, almost into that canal.

The *abomasum*, as the fourth stomach is called, is, in fact, the true stomach, being that which secretes the gastric juice by which the food is converted into chyme. It is

this peculiar acid which gives it the power of coagulating milk, and in calves it is particularly employed for this purpose in the manufacture of cheese, under the term rennet.

Externally this organ is somewhat conical in shape, its apex being the part which joins the intestines. It possesses three coats, like the other stomachs; but its internal surface is very different, being smooth and shining, and of a pale red color. Its mucous membrane is, indeed, very vascular, and this secretes the gastric juice. The internal surface is greatly increased, and exceeds the external, by being in the form of plaits, arranged longitudinally, but very different from those found in the maniplus. The entrance to this stomach (its *cardiac* opening) is close to the entrance to the maniplus; it is arranged somewhat in a crescentic form, and is situated at one extremity of the base, while the *pyloric* opening, leading into the small intestines, is, as before observed, situated at the apex. Having thus described the situation and appearance of the stomachs, an external view of which may be seen at page 142, we must return to the consideration of the course of the food through them.

The situation, the structure, and the size of the rumen point it out as the first and general receptacle for the food, which receives in the mouth only sufficient mastication to enable the animal to swallow it. It is then received by the rumen, and morsel after morsel is taken until this viscus is comparatively full. The animal then feels some repletion, and rumination usually takes place, the animal generally preferring a recumbent position. It has been shown, however, that it is not the food just taken, but that which has been swallowed some twelve or sixteen hours previously, that undergoes the ruminating process. The food, indeed, is turned and shifted about the stomach by its muscular action, and well mixed with the fluid secreted by its internal surface: it, of course, enters at first the superior compartment, from which it passes to the inferior, and again enters the former division ere rumination takes place. A tolerably full stomach is necessary for the act; for it has been found in sheep that had fasted for several days that a tolerable portion of food still remained in the rumen. Before rumination can take place it is evident that the food must rise to the upper part of the viscus and enter the æsopha-

gean canal. What, then, is its direction? The liquid portion passes on in the course of the canal; but it is contended by some physiologists that the second stomach, the reticulum, is the active agent in rumination, and that the food enters it previous to its being returned to the mouth, and they are supported in this opinion by the muscular strength possessed by this viscus. In opposition to this opinion it may be urged that it requires but little more force to raise the food to the root of the æsophagus than to the entrance of the reticulum, and also, that the contents of the second stomach are of a more fluid nature than those of the first. It is not to be supposed that all the food taken is again ruminated; it is only the hard indigestible portion that undergoes the process. Rumination is assisted by the pressure of the abdominal muscles and the diaphragm, and the larger and more distended the stomachs the more likely they are to receive assistance from these aids. Keeping these facts in view, we are inclined to believe that both the first and second stomach may have equal power in the process of rumination. In accordance with this idea we must suppose that a mass of food is raised from the rumen into the æsophagean canal, that the hardest and driest portion is selected by the root of the æsophagus, and that the other part passes onwards, and whilst some portion may reach the third, the great part will fall, as it were, through the trap-door into the second stomach, there to undergo a further macerating or digesting process. When this viscus is moderately full it will contract on its contents, and first squeeze out the fluid portion, which will, of course, pass onwards into the third and fourth stomachs, whilst the solid part will be embraced by the æsophagus and returned to the mouth.

It is evident that the functions of the æsophagus are much more onerous than in non-ruminating animals, and accordingly it is furnished with more muscular power; the lower portion particularly is surrounded with spiral muscles, by which the selected pellet is first sent upwards.

It is not unlikely that some portion of the food may be submitted two or more times to the process of rumination.

It is probable that the most liquid portion of the food at once enters the fourth stomach, and that of a harder nature the maniplus. The singular construction of this vis-

cus evidently shows that it must effect an important office, and it has been found that in animals which through life have never thriven well, notwithstanding that they have consumed a larger quantity of food than other beasts, the maniplus has been imperfectly formed, the plaits being short so as to afford considerably less surface than usual.—The use of this stomach, therefore, is to detain the food, to press it between the folds, and to soften it by the secretion afforded by its extensive surface, and thus to prepare it for the action of the gastric juice in the fourth stomach, to which organ we now trace it.

In the young animal living entirely on its mother's milk, the fourth is the only stomach employed; it is, therefore, then fully developed, whilst the others are small and imperfectly formed. The milk contains the elements of nutrition in a much more perfect state than it exists in vegetable food. It requires but a little separation in order to fit it for nutrition. As the young animal gradually becomes inured to other food, the other stomachs become more developed. By the time the food reaches the *abomasum* it is in a macerated pulpy state, and fit to be exposed to the powerful solvent action of the gastric juice. This fluid is secreted in abundance by the mucous coat of the fourth stomach. It is a peculiar fluid, acid in its nature, and so powerful a solvent that it has been known after death to dissolve a portion of the coats of the stomach itself. It has in its composition muriatic acid, and its action on the food is of a chemical nature, converting it into *chyme* and rendering it into a fit state for the other digestive processes. The food being thus dissolved passes through the pyloric opening into the small intestines; this orifice has a valve-like construction (see p. 134), admitting the food to pass in one direction only, and then not until it has been sufficiently acted on by the gastric juice.

The small intestines are of considerable length in the sheep, being upwards of sixty feet. In the human subject it is customary to divide them into three portions, and they are called the *duodenum*, the *jejunum*, and the *ileum*.—These distinctions are arbitrary even in man, but still more so in the sheep, and, in fact, cannot be properly applied.—The whole length of the intestinal tube of the sheep, from

the stomach to the rectum, is upward of 90 feet.* The first portion of these intestines (the duodenum in man) differs much from the rest. It lies comparatively loose, and on opening it we observe a yellow substance, which is, in fact, the bile, which enters by a duct or very small tube some eighteen inches from the stomach, and at nearly the same place another fluid flows in from the pancreas or sweetbread. These fluids, it may be supposed, exercise an important office in the process of digestion, and the early portion of the small guts is the situation where the admixture takes place.

The *liver* is a bulky organ whose size, general appearance, and shape must be familiar to most people. Its weight in sheep is about one-fiftieth that of the carcase, and its specific gravity is somewhat greater than water. It is partially separated into divisions or lobes, and is principally situated towards the right side. Its office is to separate the bile from the venous blood—that which has circulated through a great portion of the body and is on its way to the lungs to be re-purified. It is called a gland, and is, in fact, a fine sieve or filter, having the power of separating a peculiar substance from the blood and no other. It is supplied with arterial blood for its own nourishment, but by means of a large vein called the *vena porta* it is furnished with venous blood for the exercise of its functions. The bile being thus separated, is then conveyed into a reservoir attached to the liver and called the gall-bladder, from which the gall-duct rises, and enters the intestine about eighteen inches from the stomach. Ruminating animals, in common with man and the carnivora, are furnished with a gall-bladder, whilst horses and the other solid ungulous animals do not possess them; the reason being that in the latter the digestive process is continually going on, and therefore a constant supply of bile is essential, while in the former the food is either taken in distinct meals, as in man and the carnivora, or otherwise the ruminating process is carried on and renewed at different periods, as in sheep and cattle—in either case requiring large and copious supplies of bile to complete the process of digestion. It must be evident from the existence of the gall-bladder in some species of animals and its absence in others that the bile must perform an important part in the digestive process. One of its

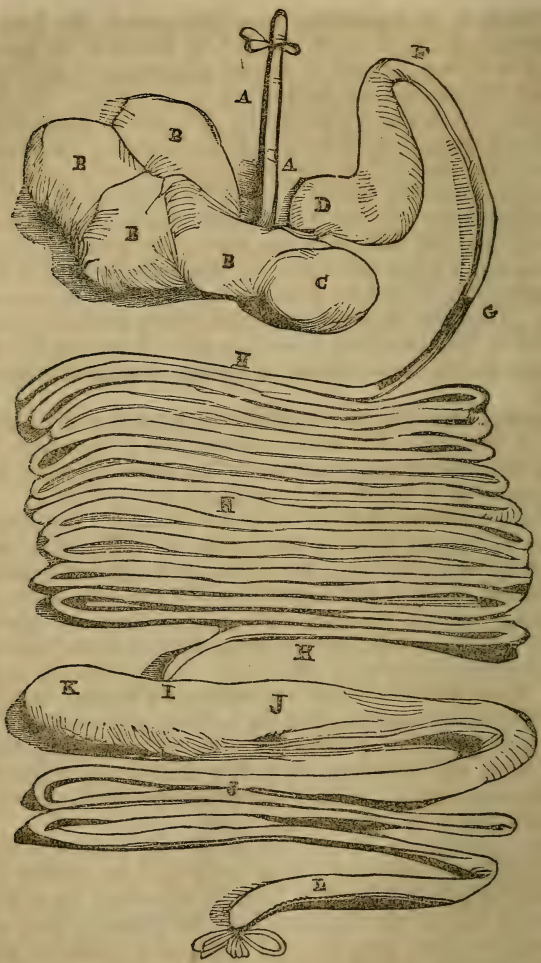
*Blacklock.

functions is to neutralize the acidity which the food or *chyme* has acquired in the stomach by means of the gastric juice, and thus prepare it for the separation of the chyle which may be seen on the surface of the food. For this purpose it is largely supplied with an alkaline fluid, which unites chemically with the acid of the chyme. The quantity of bile secreted by the sheep in 24 hours is very considerable, probably from 3 lbs. to 5 lbs.; but we are not to suppose that its sole use is that above stated, for it has been proved that the bile does not pass away with the excrements, but is again taken into the system to perform an important office to be noticed when we speak of the circulation. Thus the liver separates that which would be detrimental to the blood, and it supplies what is wanted for digestion as well as for another important process in respiration.

Besides the bile the duodenum receives a copious supply of fluid of a thin watery nature from the pancreas.—This fluid closely resembles the saliva, and its principal use appears to be to liquify the contents of the intestines.

The remaining part of the small intestines understood under the terms *jejunum* and *ileum* are confined to, and connected with, the spine by means of a thin transparent membrane called the mesentery, which not only supports the intestines, but prevents their entanglement, and serves as the vehicle by means of which the arteries, veins, nerves, and absorbent vessels are transmitted to and from the bowels. Amongst these there are some very minute, though very numerous vessels called the lacteals, whose office it is to convey the chyle, a white milky liquid resembling albumen, from the intestines to a duct termed the *thoracic*, which passes along the spine and terminates in a large vein just previous to its arrival at the heart.

The composition of the chyme is very similar to the blood, differing from it in little more than the absence of its coloring principles. The lacteals, of course, open into the inner coat of the intestines, and the greater portion of the chyle is taken from the food in the small intestines and in the earliest portion of them in the greatest degree. The small intestines are remarkably long in the sheep, exceeding, indeed, sixty feet, and this great length renders them capable of containing much more than the large guts.



EXTERNAL VIEW OF THE STOMACH AND INTESTINES

Spread apart and arranged according to the following scale, so as to show their actual and relative size.

1 foot.

DESCRIPTION OF THE CUT.

A A. The *œsophagus.*
B B B B. The *rumen*, or first stomach, showing its compartments.
C. The *reticulum*, or second stomach.
D. The *maniplus*, or third stomach.
D. The *abomasum*, or fourth or true stomach.
F. The commencement of the small intestines at the pyloric orifice of the stomach.
G. The situation where the biliary duct empties its contents into the duodenum.
H H H. The small intestines freed from the mesentery, and arranged evenly, so as to show their length.
I. The termination of the small and beginning of the large intestines, guarded by a valve.
J J. The *colon*, or first large intestine.
K. The blind extremity of the colon, by some termed the *cœcum.*
L. The *rectum*, or straight gut.

In man, the large intestines are distinguished as the *cœcum*, the *colon*, and the *rectum;* in the horse, these divisions likewise obtain, and with much more propriety than the artificial distinctions of the small guts. The cœcum and the colon in the horse commence almost close to each other, but the former is a blind gut, having but one entrance. The sheep, however, can scarcely be said to possess a cœcum, unless we term the blind portion of the colon by that name; for the fact is, the small intestines terminate in the large at a right angle with them (see I, in p. 142), and the blind portion extends about a foot in one direction from this angle and maintains its size for the space of two feet.

The termination of the small intestines in the large deserves particular notice. The internal membrane of the former projects into the latter so as to form a sort of valve, which, admitting the fæces to pass forwards, effectually prevents their passing backwards, and thus, too, prevents the effects of clysters operating beyond the large intestines. The diameter of the colon is about treble that of the small intestines, but this increased size only reaches the extent of three feet, when the intestine gradually diminishes to about the size of the small guts, and so continues for about nine feet, when it enlarges about a foot prior to its termination. This latter portion may be termed the rectum without impropriety. Soon after the large intestines become narrow, the fæces gradually become hard, and ac-

quire the form of small black balls, in which state they are dropped.

The chyle, we have observed, is principally absorbed from that portion of the small intestines termed the ileum: there is little or none remaining by the time the fæces reach the large intestines, but the fluid absorbed from these guts is principally of a watery nature.

SECTION XX.

THE URINARY AND GENERATIVE ORGANS.

The urine is separated from the arterial blood by means of the *kidneys*, which are two large glands shaped like a bean, situated within the abdomen, but attached firmly to the loins. These glands are largely supplied with blood by important arteries; and the urine being separated as by a filter enters two long white ducts termed the *ureters*, one of which rises from the pelvis or central notch of each kidney, and passes on to the bladder, whose coats are pierced in an oblique direction (which, forming a sort of valve, prevents the urine returning) not very far from its extremity or fundus.*

The *bladder* is situated partly in the pelvis and partly in the abdomen, the latter part being comparatively free, whilst the former is closely attached to the pelvis. The shape of the bladder is too well known to need description. It becomes smaller as it approaches its posterior part, where it contracts and forms the neck just opening into a canal

*The urine of the sheep is much less copious than that of the cow, and, though less abounding in substances containing nitrogen, possesses a larger proportion of salts. The following is an analysis of 100·000 parts by weight:—

Water	96·000
Urea, along with some albumen and coloring matter	2·800
Salts of potash, soda, lime, and magnesia, with traces of silica, alumina, iron, and manganese	1·200
	100·000

This gives 4 per cent. more water than the urine of cows, than which it is

called the urethra. The bladder, although apparently so thin, yet has three coats, the middle one of which is muscular and possesses the power of contracting so as to expel the whole of its contents when required, and the opening is usually kept closed by a sphincter or circular muscle, which relaxes when the bladder is being emptied. The urethra in the ewe is very short, a few inches only in length, and it is guarded by muscles which are employed both in expelling the urine and in the act of procreation.

In the ram the urethra is of considerably greater length, extending the whole length of the penis; it forms an acute angle at the perineum, just under the anus. The *penis* is a muscular organ, having a very curious structure, which enables it to receive at times a considerably increased quantity of blood, which causes the erection of the organ and fits it for the purpose of generation. Its usual state, however, is flaccid, when its use is confined to the ejection of the urine.

The *vagina* and *uterus*, or womb or lamb-bag, lies between the rectum above and the bladder below, and though much within the pelvis in their ordinary state, yet when pregnant they rise into the abdomen to a great extent. The vagina, which commences a few inches within the body, is a cylindrical cavity several inches in length, and opens into the uterus by a round opening called the mouth of the womb, which is naturally open, but becomes closed after impregnation. Its shape corresponds with the extremity of the penis, and these parts come in contact in the act of coition. The womb consists of a body and two branches or horns. It has the same number of coats as the bladder, but they are much stouter and more so than those of the vagina. Attached to the extremity of each horn by a membranous substance are two red bodies called the ovaries, each of which consists of a number of ova or eggs, the germs of the offspring, one of which on being impregnated escapes into the uterus, and thus, in the course of time, be-

less fertalizing to the soil, if the latter is properly prepared; but the dung of sheep is much more nutritious than that of cows, and the urine likewise, when dropped on pasture land, is more serviceable, in consequence of the small quantity deposited at a time, and the less proportion of caustic ammonia contained, so that it does not render the herbage rank, as is the well-known effect of the fresh urine from cows.

comes a young animal; sometimes, indeed, two or even tree ova may be impregnated, and twins or triplets are produced.

The *testicles*, or stones, as they are commonly termed, are two oval glands situated in the scrotum, a sort of bag formed by the skin and two membranes within, which are so disposed as to form two separate cavities, each containing a testicle. The testicles are first formed in the abdomen of the fœtus, aud each possesses a covering closely attached to the gland. They escape from the abdomen through the openings called the abdominal rings and take with them portions of the peritoneum, the membrane which lines the abdomen and its contents; thus it is that they possess two coats besides the skin. The abdominal rings remain open afterwards, contrary to what takes place in the human subject, so that a fluid can be ejected from the scrotum into the abdomen, and thus it is that sometimes after the operation of castration inflammation takes place and spreads upwards into the belly and destroys the lamb. In those cases where portions of the intestines are found in the scrotum they escape from the abdomen, together with the testicle, and the case is denominated congenital hernia. The testicles are also each connected with the belly by means of the spermatic cord, which consists of a long slender muscle, nerves, veins, arteries, and a strong hollow tube called the spermatic duct. It is the latter which conveys the semimal fiuid secreted by the singular structure of the testicle into the urethra, where, after mixing with other secretions from some small glands, it is forcibly ejected by the muscles of the penis in the act of copulation.

The testicles are very large in proportion to the size of the animal, and are in keeping with the powerful seminal powers possessed by the ram, and which enable him when full grown to serve properly eighty ewes or upwards.

SECTION XXI.

THE CONTENTS OF THE CHEST.

The *mouth* in the horse is almost entirely devoted to the office of mastication. It is separated from the cavity of the nostrils by a loose fleshy membrane called *velum palati*, which is confined to the bone above by a semi-circular border, and falls downwards and backwards so as to prevent, in a natural state, any communication between the windpipe and the mouth. The sheep likewise possesses this *velum palati*, but it is not so long, and therefore permits this animal to respire through the mouth as well as the nostrils. The importance of this construction is seen in the process of rumination, and also accounts for the horse vomiting through the nostrils, on those few occasions when this animal has been known to vomit. The nostrils, however, are the principal channel through which the air passes to and from the lungs. Their entrance is comparatively small and confined; the sheep does not require so extensive a supply of air as other animals that are called upon to make considerable exertions. The cavity of the nostrils is divided into two compartments by a thick cartilaginous substance, termed by anatomists the *septum nasi*, fixed to the nasal in front, and behind to the maxillary bones. This cartilage, as well as the other parts of the nostrils, is lined by a fine delicate membrane which secretes a mucus for its protection. It is indeed an inflammation of this membrane which constitutes a catarrh or cold, and an increase of its natural mucous secretion is the discharge from the nose which is visible in this disease.—This membrane is called the *Schneiderian*, from the name of its discoverer, as well as the *pituitary*, and it is endowed with a high degree of sensibility, which it derives from an abundant supply of sensitive nerves; it is also the principal seat of the sense of smelling, and for this purpose the nerve devoted to this function is spread out on its surface. This membrane also covers four curious bones, thin and gauze-like in their structure, and rolled up like a turban, so that they are termed turbinated, and attached to the chambers of the nostrils. These greatly extend the surface on which

the nerve of smell is diffused, and consequently increases the function of this sense, which sheep enjoy in a very high degree. The nostrils at the upper and back part terminate in a cartilaginous box called the *larynx*, which is situated immediately beneath the pharynx or food-bag, so that food, in passing into the latter, traverses the entrance of the former, which, however, it is prevented from entering by a triangular lid called the *epiglottis:* this lid in its usual state is elevated from the glottis or entrance of the larynx, so as to admit the free entrance and exit of the air, but the passage of food forces it down so as to close the entrance of the windpipe. The *larynx* is formed by four separate cartilages besides the epiglottis just spoken of. One is shaped like a shield, and forms the front of the larynx and great portion of its sides. Another below this is circular, and two other smaller ones, shaped like an ewer, forms the rims on which the epiglottis shuts down. The larynx is lined throughout by a mucous membrane, which is endowed with a high degree of sensibility, particularly at its upper portion; and thus when any foreign body accidentally enters, or the mucus is in undue quantity, it excites the membrane, and coughing is produced, by which it is expelled. The *windpipe* consists of a number of cartilaginous rings connected together by elastic membrane so as to form a continuous tube passing down the front part of the neck, and entering the chest between the two first ribs. The rings are not completely cartilaginous, but the circle is made up of membrane, the membranous part being on the upper portion of the tube. This structure permits the windpipe to be bent in any direction or compressed without injury, its elasticity quickly restoring it to its former shape, or position. The windpipe, on entering the chest, divides into two portions, going to each division of the lungs; and these subdivide into others, which again ramify into numerous small tubes, which ultimately terminate in very minute air-cells. The lungs, which receive these terminations, form by far the greater portion of the contents of the chest, which, however, it will be proper to describe first.

The *chest* of the sheep, in common with most quadrupeds, is unlike that of the human body, becoming narrow towards the lower part and terminating like the keel of a ship; a form more favorable to the flexion and extension

of the fore-legs, as well as of the shoulder-blades, than any other. This keel-like form is, however, much less developed in the sheep than in the horse and many other quadrupeds. The upper part of the chest is formed by the spine or back-bone, the sides by the ribs, and the lower and front part by the sternum or breast-bone. The number of ribs varies in different animals; in man there are twelve, in the horse eighteen, but in the sheep there are only thirteen pair. Each rib possesses two heads or protuberances, each of which is connected by a joint with two vertebræ or bones of the back, and to the breast-bone by means of cartilage. The sternum or breast-bone, in young animals, is chiefly cartilaginous, and may be separated into eight pieces; it afterwards becomes divisible into four only, and with age is consolidated into one. The ribs are externally convex, and are divided into the true and false; the former being situated anterior to the others, and immediately connected with the sternum, whilst the latter are implanted into each other at their cartilaginous extremities, and are only connected with the breast-bone by means of the true ribs. Their connexion with the spine, by means of a double joint, affords to the ribs a motion backwards and forwards, by which means the cavity of the chest is enlarged or diminished. This motion, however, is considerably less in quadrupeds than in man, for in the latter the rising and falling of the chest is seen in common respiration, whilst in the former it is not perceived, unless the breathing be embarrassed. The ribs are connected together by fleshy substance, termed the interested muscles, which are disposed in an oblique course, by which means their length considerably exceeds that of the space between one rib and another, so that a contraction of one-third their length will bring the ribs together, which could not be the case if the muscles took the shortest course from one rib to another.

The chest is separated from the abdomen or belly by a very singular and important muscle, called the *diaphragm* or midriff, which is convex towards the chest when in a state of rest. This muscle is shaped somewhat like a fan, and is attached to the inferior extremities of the ribs and the spine, by which means its position is rendered oblique, its developments more extended, and its action greater than it would otherwise have been. The diaphragm, unlike ev-

ery other muscle, is fleshy at its circumference and tendinous at its centre. The reason of this peculiar construction may be thus explained :—the central part of the diaphragm is pierced with two holes, for the passage of the æsophagus (the tube which conveys food to the stomach) and the vein which conveys the blood to the liver for the secretion of bile. Now, if these important vessels were surrounded with muscular substance, they would be forcibly compressed every time the diaphragm contracted, and would in consequence be liable to considerable injury; but being surrounded with tendinous substance, which possesses no such power of contraction, all danger of compression is at once removed, without any sacrifice of strength or power in the muscle. The diaphragm, when in a quiescent state, is convex towards the chest, and when in action it becomes flat, thus enlarging the cavity of the chest.

The *thorax* is everywhere lined internally by a thin serous membrane, which secretes a fluid by which the surface of the cavity is lubricated, and its contents are enabled to glide upon each other without occasioning any friction or inconvenience. This membrane is called the *pleura*, and the portion which lines the chest itself is designated the *pleura costalis*, while that which covers the lungs is distinguished as the *pleura pulmonalis*. This membrane divides the chest into three cavities, one on the right side containing the *right* lung, and the other two on the left side, the smaller of which contains the *heart* and the larger the *left* lung.

The *right* lung is thus the largest, and consists of three lobes or divisions, whilst the *left* lung only contains two.—These divisions of the chest do not communicate with each other, so that if one cavity is injured, or air is admitted into, respiration can be carried on in the other.

The *lungs* are light spongy bodies, their specific gravity being one-half less than water. They are composed of the air-cells before spoken of, the bronchial tubes connected with them, and a vast number of arteries, veins, and absorbent vessels, the whole being connected together by cellular substance, or *parenchyma* as it is termed: thus constituted, the lungs are closely packed away in the cavity of the chest, filling every part of it, so as to leave no vacant space whatever.

CHAPTER XXII.

THE BLOOD AND ITS CIRCULATION.

The blood is by far the most important fluid in the animal machine: it stimulates the heart to contract, secretes and nourishes the various organs of the body, and supplies it with heat; and although it is the source whence other fluids are obtained, it is yet a fluid *sui generis*, differing from all others. Soon after it is drawn from the body it coagulates, and then separates into two parts: the *serum*, a watery, colorless fluid, which floats on the top, and the *crassamentum*, which appears of a firm consistency and a red color. The serum is a peculiar fluid, and may be separated into its constituent principles. If subjected to a temperature of 150 deg., a portion is converted into a substance resembling albumen or the white of an egg; the other portion remains fluid and is termed the *serosity* of the blood, and is that which constitutes the gravy in meat.—The serum contains several salts in solution, the most abundant of which is soda. The crassamentum is likewise divisible into two portions: the cruor, which gives to the blood its purple hue; and the lymph, which is more solid in its nature, and is considered the basis of the coagulum. The latter can be separated from the former by washing, and likewise separates when the blood is a long time coagulating, in which case the red portion of the blood, being the heaviest, falls to the bottom of the vessel, leaving the lymph on the top. The cruor, or red portion of the blood, has been found, on being submitted to a microscope, to be composed of globules, which are supposed to be each about the three or four thousandth part of an inch in diameter.—It is therefore to these globules that the blood owes its redness: but the intensity of the color is subject to great variation, being darker in animals that are poorly fed, or when exposed to carbonic acid, and becoming more florid in others that are well fed, and also when exposed to oxygen, or to atmospheric air.

The other part of the cressamentum, the lymph, which from its nature is also called the *fibrine*, is, in fact, the most important of all; for it is that which mainly supplies

the different parts of the body, particularly the muscles, with nutriment, and repairs wounds and fractures in an extraordinary manner. Unlike the cruor, it exists in the blood of all animals, and in every part of the system.—Some animals have entirely white blood, the cruor being absent; and in red-blooded animals there are some portions of the body, such as the white of the eye, where the vessels are so small that they do not admit the red globules. The specific gravity of blood rather exceeds that of water; but venous blood is somewhat heavier than arterial. The temperature of the blood varies in different animals; in man it is 98 deg., but in the sheep 103 deg. It is rather warmer in the arteries than in the veins, and is liable to variation from disease, it having been found in severe inflammations to be raised 7 deg. in man, and in the cold fit of agues 4 deg. lower than in a state of health. It is, however, but slightly raised or depressed by external temperature.—It was not till comparatively a recent date that the blood has been considered to possess vitality, which, however, is now generally acknowledged. The vitality and fluidity of the blood are intimately associated; in fact, its coagulation, when removed from the body, constitutes its death. The time in which this is taking place is different in different animals, and is influenced by various circumstances. In strong animals, such as the horse, it is longer than in such weak animals as the sheep: in the former it is often as long as fifteen minutes; and if the body be in a state of plethora, the vital power being too highly developed, the death of the blood is much longer resisted. In these cases coagulation is delayed, and, in consequence, the red portion of the blood, being the heaviest, falls to the bottom of the vessel, and the fibrine remains at the top, constituting the buffy coat of inflammation. This separation, when arising from the above cause, takes place long before the serum is developed. The coagulation of the blood has been endeavored to be accounted for without success; it was held by some that it was produced by the cessation of its motion; but it has been found that if stirred in a vessel it will coagulate quicker than before. It was thought that exposure to the atmosphere was the cause; but it has been known to coagulate in a vacuum, and likewise in the body when a vein has been tied. It was next conceived that it was cau-

sed by the low temperature to which it is exposed; but it has been ascertained that it will coagulate quicker if the temperature is either higher or lower than natural; but if so low as to freeze the blood, it will not coagulate when afterwards thawed. These experiments show that the blood is analagous to no other fluid, and that coagulation cannot be owing to physical causes, but can be explained only by reference to its vitality.

Although the blood will coagulate in the body if obstructed, yet there is a considerable difference between this state and its coagulation out of the body. In the former instance coagulation is longer occurring, new vessels are thrown into its substance, and it becomes organized. So, likewise, if a part be wounded, the divided vessels throw out clots of blood, which adhere to the surface of the wound; the red particles become absorbed, the glutinous fibrine organized, and the breach is thus gradually restored. Thus we see how important it is that the blood should possess its peculiar properties, its state of fluidity, and its disposition to coagulate: if the former did not exist, the blood would be obstructed in the capillary vessels, and the vital functions could not be carried on; and if deprived of its coagulating property, no wounds could heal, or loss of substance be restored, but the most trifling cut would be the precursor of death.

The quantity of blood contained in the body is very difficult to ascertain; for if an animal be bled to death, a good deal will still remain in the blood-vessels. It has, however, been estimated to be about one-fifth the weight of the body; and of this, about three-fourths are contained in the veins, and one-fourth in the arteries. In young animals there is more than in old ones, as in them the body must not only be sustained, but increased in size. It is likewise more abundant in wild animals than in tame ones, and in proportion to the vigor of the animal.

The *Heart* is a strong hollow muscle, of a conical shape, with its base towards the spine, and its apex towards the left side, against which it is thrown at every contraction.—It is double, having a right and left side, the former containing black, and the latter red blood; the right side is the thinnest and weakest, being devoted to the lesser office of the circulation of the lungs; the left the stoutest, having to

govern the general circulation of the system. Each of these halves consists of two cavities, an auricle and a ventricle; the former, which derives its name from its resemblance to a dog's ear, is considerably thinner than the latter, and is situated towards the base. The heart is formed principally of fleshy fibres, connected together by cellular tissue, whence it obtains its elasticity; and its surfaces, both internal and external, are lined by a transparent membrane. The blood is prevented from moving in a retrogade course by means of a number of valves: there are three in the left ventricle, the edges of which are connected by tendinous cords (*cordæ tendinæ*) to small fleshy eminences on the inside of the ventricle, called *carnæ columnæ*, or fleshy columns. The tendinous cords are more numerous in the valves of the left ventricle than in the other parts, and being supposed, with the valves, to resemble a mitre, are named mitral valves. There are valves also in the right ventricle for similar purposes, which are named tricuspid, or three pointed; also in the great artery, or aorta, and in the pulmonary artery, where, having no cords, and resembling, or supposed to do so, a half-moon, they are named semilunar. The heart is enclosed in a strong membranous bag, which is named *pericardium*, and this encloses also the trunks of the veins and arteries, as well as the appendages or auricles.

The heart is a muscle, but unlike other muscles, it is involuntary, being altogether independent of the will, and is for this purpose supplied by a peculiar set of nerves. It is also furnished abundantly with blood for its support, by means of arteries which are the first that are given off; and these arteries are accompanied by veins for the return of the blood to its proper receptacle.

THE CIRCULATION OF THE BLOOD

is one of the most important processes in the animal economy: when suspended for a few moments, a state of insensibility is produced, and if this suspension continues a little longer, death quickly supervenes.

The heart, we have seen, consists of two halves or sides, the right being devoted to the pulmonary circulation. The *right auricle* receives from a large vein, called the *vena cava*, the blood which has travelled throughout the system;

whence it passes, by the action of the heart, into the right ventricle, which by its contraction forces it into a large vessel called the pulmonary artery. Thence the blood is sent into the lungs and ramifies throughout its minute vessels, where it is exposed to the action of the inspired air, and becomes, by means we shall afterwards speak of, reddened and purified. This process being accomplished, the blood passes into minute vessels, which, coalescing, become the pulmonary veins, and through them the blood again returns to the heart; thus finishing the circuit of the pulmonary circulation.

The *left auricle* receives the purified blood from the pulmonary veins, forces it into the left ventricle, which, contracting, sends the vital fluid into a large strong vessel called the aorta, whence it enters smaller arteries, to be distributed throughout the whole system. The remote divisions of the arteries are called the capillary vessels, and in them the blood, after having accomplished its purposes and conveyed nourishment to all parts, becomes black and impure, and in this state enters the capillary veins, which, conjoining and increasing in size and diminishing in number, convey the blood again to the right auricle of the heart. Just before it enters the heart it receives a supply of chyle, which, as we have before observed, is extracted from the food, absorbed by certain vessels called lacteals, and conveyed by a specific channel to the heart. Such, then, is the circle, or rather the double circle, which the blood takes, and by which so many important purposes are beautifully and correctly accomplished.

The circulation of the blood is accomplished by the joint action of the heart and arteries, but principally by that of the former. The contraction of the ventricles and of the auricles immediately succeed each other: as the one expands to receive the blood, the other contracts to force it forward, thus producing the unequal double action of the heart that we feel. These actions, however, of the different cavities could not be correctly performed unless some provision were made for preventing the blood, when the ventricles contract, from retrogading into the auricles.—This, however, is effected by means of a valve, situated between these cavities, which is formed by a duplication of the inner membrane of the heart, thickened by fibrous sub-

stance. The floating edges of this valve in the right ventricle present three points and in the left two; whence the former is called the tricuspid, and the latter the mitral.—The edges of each valve are joined by numerous short tendons to the fleshy columns of the heart; and whilst the blood is flowing into the ventricles the fleshy columns are passive; but when the ventricles act these columns also contract and draw the edges of the valve together, and thus close the cavity in that direction and prevent the blood reentering the auricle.

There are also valves that guard the entrance of the aorta and pulmonary arteries, but they are of a different description, being of less strength, because they are not called upon to oppose the powerful action of the ventricles. Accordingly we find that they consist of three folds of membrane, and are called, from their shape, semilunar. They are so situated that when the blood passes into the arteries they are thrown against their sides, and when the blood has passed they are thrown up so that their edges meet, and thus prevent the blood returning to the heart.

In fishes the heart is single, and only serves the office of the pulmonary circulation, that of the system being accomplished by the arteries alone. In the sheep, though the heart is the principal power, yet the arteries greatly assist. The aorta, which receives the blood from the left ventricle, divides into two branches, called the anterior and posterior aorta; the former conveying the blood to the head and neck, and the latter to the lower parts of the body. These arteries are strong and thick, and consist of three coats; the outer, the strongest and thickest, gives the vessels the remarkable elasticity which they possess; the middle coat is the fibrous, which seems to be a modification of muscular power, and enables the arteries to contract on their contents; the third coat is the serous, which lubricates the interior of the vessel and facilitates the passage of the blood. Thus to these several coats, but particularly to the two former, do the arteries owe the remarkable property they possess of contracting when distended with blood, and almost immediately afterwards expanding to receive a fresh supply, and which, assisted by the action of the heart, constitutes the pulse; and may be felt in every part of the body

where an artery is sufficiently near the surface to be perceptible.

The arteries, however, do not all possess an equal thickness and power; for instance, the pulmonary artery, though quite as large as the aorta, is neither so thick nor so strong; and the reason is, that the same power is not required to send the blood over the smaller circuit of the lungs as over the larger one of the whole system; and, for the same reason, the right side of the heart is weaker than the left.—The arteries, as they divide and subdivide in their course, become weaker in their coats in proportion to the diminution of their size, till at length they terminate in the minute branches called the capillary vessels, which do not possess any pulsating power, and many of which do not contain red blood. Diminutive, however, as these branches may be, yet it is by them that the most important offices are performed; by them the different parts of the body are nourished, whether bone, flesh, nerve, or skin; by them the various fluids are secreted, however different in appearance they may be; by them the most ghastly wounds are healed, and often in a remarkably short space of time; and all these various offices are performed not only by the same class of vessels, but by the same fluid, the blood. Having accomplished these important purposes, the capillary arteries terminate in equally minute vessels, called the capillary veins; and so abundant are these diminutive vessels that the finest point of the finest needle cannot be plunged into the body without penetrating some of them. By the time the blood reaches the veins it becomes dark and impure, and loaded with carbon: the office of the veins, therefore, is to return it to the heart to be again purified. The circulation, however, becomes much slower as it is further removed from the impulsive power of the heart, and the veins, which are supposed to contain two-thirds of the whole blood circulating in the system, are consequently much more numerous than the arteries: they do not, however, possess the same strength in their coats as the arteries, nor have they any pulsating power. They have, however, the assistance of other agents in propelling the blood to its destination. The greater number of them possess valves, which admit the blood to pass in one direction, but effectually prevents its passing in any other. It was, indeed, from

reflecting on the structure and necessary office of these valves that led the immortal Harvey to discover the circulation of the blood. Another circumstance peculiar to the veins is their situation, being mostly near the surface of the body, whilst the arteries are generally deep seated. The wisdom of this provision is evident: it is well known that in wounds it is readily ascertained if an artery be wounded by the jet of blood that ensues, and which even from an artery of small size is very considerable, and the danger of death from bleeding is often great in consequence of the force with which the blood is thrown into these vessels.—Now such being the danger attending the division of arteries, it was necessary to remove them as much as possible from the risk of injury, and accordingly they are almost invariably deep seated, and when they do approach the surface it is in parts least likely to be injured. Thus round these important vessels nature throws a thick muscular covering, and protects the whole by a mantle so sensitive as to give warning to the least attack. The veins, however, do not require this care; in them the circulation is languid, and their wounds are comparatively unimportant and unattended with danger, for the blood generally stops, without assistance, from its coagulating quality. It is also of importance that the greater portion of the veins should be situated near the surface, in order to receive the influence of the atmospheric pressure, which greatly assists the motion of the blood; and it has also been found that veins possess a power of absorption in common with a particular order of vessels called the absorbents; thus these various purposes are effected by the relative position of the veins and arteries. The structure of the veins is very different from that of the arteries; for, whilst the latter are thick, elastic, and composed of three coats, the former are thin, inelastic, and composed only of two coverings. But although thin they are yet capable of affording great resistance to pressure.

We have seen that the blood is sent to all parts of the body by the action of the heart and arteries, but what is the cause of its return? First in importance is the law of hydrostatics, "that all fluids support their level." Thus the same law by which springs arise, and streams are produced, and rivers flow towards the sea, is brought to bear in the living system, and enables the blood in the arteries to sup-

port that in the veins. This effect is greatly assisted by the action of the valves in supporting the column of blood. The blood thus supported and propelled by the arteries, assisted by atmospheric pressure, must go somewhere, as the valves prevent return; it goes, therefore, where alone a vacancy is afforded, and that is in the right auricle of the heart, which has just propelled its contents into the ventricle. To these several forces may be added a power of suction the heart possesses whenever the chest is enlarged in respiration.

The manner in which the chyle is mixed up with the blood, so that its color quickly disappears, is worthy of particular notice. It is owing, indeed, to the great agitation the blood receives, and to the irregularity of the heart's internal surface. When the auricles contract, their contents are, in a great measure, discharged into the ventricles, but a portion is thrown back into the veins, which constitutes what is called the venous pulse, and may sometimes be seen in the jugular veins. In like manner, when the ventricles contract a portion of their contents is thrown back into the auricles, at any rate that part of it situated behind the valves. By these means an agitation is produced which effectually mixes these different fluids together.

It has been ascertained that the veins possess a power of absorption in common with a numerous class of vessels called the absorbents, or lymphatics. These vessels are very minute, and are distributed throughout the whole body; they generally accompany the veins, and, like them are furnished with valves.

SECTION XXIII.

ON RESPIRATION AND ITS EFFECTS.

The phenomena of respiration, which is carried on from the first minute after birth to the last of existence, consists of two acts, inspiration and expiration. The former, that of inhaling the atmosphere, is accomplished mostly by the diaphragm, which, in its relaxed state, is convex towards the chest. As its fibres contract, the muscle flattens, and thus enlarges in a considerable degree the cavity of the thorax. A vacuum is thus produced, or rather a tendency towards it; for the air rushes into the lungs, and the blood into the heart; and, as the lungs are elastic and spongy in their nature, they become closely adapted to the enlargement of the chest, and prevent any vacuum from taking place between them and the sides of the thorax. The diaphragm is thus the chief agent in the act of inspiration, although in some degree assisted by the intercostal muscles, which raise the chest, and also, when the breathing is violently excited, by those muscles that in quadrupeds attach the fore extremities to the body. The air thus thrown into the lungs throughout its internal surface, and, having fulfilled it office, is forced out by the act of expiration. This part of the process is effected chiefly by means of the elasticity of the lungs, which acts as soon as the diaphragm becomes passive, assisted, however, in some degree by the elastic cartilages of the chest, and occasionally by the abdominal muscles.

Atmospheric air consists of unequal parts of two aeriform fluids, viz., four-fifths of nitrogen or azote, and one-fifth of oxygen in each 100 parts; besides which it contains other heterogeneous matters, such as odorous effluvia, aqueous exhalations, electric matter, and carbonic acid gas. It everywhere surrounds and embraces the globe, extending, in the opinion of some, a distance of forty-five miles, and in that of others a much greater height. Its gravity differs very much at different times and in different places, being heavier on a clear than on a close day, and also in low places than in lofty ones. The small portion of carbonic acid gas which the atmosphere contains is not chemically, but

mechanically mixed with it. This gas is evolved by the fermentation of beer, and the decomposition of vegetables, and is often found in wells and deep places. It is much heavier than the atmosphere, and thus remains in these low places by its gravity. A lighted candle placed in this gas is immediately extinguished; so that it is used as a safeguard in descending into these low and foul places; for whatever will not support combustion will not support life. It is not a simple gas, like oxygen, but is formed by the union of carbon and oxygen.

Nitrogen or *azote* is a simple gas, but its use in the atmosphere seems to be principally of a passive nature, being for the purpose of diluting the oxygen and rendering it less stimulating: it will not alone support life or combustion, but is chemically mixed with the oxygen. Oxygen is essential for the support of life and combustion; for if air be deprived of it no animal can live, nor will a candle remain lighted. It is abundantly furnished by plants and shrubs, which thus restore the loss of it occasioned by animals.—When a flame is exposed to this gas it greatly increases in brilliancy; and when venous blood is submitted to it, it quickly becomes florid.

We have before shown that all the blood in the body was in its turn carried from the heart to the lungs by means of the pulmonary artery, which divides and subdivides into the smallest branches, and terminates in small capillary veins, which, coalescing, become larger, and convey the blood again to the heart by the pulmonary veins. Before it reaches these veins, however, an important change takes place: the blood proceeds from the heart in a black and impure state; it returns reddened and purified; it is submitted in its course to the action of the air in the air-cells, not by actual contact, but through the membrane which forms these cells: and by this means the important change is effected.

There is, we well know, a considerable difference between the expired and the inspired air; the former it hot, the latter cold; this is healthy, that injurious; one will support combustion and life, the other is unfit for breathing, and will extinguish a flame. There is but little difference in quantity between the air in its different states, but the oxygen in expired air has nearly disappeared and carbonic acid gas is found in its stead; it also contains much aque-

ous vapour, which is condensed in a visible form, at a temperature of 60 deg. Thus, although the carbonic acid gas is much heavier than common air, partly from the aqueous vapour which the expired air contains being much lighter, but principally from its own increased temperature, the expired air, notwithstanding its carbonic aid, is yet specifically lighter than the atmosphere; and consequently rises upwards, and thus, in a great measure, is prevented from being respired a second time. It has been found by experiment with a portion of atmospheric air, containing 80 parts of nitrogen, 18 of oxygen, and 2 of carbonic acid, that, on being respired, the nitrogen continued the same, but the carbonic acid was increased to 13 parts, and the oxygen reduced to 5; whence it appeared that 11 parts of carbonic acid were substituted for 13 of oxygen, 2 parts having entirely disappeared. Thus the disappearance of the greater portion of the oxygen was accounted for by its being converted into carbonic acid; but there remained a small portion, whose absence could not be thus explained, more particularly as Sir H. Davy calculated that about 32 ounces of oxygen were necessary for 24 hours' expenditure in a man; but only 26½ ounces are requisite for the formation of even 37 ounces of carbonic acid gas, giving us an unexplained surplus of 5½ ounces of oxygen, during the above period. By some it was supposed that this surplus oxygen united with the hydrogen thrown off by the blood, and is thus converted into watery vapour: by others it is held, that this oxygen is absorbed by the blood, and enters the circulation. Carbonic acid gas is exhaled from the lungs in different quantities during different periods of the day, being generated in the greatest quantity about noon, decreasing in the morning. It also increases in man by taking animal food.

Sir H. Davy contended that a small portion of nitrogen is absorbed by the blood; but this has been denied by others. The chief use of nitrogen, however, is to dilute the oxygen; for if the latter is inspired pure a sense of warmth is felt in the chest, the heat of the skin is raised, the pulse quickened, and other symptoms of excitement produced.—A given quantity of oxygen will, however, support life longer than the same quantity of atmospheric air. It has been computed that, in the course of twenty-four hours, about 2 lbs. 8 ozs. of oxygen is consumed by a man. After

an ordinary respiration a considerable quantity of air still remains—perhaps four-fifths, one-fifth having been expired.

Having mentioned the changes that take place in the atmosphere, we must next consider in what manner the blood becomes so altered by its passage through the lungs.

The blood, as it traverses through the body, gradually becomes darker; it is loaded with carbon, and is rendered unfit for the circulation, and in this state it is called venous blood. If venous blood, taken out of the body, be exposed to oxygen, it quickly becomes red; and so it does if exposed to the atmosphere, but not so rapidly. So, likewise, if arterial blood be exposed to carbonic acid, it quickly acquires the color and character of venous blood. In the same manner is the color of the blood changed in the lungs; thus the principal use of respiration appears to be to free the blood from its impurities; and this is effected although the air and the blood do not actually come in contact. It was found, that if blood in a common bladder were exposed to the atmosphere for some time, it acquired a coat of florid blood; and thus, as the membrane lining the air-cells is by no means so thick as that of the bladder, there is no longer any difficulty in accounting for the change taking place. It has been the subject of some dispute as to when the change, or rather exchange, takes place, some contending that the carbon unites with the oxygen in the air-cells, whilst others maintain that the oxygen enters the blood, and there unites with the carbon, forming carbonic acid gas, which is then exhaled into the air-cells. It was found, however, that if venous blood were put within the exhausted receiver of an air-pump a quantity of carbonic acid escapes; thus proving the presence of this gas in the blood, and supporting the second theory. And as there appears to be a greater quantity of oxygen abstracted from the atmosphere than can be accounted for by the formation of carbonic acid, we must conclude that a portion mingles with the blood and enters the circulation; which theory agrees with the fact, that it has recently been discovered, by correct analyses, that both venous and arterial blood contains carbonic acid, nitrogen, and oxygen; but that the latter gas is most abundant in arterial and the former in venous blood.

Although the action of the heart is much more frequent

than that of the chest in respiration, yet there is a most intimate connexion between the one and the other; for, besides the changes which we have spoken of in the blood, it rushes into the heart when the chest is expanded, and when, from any cause, respiration is delayed, the pulse becomes less frequent and more languid in consequence of the obstruction in the current of the blood. Thus, in violent fits of coughing, the chest collapses, the air is expelled, and the blood not being purified, is unfit for circulation, and the consequence is the veins of the head become distended, and, in man, the person becomes red or black in the face, and sometimes a blood-vessel has ruptured and death supervened.

THE PRODUCTION OF ANIMAL HEAT.

This important operation is effected by means of respiration, the chemical process carried on in the lungs.

The sensation of heat is derived from the presence of an extremely subtle fluid called caloric, the particles of which have a tendency to repel each other and unite with other substances. Thus, if we touch a body whose temperature is lower than that of our hand, caloric passes from the hand to this substance, and the sensation of cold is experienced: and if, on the contrary, the temperature of the substance is higher, we feel a degree of heat from the passage of caloric into the hand. It is a singular fact, that this caloric may exist in two different states—the one in a free or sensible form, the other in a latent or combined form.—Thus two substances may appear to be of the same temperature, and yet one may contain a much greater degree of caloric than the other, but so combined with the substance that it is not sensible to the touch. If, however, the object be exposed to the influence of some chemical agent, its latent coloric may be set free or rendered sensible. For instance, if sulphuric acid and water be mixed together, although each fluid were before cold, the mixture is raised to a high temperature, and caloric is evolved. In the fermentation of malt liquors the temperature of the liquid is raised with the process, and carbonic acid is produced; and whenever, indeed, this material is formed, heat is evolved. Animal heat is kept up and supported by the chemical union of these two substances, oxygen and carbon—the same that

produces combustion in our fires and candles. Carbon may be considered as the fuel, not only in ordinary combination, but also in the animal economy, whilst oxygen may be regarded as the fire; and, in fact, this agent, throughout nature, is the cause of what appears to be destruction, but is, in fact, only change of form; such, indeed, is its tendency to combine with other substances. Carbon is supplied by the food, and it is necessary that sufficient should be furnished to counteract the consuming tendency of oxygen, which would otherwise gradually waste and destroy the system. In cold weather and cold climates more oxygen is taken into the lungs, the air being more condensed, and a greater waste of the system would be the consequence were it not for the fact that the appetite is increased, and more food is taken, particularly that which contains most carbon. This accounts for the fact of the people in cold countries having such a great inclination for oily food, which consists chiefly of carbon, whilst those in hot climates dislike fat of every description, and prefer a vegetable diet: thus the functions of the lungs and the stomach most intimately agree. In cold weather a large fire must be kept up to preserve the animal warmth, and the digestive organs furnish the fuel, or otherwise the tissues of the body would be wasted or consumed.

SECTION XXV.

STRUCTURE OF THE SKIN.

The skin of the sheep, like that of most other animals, is composed of three coats. The external coat is called the cuticle, or scarf-skin. It is very tough, and destitute of feeling, and is pierced by innumerable holes for the passage of wool and yolk. On other animals, the principal secretions from the skin are hair and insensible perspiration; but the skin of the sheep has large sebaccous glands, from which the secretion is more oily and abundant than on other animals, and is called yolk.

The next coat is called the mucus coat, from its pulpy appearance. It is in this coat that the nerves of the skin terminate, and it is therefore the seat of external sensation. The color of the mucus coat, and of the hair or wool which passes through it, are frequently much alike, and, therefore, it is ordinarily supposed that the coloring matter of the wool or hair is communicated to it from this layer.—But this seems to be a mistake. By inspection of the appendix, it will be seen that the dark color of hair is communicated to it merely by its ingredients being differently proportioned from those of light hair; and the color of wool is doubtless determined in the same manner; and as dark hair is frequently secreted from a light colored skin, it seems very evident that its color does not depend upon that of the skin.

The third, or innermost layer, is called the cutis, or true skin. It is a dense, firm, elastic membrane, fitting closely to the body, and capable of yielding to the various motions, and to external resistance. It is composed mostly of gelaatine. It is insoluble in cold water, but may be dissolved by boiling. It is in this skin that the glands which secrete the wool and yolk and horns and hoofs are placed.

The caloric, which is disengaged from the skin of the sheep, is considered to be equal to about one-seventh part of that which is emitted from the skin of man. This arises from the non-conducting power of the wool, and is a wise and kind provision of nature well explaining the means by which the animal is enabled to endure many hardships from vicissitudes of the weather.

Whether a thick skin or a thin one is preferable, is a matter about which there is a difference of opinion. The New Leicester and the Cheviot are commended for having thin mellow skins. On the other hand the Cotswold are considered more hardy than the New Leicester or Dishley breed, on account of their having thick, mellow, silvery skins; and doubtless a moderately thick mellow skin is preferable to a thin one, more capable of withstanding the various vicissitudes of the weather.

The thickness of the skin may be ascertained in some measure by the thickness of the ears. The New Leicester and the Cheviot with thin skins have thin ears. Different

breeds of Merinos differ in the thickness of their skins, and the thickness of their ears appears to correspond.

COVERING OF THE PRIMITIVE SHEEP.

In all the regions over which the patriarchs roamed, and extending northward through the greater part of Europe and Asia, among the most unimproved breeds of sheep, the sheep is externally covered with hair, but underneath is wool, of various degrees of fineness on different breeds, from which, in most cases, the hair is easily separated. This is the case with the sheep at the Cape of Good Hope, and also in South America.

Also, sheep of almost every variety have at times been in the gardens of the Zoological Society of London; but there has not been one on which a portion of crisped wool, though exceedingly small, has not been found at the bottom of the hair.—(Youatt.)

These circumstances render it probable that the covering of the primitive sheep consisted of both hair and wool; and that on the best improved breeds the hairy portion of the fleece has been mostly bred out by careful selection and management.

CHAPTER XXV.

WOOL AND ITS PROPERTIES.

FELTING.

In ancient times, the people of most northern climates clothed themselves with the skins of animals. In winter, the fur or wool was turned inwards.

This practice is continued among the peasants of Russia to this day; many of them make use of sheep skins with the wool turned inwards, for their ordinary clothing in winter. These skins were called among the Saxons, from whom we derive our language, *felts* (i. e. skins). So that, strictly speaking, the word felting means manufacturing a

skin or covering; but is now generally used in the same sense as the word fulling.

The phenomena of the felting properties of wool long remained a mystery. This gave rise to many speculations as to the cause of it. To M. Monge, the distinguished French chemist, are we indebted for the first correct view of the structure of the fibre of wool. He asserted "that the surface of each fibre of wool is formed of lamellæ or little plates, which cover each other from the root to the point, much in the same manner as the scales of a fish cover that animal from the head to the tail.

By the perseverance of Mr. Youatt, the author of a valuable treatise on British sheep husbandry, Monge's theory was shown to be correct. The construction of a superior achromatic telescope by Mr. Powel, of London, enabled him to determine this fact. In February, 1835, Messrs. Youatt, Powel, and several other persons present, ascertained with this telescope that the edges of wool are hooked, or more properly *serrated;* that they resembled the teeth of a fine saw, with all the projecting edges pointing in a direction from root to point; and that consequently, in the process of fulling, the fibres of wool can move only root end foremost.

The serrations of wool are the great causes of its felting quality. But its elasticity, pliability, and the spiral curve contribute greatly to render it more perfect. Hence the fine wool of the Barbary sheep, which is very glossy and perfect in every respect, except that it wants the spiral curve, is inferior in value to the Merino, which has many spiral curves.

In order to complete the felting process, the presence of soap or moisture is necessary; these add greatly to the cohesion of wool or fur. Hence, when cloth or stockings are simply placed in water, and are suffered to remain a considerable time, they will frequently be fulled by this means. The variations of heat from day to day will cause an alternate expansion and contraction of the wool, so as to cause the felting process to proceed.

By means of these qualities of wool, and the alternate pressure and relaxation of the hand or machinery, the fibres of wool are compelled to imitate the process of weaving, being driven root end foremost in every direction, so as to

form a solid and firm body, which cannot be unravelled, and which is far superior to what can be obtained merely by weaving.

In order to a more perfect knowledge of the qualities of wool, it will be necessary to notice its formation and properties more particularly.

FORMATION OF WOOL.

Wool is secreted from glands which are placed in the cutis vera or true skin, and according to the analysis of Scherer, is composed of carbon, hydrogen, nitrogen, oxygen, and sulphur. Each fibre of wool is composed of a number of distinct filaments ranged side by side. Mr. Bakewell has remarked, "that hair is frequently observed to split at its points into distinct fibres. A division is also sometimes seen in the fibre of wool. In one hair, I distinctly perceived fifteen of these divisions or fibres, lying parallel to each other."

The cause of these divisions seems to be, that the glands which secrete wool are, like some other glands, divided into distinct divisions, and each of these divisions doubtless secretes a filament of wool by itself; and these filaments, in their fresh state, are agglutinated together by the action of the skin, before the wool comes to the air. In the same manner, the ducts which convey the gall from the various divisions of the liver, all unite and convey the gall into one common receptacle, the gall bladder.

Whether wool is hollow, (i. e. tubular,) or not, has not been determined; but moisture may pass to its different parts by capillary attraction, between the different filaments.

Whatever the diameter of wool is when formed, so it remains; it does not grow in diameter like a tree, though its filaments lie side by side, like the grains of a tree. And if the roots of a large hair be examined, it will be found that at bottom it comes to a point, giving room for a central filament and the arrangement of others around it, much like the grains of a tree; and as there is nothing to keep these filaments asunder, there seems to be no reason to imagine that either hair or wool is tubular.

The fibre of wool is circular; it differs materially in diameter on different breeds, and also in different parts of the same fleece.

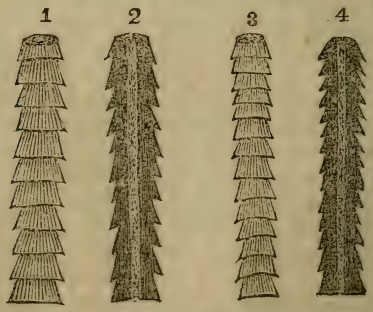
The component parts of wool and hair are precisely sim-

ilar; but these component parts are differently proportioned in these two articles. Hence, hair is generally opake; but wool is usually semitransparent.

The following observations by Mr. Youatt will illustrate the subject: "The fibres of wool, when cleansed from grease, are semi-transparent; their surface in some places is polished; in others curiously incrusted, and they reflect the rays of light in a pleasing manner. Their exterior polish varies much in different wools, and in wools of the same breed of sheep at different times. When the animal is in good condition, and the fleece healthy, the appearance of the fibre is really brilliant. But when the sheep has been half starved, the wool seems to have sympathized with the state of the constitution, and either a wan pale light, or scarcely any is reflected.

"As a general rule, the filament is most transparent in the best and most useful wools, whether long or short. It increases with the improvement of the breed and the fineness and healthiness of the fleece. Nevertheless, some wools have different degrees of transparency and opacity, which do not appear to affect their value and utility. It is the difference of transparency in the same fleece, or in the same filament, that is chiefly to be noticed as affecting the value of the wool."

MICROSCOPIC VIEW OF WOOL.



SERRATIONS.

No. 1, a fibre of South Down wool as a transparent object; No 2, the same, as opaque. No. 3, a fibre of Merino wool, transparent; No. 4, the same, opaque.

The manner in which the serrations of wool are formed, seems to be, that the wool glands, like other glands,* have a motion; that is, at the time of the formation of the longest point of the serration, the wool glands must rise somewhat in the centre, and expand, so as to put forth the largest bulk of woolly fibre, and then gradually sink down again in the centre, so as to form only the smallest diameter of the wool. And as hair or wool is formed in glands which is formed in the *cutis vera*, or true skin, this motion will be necessary, in order to expel the hair or wool through the two outer coats of the skin, and also to compress the filaments.

The serrations are somewhat differently shaped on different kinds of wool and hair. Hence, hair being of a more uniform texture, is less pliable than wool, which has deeper serrations. And the greater the number of serrations in a given length, the greater is the pliability of the wool. Hence, too, the deeper and sharper the serrations of wool are according to its diameter, the harsher will be the wool, even though there be a plentiful supply of yolk.

I have sometimes noticed in crossing two full blood Merino breeds of sheep together, that although the wool of the cross breeds was equal in fineness to that of either kind by itself, and was very curly, it was excessively harsh.

In using a ram which was a half and half cross of this kind, he communicated this defect to his progeny; and their wool was at the same time remarkably curly, and had abundance of yolk.

A cross between the Escurial Saxon breed and other breeds of Merinos, sometimes produces some other defect of the skin, which makes such cross bred sheep very tender, and sensitive to cold.

These circumstances seem to show the propriety of breeding each kind of fine wooled sheep by itself. We can then know at all times what to depend upon, as to the quality of wool. In Spain, they have, for many centuries, pursued that course which by experience they found would produce the best wools, and they have bred each kind by itself; and their long experience should not be disregarded.

By Mr. Youatt's examination of wool with the micro-

* See Richerand's Physiology, p. 262.

scope, the diameter, and number of serrations in an inch, of several kinds of wool, were found to be as follows:

	Diameter.		*Serrations in an inch.*
Merino,	750th	of an inch,	2400
Saxon, (Escurial)	840th	"	2720
South Down,	600th	"	2080
Improved Leicester,	500th	"	1360
Australian Picklock grade Saxon, (Escurial)	780th	"	2400

As to the Merino, he remarks, "The fibre thus looked at, assumed a flattened, ribband like form; it was of a pearl grey color, darker towards the centre, and with faint lines across it. The edges were evidently hooked, or more properly serrated; they resembled the teeth of a fine saw."

Of the Saxon, he observes: "The greater number of serrations, with equal prominence when compared with the Merino, accounts for its superior felting properties."

Of the South Down he says: "The fibre is clearly larger: it is the 660th of an inch in diameter. The serrations differ in character; they are larger, but not so acute; they appear almost as if they had been rounded; they have a rhomboidal, and not a hooked character."

The Editor of the Genesee Farmer remarks that, "The South Down is a valuable wool, but its felting power is inferior, and it is little used in the manufacture of the best broadcloths."

Of the Improved Leicester, Mr. Youatt says, "The lamellæ are superficial and irregular, differently formed in different parts; *a few like small spines running along the surface of the fibre, while other prominences were rounded.*"

As to the Picklock Australian grade Saxon, Mr. Youatt says: "*The serrations of this sample were very sharp, and in appearance almost barbed. There is a marked difference, not only in the length, but in the structure of the Saxon wool, as obtained direct from Germany, and that imported from Australia. The fibre of the Australian wool is considerably longer, but not so fine: the serrations are not so numerous; they are of a different character, seemingly giving pliability and softness to the one* [the Saxon], *and fettiness to the other* [the Australian].

"So far as the examinations have proceeded, the serrations are sharper and more numerous in the felting wools than in others, and in proportion as the felting property exists."

Of the Merino, as compared with the wool of the bat, Mr. Youatt says: "Though the lamellæ were not so distinct on the Merino as on that of the bat, yet the cone-like points were distinctly visible, forming a series of cup-like indentations, with their projecting edges pointing from the root to the point."

As to the formation of the Leicester and South Down fibres of wool, it may be observed, that in the formation of these two kinds of wool, there must be a mechanical movement of the skin in forming the serrations, or the serrations would not be so very different in their appearance on the same fibre of wool, in its texture lengthwise. It is evident that wool does not grow into a particular shape, like the leaves of a tree, which are formed precisely alike on the same tree; whereas, wool is a secretion like horn, and is put into a particular shape by the action of the glands from which it springs.

As every new cross of different breeds may form wool glands which will make differently and badly formed serrations, such crosses should be made with caution.

SPIRAL CURVE.

The manner in which the spiral curves of wool are formed, seems to be, that the opposite sides of each wool gland are alternately in a more active state than the other side; and the extreme regularity of these spiral curves shows that this action is very regular in most breeds of sheep, and especially in Merinos of pure blood.

Wool generally has more or less spiral curves; but not always; the wool of some breeds, as that of the Barbary sheep and the Wallachian sheep, is straight. But hair is more generally straight.

The spiral curve is a valuable property of wool. It adds greatly to the elasticity of wool, and multiplies the opportunities for the interlacing of fibres, and thereby greatly increases its felting properties, and the strength of the articles felted.

In most kinds of wool, especially in that of pure bred Me-

rinos, it has been found that the number of curves in a given space is very nearly in proportion to the diameter of the fibre; the smaller the diameter of the fibre, the greater is the number of the spiral curves. Hence, the comparative fineness of wool may be nearly ascertained by counting the number of curves in an inch.

In Mr. Lafoun's work on the German management of sheep, are the following observations:

"Those breeding pure Saxons inspect their flocks three times in a year; before winter, when the selection of lambs is made; in the spring, and at shearing time. Each sheep is placed in its turn on a kind of table, and examined carefully as to the growth, the elasticity, the pliability, the brilliancy, and the fineness of the wool. The latter is ascertained by means of a micrometer. *It being found that there was an evident connection between the fineness of the fibre and the number of curves*, this was more accurately noted, and the following table was constructed.

"The fleece was sorted in the manner usual in France. The fineness of the Superelecta, or Picklock, is represented by a space corresponding with the number 7 on the instrument."

Sort.	*Name.*	*Curves in an inch.*	*Diameter of fibre.*
1.	Superelecta,	27 to 29	7 or 1–840th of an inch.
2.	Electa,	24 to 28	8 or 1–735th "
3.	Prima,	20 to 23	9 or 1–600th "
4.	Secunda prima	19 to 19	10 or 1–558th "
5.	Secunda,	16 to 17	11 or 1–534th "
6.	Tertia,	14 to 15	11½ or 1–510th "

The lamb or sheep, after being duly examined, is marked upon the ears, and samples of its wool are preserved in papers, and these papers are numbered, so that by reference to the breeding register, the quality of its wool, its age, and relation to others in the flock, may at any time be ascertained.

The spiral curve is a valuable property of wool, and care should be used in breeding so as to preserve it, and also not lessen it by systematic high feeding.

ELASTICITY OF WOOL.

If a fibre of wool, or any other substance, be drawn out

beyond its natural length, and will, without breaking, return to its natural shape, it is said to be elastic. This property depends chiefly upon the component parts of any substance, and their relative proportions. Hence, though wool, and the feather of a quill, are composed of precisely similar ingredients, wool is very elastic; but the feather of a quill is destitute of this property. Two specimens of wool, of the same fineness and evenness, will often differ much in their elasticity and pliability; and doubtless this arises from some small difference in the proportions of their component parts.

Evenness of texture is necessary, in order to obtain the most perfect elasticity of wool. When a sheep is kept in high order in one part of the year, and in low condition at other periods of the year, the size and strength of the fibres of its wool will vary in different parts, and one part will break before the other can be fully extended.

The usefulness and value of wool depend chiefly upon its elasticity and pliability; and these properties render it far superior to hair. By these qualities it is admirably adapted to all the purposes of felting and the finishing of hats, cloths, &c.

SOFTNESS.

The softness of wool depends much upon its comparative fineness. Hence, high feeding ever has a tendency to render it coarser and harsher.

But there are several causes which make a different degree of softness in wools of the same fineness. The different proportions of its component parts doubtless render some kinds hard and wiry, whilst others of the same fineness are soft and mellow. For the same reason, the hair of the head of man is generally soft, but that of the beard is always comparatively hard and wiry. (See Appendix.)

Also, by the preceding observations, it will appear that the softness of wool depends very much upon the form of its serrations; wools of the same fineness, and the same quantity of yolk, varying much in their softness from the difference in their serrations.

The soil, also, upon which sheep are pastured, sometimes renders the wool harsh. The chalky soils in England, not being well covered with herbage, absorb the yolk,

and thus expose the wool to the influence of the weather, and render it harsh and brittle. But the limestone soils of the United States are generally well covered with herbage, and are among the best for growing fine wool.

Hence, also, when sheep on mountains, or very low lands, are much exposed to cold misty and rainy weather, the secretion of yolk is lessened, and the wools of such sheep are generally harsh, and sometimes wiry; for wool owes much of its softness to the presence of a plentiful supply of yolk. Yolk preserves the softness of the fibre, and sheathes it from the external influences of soil, air, and moisture.

The salving of sheep with a mixture of tar and grease, as practised in England and Scotland, has the same useful tendency. Hence, if fine-wooled sheep are kept in uniform middling good order, and are well sheltered, the necessary supply of yolk will be produced on young and middle aged sheep, and the softness of the wool will be preserved. But on old sheep the secretion of yolk diminishes in quantity, and the wool becomes comparatively hard and inelastic.

As wools of the same fineness frequently differ in their quality as to softness, so much as to make 15 or 20 per cent. difference in their value, every circumstance which can affect this quality should be particularly attended to by those whose principal object is, the rearing a superior quality of wool; and those should be selected for breeders of each sex, which have the softest wool, and whose fleece contains the least hair (or jar), provided they have all other necessary qualities.

TRUENESS.

By this term is meant, an equality of the diameter of the fibre of wool from root to point. This quality depends principally upon a regular supply of good food, and shelter from the inclemency of the weather. If these are both provided, the skin will be able at all times to secrete a fibre nearly uniform in size. Hence, if at any time the sheep be fed much higher than usual, a larger fibre will be produced, and such wool will felt unevenly. If food or shelter are not provided when necessary, especially in winter, the skin will sympathize with other parts of the body, and the

wool glands will be unable to secrete as large a fibre as at other times; smaller, and consequently weaker portions of the fibre will be formed, in which breaches will be made when used for manufacturing purposes; and this defect will greatly injure its value. Such wool is termed unsound, and will be prized accordingly by the skilful wool buyer.

COLOR.

The color of the fleece, or coat of the sheep, like that of other animals, seems to be determined principally by the influence of light and heat. In the torrid zone, and countries bordering nearly upon it, the fleece or coat of the sheep is generally black, brown, or reddish. In more northern climes, white or grey are the prevailing colors, and black and brown are exceptions to the general rule. In wild races, as the Shetland sheep, it is presented of various colors; and the white hue of our present races is owing, in some measure, to the constant practice of breeding only from white parents.

Wools of the purest white are most highly prized by manufacturers, for the reason, that those of a black, brown, dun, or grey hue, do not receive a perfect fancy dye, and therefore can be converted only into black or grey cloths or goods. Flock masters, therefore, should breed only from rams of a pure white, unless for the sake of domestic manufactures, or some particular use.

FINENESS.

This term, when applied to wool is wholly comparative. The fibre may be considered coarse. when it is more than the five hundredth part of an inch in diameter, and very fine, when it is less than the nine-hundredth part of an inch in diameter, as in some of the choicest samples of Saxon Merino. Yet, on some animals, which have wool underneath a covering of hair, but whose wool has not been used for manufacturing purposes, the diameter of its fibre is less than the twelve-hundredth part of an inch.

The fineness varies, to a very considerable degree, in different parts of the same fleece, and the diameter of the same fibre is often exceedingly different at each of its extremeties. The micrometer has sometimes indicated that the diameter of the outward point is sometimes five times

greater than that of the centre or root; and, consequently, that a given length of pile, taken from the outward point, would weigh twenty-five times as much as the same length taken from near the root, and cleansed from all yolk and grease. This results, from the sheeps having an abundance of food, at the time of being shorn, and from moderate cold strengthening the glands of the skin, so as to secrete a larger bulk of fibre.

Grade Merinos often produce seven or eight different qualities of wool in one fleece; whereas that of the pure Merino is, in Spain, commonly divided into but four sorts; but the Negretti breed is remarkable for the even fineness of its wool, and a well assorted flock of that breed will produce only about three qualities of wool.

Most breeds of sheep may be much improved, by a careful selection of individuals for breeding, which have fleeces of the most uniform fineness; and this improvement deserves the particular attention of the wool-grower.

FORM AND QUALITIES OF THE STAPLE.

The following remarks of Charles L. Fleischman, Esq., will fully illustrate this subject:*

"The wool of sheep does not grow, as does the hair of other beasts, in a manner, that every individual hair takes its own direction, but its many threads of wool always unite into one little tuft, and each of these again stands in such connexion with the rest, as may allow every wool pelt, (every fleece) as a whole, to appear like a web. The single tufts we call the *staple*."

"The fleece of an *original*, (or pure improved Merino,) contains, upon a square inch, 40 to 48,000 wool hairs.—The fleece, in this epoch, is separated upon the skin in small wool divisions, which consist of 2000 or 3000 wool hairs, and which are, from root to top, regularly curved, equal, fine, connected, and, at the top, ending in an even staple. These wool divisions are about as large as one sixteenth of a square inch. The yolk is clear, oily, and gives the wool a glossy, shiny appearance."

"Mr. Jeppe remarks, in his report on wool, at the meeting of German agriculturists, at Munich, Bavaria, held

*From Patent Office Report for 1848.

in the year 1844, that upon a heavy fleeced animal he counted, on one sixteenth of a square inch, 2618, and upon a thin, flabby fleeced animal, 1018 wool hairs; the wool was nearly equally fine in both fleeces."

"*The formation of the staple* may be easily discerned in the surface of the fleece, which contains on it web-formed furrows, woolly seams, but will be more noticeable, if one lays the same out together, in any place. If we examine the fleece more closely, we may discern in it the so called *strands*, (still smaller branches,) in which many threads of wool are closely connected. Strands of different forms, different fineness, or an irregular curl, transfer these peculiarities to the staple, whereby yet further the exterior of the whole fleece is affected. We may, with tolerable certainty, from this form, and from the state of the staple, draw a conclusion as to the condition of the threads of wool, and correctly assume, that the wool which has a good structure of staple, must also possess the other good properties, which render it a valuable article. But the inverse of this does not hold, because the condition of the sheep, dust and sweat, moist and musty fodder, frequently the soaked state of the fleece, &c., may give to the staple a faulty appearance, without affecting the goodness of the wool, or being injurious for the whole life time of the animal."

"The wool itself appears, in the staple, much shorter than it really is, in its extended state, because by its curl it is very much contracted. The smaller and more regular are the bends of the single threads, the more it allows itself to be stretched out, far beyond the length of the staple, indeed, to double the unstretched length of the same.—Such we call wool of a *short contracted staple*, and such as scarcely allows itself to be stretched to half its length, or yet less, wool of a *long extended staple*."

"The staple itself must approach a cylindrical shape, when it is well formed, and be round and smoothly terminated, (blunt,) on the upper end. The staple often appears of greater circumference, that is, more extensive, than it really is, while a stronger and larger staple in extent is frequently composed of a number of small ones."

"*A clear, true wool*, which is valued above all, is that in which the strands of the staples lie parallel to each oth-

er, because the threads, (fibres) are of equal fineness, and form. On the contrary, if the staple comes out strikingly pointed, so that it ends with a hairy point, this shows that many hairs (*fibres*) do not reach the top, either because they are shorter, or because they have an irregular growth, and on this amount, the single strands do not lie near each other. Such uneven grown wool is called *untrue*, not clear and causes many difficulties in the manufacture. Hence we consider this peculiarity as among the principal defects of wool."

"If the points of the staple stand out very far, we say that the wool is *pointed*. If, besides, they are underneath pretty strong, and many stick out far, then the surface of the fleece has a stiff appearance like a reed, which is likewise a fault."

"If, on the contrary, the staple is thicker and stronger above than below, then too, the single fibres are coarser above than below, and thus it is not fitted for an even yarn."

"The *curling* of the upper end of the staple, by which small knobs arise, is also a defect because then the woolly fibres are not of equal length and fineness."

"When the wool is curled more on one place than on another, and many staples also stand upright, while some are blunt, and others again pointed, this then is a mark of the great unevenness of the wool, and the surface of the fleece maintains a bushy appearance. It sometimes happens, with sheep of very fine, but somewhat long and soft wool, when they are poorly fed."

"Further, *the staple must stand upright*. It is defective, when the wool on the back of the sheep parts and hangs down loose on the sides.* It then not only wants the necessary compactness, but it is also often washed out by rain, on the back, and thus becomes rough, harsh, and coarse pointed."

"Generally a fleece should not open itself, but present itself more closed; the former is always a sign of a thin state of the wool."

"Much as a closed fleece is derived, the surface of the

*This refers especially to Merinos; for with the peculiar long wooled races of sheep of the lowlands of England and Germany, usually the wool more hangs than it stands up.

same must not appear like a board, because then usually the staple is too large and flat and the high degree of fineness is lost to the woolly fibres. The fleece must more resemble a soft, elastic cushion."

"If the wool appears, on parting it on the body of the animal, as a uniformly woven cloth, and many staples are apparently joined into one whole, as it is said, the *wool is full*, and is not therefore of less value; or when the staple, on closer examination, shows continual indentations across its whole breadth, it is approved; for such are always signs of evenness, purity and compactness of the fleece."

"If the surface is not wholly smooth, but is covered with little soft knobs, (hard ones they must not be,) as if with pearls, then this shows a great softness of the points, which is approved. It is called *bedewed*, and also *cauliflower staple*.

Wool is called *strongly marked*, when the curves of the single fibres are very high and perceptible, but are uniform. But if the curves are uneven, sometimes small and sometimes large, and many of the small ones run together again into the greater, and twist the strands together in particular places, so that they appear winding at these points like a corkscrew, then the wool is called *twisted*. This is a worse fault, because twisted wool cannot be well spun on the spinning machines, and does not produce smooth cloth. We must therefore labor, to the utmost, to counteract this fault which usually affects the withers of the sheep between the shoulder-blades.

"If the particular fibres, strands and staples stand apart from each other, without showing much dependence on each other, than it is distinguished by the term *empty hollow* staple; and if the whole fleece is thus conditioned, a *hollow fleece*. Sheep which are thus affected, in general, have only a little wool. The faults of being stranded or twisted are often connected with it.

"When the strands in many places lie closer together than in others, and the curves of the particular fibres are very different in form and size, the wool is called *tangled*, and in a yet higher degree, *felted*. This fault may sometimes arise out of a disease, a sickly, weak state of the sheep; and, besides, is probably an original tendency. In an unblemished fleece, not a trace of felt is to be met. [In

such a fleece], the fibres of wool belonging to a staple should be so perfectly closed together, that the particular staples, from the surface of the fleece to the foundation, may be fully separated from each other, without the particular fibres running up across, or in streaks, from one staple to another.

"The better sort of wool [i. e., that which is produced by the various breeds of pure Merino,] shows, after a full year's growth, at the time of the usual shearing of wool, either short compressed staples, (1, 1½, or at the highest, 2 inches long,) which are small, blunt, and perfectly cylindrical, but well rounded above, which form a close, nearly even, or cauliform surface of the fleeces; or if it is long stapled, slightly curved, it is of a more sleek character.* The staples, in this case, are 3 inches or above, long, and do not end roundly, but more in a pointed form, and yet without having any faulty points. The short stapled, as it is called, is the *card-wool*, as the long staple is the *comb-wool*; the *first* is used for making cloths; the *second* for smooth fabrics [i. e., worsted goods.]"

The above very particular description of well-formed staples, and of those which are defective, is inserted in order to show what should be the aim of the breeder, and what defects are produced by mismanagement. Defective staples are ordinarily produced by improper crosses of various breeds, by disease, by want of a regular supply of good food and shelter, hard usage, &c.

On the best breeds of coarse-wooled sheep, and also on the various breeds of pure Merino, the staple is generally very perfect. Hence, by selecting and adhering to any one valuable breed of sheep, whose qualities have been long inbred, with good management, a good staple of wool may ever be produced with certainty.

The qualities most desirable in wool, whether fine or coarse, are, trueness, firmness, elasticity, pliability, softness, and the spiral curve. The two first mentioned qualities are the natural result of a regular supply of good food and suitable shelter. With these precautions, Saxony and Silesia produce wools, which are superior to the best

* This refers to long fine wool produced by crosses of the Merino with long coarse wooled sheep.

which is produced in Spain, by the migration of flocks, at different periods of the year, so as to provide a supply, at all times, of fresh pasture, and a temperature which is seldom very hot, and never very cold.

Wool is generally injured, in some measure, by being kept on hand for a long time before it is manufactured; it becomes harsher and less pliable, and is sometimes injured by moths.

SECTION XXVI.

YOLK.

This substance is also called *eke*, in some parts of the United States; and with much propriety, as it is continually eking or oozing out of the skin. The words *eke*, and *yolk* or *yoke*, as it is frequently pronounced, appear to be derived from the Saxon word *eac*, which in their language is pronounced *e-oke*. So that between the spelling and the pronunciation, the two words *eke* and yoke or yolk are made out of the same word. In the present state of the English language, the word *eke* seems to define this secretion of the skin with propriety, and the words yolk or yoke seem to be the Yorkshire dialect, for the same thing. The yolk of wool is a kind of soap, which is composed of potash and an adhesive oil, and the potash is supersaturated with this oil, and to it are added acetate of potash, muriate of potash, and lime in small quantities. That it is principally a soap, in which the alkali is supersaturated with oil, any persons may convince themselves by putting some alkali, either potash or soda, into some rain water, and washing some eky wool in it. The eke will be turned into a perfect soap, and the wool made clean with the greatest ease.

The yolk of wool appears to be useful for three purposes.

First—It preserves the softness and elasticity of the wool. Hence, that kind of yolk which is most abundantly saturated with the adhesive oil, is best. It will then adhere to the ends of the wool, as well as to that which is near the

skin, and every part of the wool will be kept lively; whereas, if the yolk is almost nothing but a mere soap, as seems to be the case with the yolk of some kinds of sheep, it will be washed by the rain out of the ends of the wool, and such wool will become harsh or dead.

Second—The yolk forms a defence against the weather. If it is of such a quality that it will not be washed out by the rain, it will be for the sheep a complete coat of mail, and the severest storms of rain or snow will seldom wet through a fleece which is well covered with such yolk.

In Scotland, after the lambs have been weaned in autumn, it has been customary to milk the ewes a few weeks, and from this milk to make a quantity of butter; and then mixing this butter with tar, two or three pounds of butter with one of tar, they prepare a kind of artificial yolk, with which they smear their sheep, in order to defend them against their wintry rains and snows. If they find it profitable to take so much pains to make this artificial yolk, how carefully should the breeder of Merinos so breed them together as to preserve the proper quantity and quality of the yolk upon his sheep; and one very especial cause for preserving Merinos pure, is the preservation of the quantity and quality of their yolk.

Third—there is very little taste to the yolk, and yet it appears to be, in some measure, a defence against flies and worms. The sheep tick and louse seem to be the only animals which can live comfortably in it. No fly of North America will lay its eggs in pure yolk of wool of the Merino. It is only when the yolk is mixed with blood, mucus or some other animal matter, that the fly will deposit its eggs in it.

And after the wool is shorn, it will not be disturbed by moths, so long as a moderate portion of the yolk is left in it. This, to the wool buyer, is a very useful property of yolk; and he ever buys the wool, making proper allowance for yolk and dirt; and buys it readily when it is black with yolk, knowing it to be good. And therefore, a large proportion of yolk on wool is disadvantageous, only with relation to the expense of transporting it to market.

On a healthy Merino, the yolk should flow like oil, nearly or quite to the ends of the wool. In such case the yolk will defend the wool from the influence of the weather,

and prevent dead ends of wool. The original breeds of Spanish Merinos are very perfect in this respect; but a mixture of the Escurial or Saxon breed, with other breeds of Merinos, frequently makes a race on which the wool often appears clapped, mashed down, and the yolk is imperfectly formed, and becomes inspissated, before it reaches the ends of the wool. The consequence is, that the ends of the wool are deprived of yolk, and an abundance of dead ends are produced. Such crosses should be avoided.

Mildness of temperature contributes to the secretion of the greatest quantity of yolk, and the truest fibre of wool; and therefore in northern climates, both a plentiful supply of good food, and sufficient shelters, should be provided, especially for fine wooled sheep, in winter.

When a flock of sheep is a mixture of several breeds of Merinos, the color of the yolk, with other points, will be an useful guide for the selection of those for breeders, which appear most desirable.

More yolk is usually found upon thorough bred Merinos than upon those which have been crossed with coarse wooled sheep; and hence an abundance of yolk is ever a favorable point upon the Merino ram.

SECTION XXVII.

INFLUENCE OF SOIL, FOOD & CLIMATE UPON THE FLEECE.

INFLUENCE OF SOIL.

The fleece, or covering of the sheep, is subject to the immediate influence of soil, food, and climate, or weather. Even the fibres of the same fleece vary in different parts of the year, from the same influences.

When sheep graze upon chalky soils, as in some parts of England, the wool becomes harsh, and is wanting in pliability, in consequence of the direct influence of the lime upon their wool by their lying upon it. The lime does not act as a corrosive upon the wool; but it absorbs

the yolk, and thereby renders it brittle and harsh. It is possible that all limestone soils which are but thinly covered with herbage, may have this effect in a degree; but such soils are extremely healthy for sheep. Lime is an indispensable constituent of all wholesome grasses; and whether it is received into the stomach in water, or in grass, or as a condiment, is immaterial; the lacteal ducts of a healthy sheep will receive into the system no more lime than what is necessary for the health and well-being of the animal; and, consequently, the quality of the wool cannot be impaired by its being in their food.

In order to prevent the influence of lime upon the fleeces of sheep grazing upon limestone soils, sheep, having an abundance of yolk, should be selected and bred upon them. With this precaution, the hilly limestone soils of America are the best which can be selected for growing fine wool. Some of the finest and softest wooled flocks in the United States, are pastured upon limestone lands without injury to the softness of their fleeces.

INFLUENCE OF FOOD.

The food of the sheep has an immediate and strong influence upon the fibre of wool. Mr. Youatt remarks that, "the staple of wool, like every other part of the sheep, must increase in length or bulk when the animal has an abundance of nutriment; and, on the other hand, the secretion which forms the wool must decrease like every other, when sufficient nourishment is not afforded."

Dr. Parry, of Bath, in England, says, "the fineness of a sheep's fleece of a given breed is within certain limits inversely as its fatness, and perhaps also as the quickness with which it grows fat. A sheep which is fat, has comparatively coarse wool, and one which is lean, either from the want of food or from disease, has the finest wool: and the very same sheep may, at different times, according to these circumstances, have fleeces of all the intermediate qualities, from extreme fineness to comparative coarseness."

The influence of quantity of food upon the fibre of wool, has been exemplified in the Paular breed. One hundred years ago, the pile of this breed was considered to be equal in fineness to that of the Escurial, or any other the finest in Spain. But in later years, their proprietors became pos-

sessed of some privileges of pasturage exclusively belonging to this flock, such as feeding in the finest pastures in its way to the mountains, and the pile of their wool increased in size so as to be only on a par with other transhumantes flocks.—(Letter from Edward Sheppard to Sir John Sinclair.)

Hence, on the low rich lands of England and other countries, have originated breeds of sheep having coarse and very heavy fleeces.

On the other hand, if the food is deficient in quantity or quality, the skin, as well as other parts of the body, will be debilitated, and a smaller fibre of wool will be produced, and sometimes none at all. In such case it is said that the sheep has the pelt-rot; for the skin becomes too weak to produce wool, and the yolk is imperfectly formed, and presents the appearance of a mere scurf.

These circumstances show, that in order to produce wool of an uniform fibre, whether fine or coarse, the sheep should be kept as near as may be in even good condition throughout the year.

In Spain, the Merino is provided with a plentiful supply of upland pasture at all seasons of the year; but their long journies, and continual breeding, prevent any excessive accumulation of fat, and the best of wools are produced.

Hence, in producing the finest qualities of wool, the Merino should be supplied with short pasture, upon dry hilly lands; but in producing long coarse combing wools, an abundance of highly nutritious feed will be most suitable.

INFLUENCE OF TEMPERATURE.

A dry mild climate or temperature is, doubtless, most favorable to the production of the most perfect wool.

The sheep is ever impatient of the extremes of heat or cold. In summer, it seeks the highest hills and coolest shades; in winter, the vallies and places of refuge from cold and storms.

The Spanish custom of driving sheep from the south of Spain, in spring, into the mountainous regions farther north, and then back again to the south in autumn, originated in the necessity of providing food for them, in consequence of the severe annual drouth, which takes place on the southern plains of Spain in summer. By this means,

they are kept on cool uplands and mountains in summer, and in winter, in a temperature which rarely falls below 48 degrees of Fahrenheit's thermometer.

But this custom has shown conclusively that a moderate, not very warm temperature, will produce the most perfect wool: and it is in no wise improbable that it has been the means of perfecting the Merino race of sheep, the most perfect wool-growing race which has yet been exhibited.

In this matter we cannot, with propriety, compare the sheep with furred animals; for their anatomical structure, food, and mode of life, are entirely different from that of the sheep. We can only reason from experience, from a view of the effects which climate has upon the sheep in different parts of the world.

If the sheep of the temperate zones be carried to the torrid zone, the wool becomes, on such a sheep, thin and coarse, and finally degenerates into short hair: even if the change does not take place to its full extent on the individual, it will infallibly do so in the course of a few generations.—(Mr. Hunter.)

On the other hand, if the same breed of sheep be taken to very high northern latitudes, the various breeds propagated in those countries show, that a mixture of hair will supervene with the wool, and the wool generally becomes coarse and harsh, instead of finer and softer like fur.

And in spring, after the sheep is first shorn, when the skin is most exposed to cold, the largest bulk of fibre is immediately produced, and the fibre diminishes in size after the fleece has grown, so as to produce that temperature of the skin which is most congenial to the sheep.

These facts all go to show, that a climate of medium warmth, a temperate climate, will produce the most perfect fleece—that which contains the smallest proportion of hair. In such a climate, the sheep is most comfortable and healthy; the action of the glands of its skin is most regular, and produces fibres the most uniform in size, and of the softest texture.

If, then, in such a climate, the sheep can be kept as near as possible in the same condition as to health and flesh, and without exposure to the extremes of heat, or cold, or moisture, the greatest possible perfection of wool may be obtained.

In the northern parts of Africa and southern parts of Spain, fine wools have been produced for ages, without any very special care, in a climate not much differing in warmth from that of the southern parts of the United States. In such a climate, by pasturing sheep in summer on highlands well provided with shades, and in winter on lower hills, the sheep may be accommodated with a temperature the most desirable for producing fine wools.

In the northern parts of the temperate zones, doubtless, sheep will produce the heaviest fleeces; for in such latitudes, the largest fleeces are necessary for their protection. But in more southern latitudes, with the same care, they will produce the best wools.

Hence, in high northern latitudes, vallies and low ranges of hills are best adapted for wool-growing; and shelters will be necessary in winter, and also even in summer, in cool, moist northern climates, like those of England and Saxony, in order to prevent the growth of hair, (or jar, as it is called,) to which the skin of the fine-wooled sheep has a strong tendency in such climates.

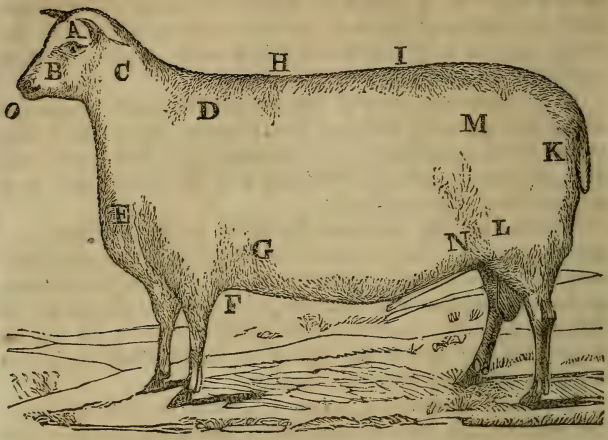
By means of shelters, proper selection and management, the wool of the Merino has been greatly improved in the climate of Saxony—a climate which is entirely unnatural to it.

As it is less difficult to provide against the extremes of heat in the southern parts of the temperate zones, than against those of cold and moisture in the northern parts of them, with good management, doubtless, fine-wooled sheep may be reared advantageously in any part of the temperate zones, on suitable localities.

But the sheep has a constitution which is so extremely pliable that it will continually endeavor to adapt itself to the climate, food and soil where it is placed: therefore, if any breed be placed in situations which are not congenial to it, it will be only by special care that such breed can be preserved in its purity and full perfection for any great length of time. Hence, in Prussian Silesia, the temperature of their sheep-stalls is regulated by the thermometer, in order to provide such a temperature as is best adapted to the growth of fine wool upon the Merino.

SECTION XXVIII.

BREEDING.



POINTS OF THE SHEEP.

A—Forehead. B—Face. O—Nose. C—Neck. D—Shoulder. E—Bosom. F—Brisket. G—Fore-flank. H—Chine. I—Loin. K—Rump. L—Leg. M—Hip. N—Flank.

When sheep have, for a long period, been bred in and in, or with others so nearly like them, that their progeny will, regularly and successively, possess points and qualities which are peculiar and very nearly similar, they are called a breed, or race.

The breeds of sheep are improved principally with reference to two great objects—wool and mutton.

The breeder acts upon the general principle, that "like produces like." But in order to realize the benefits of this general law of nature, he should possess a very correct knowledge of the structure of the animals to be improved, together with an equally perfect acquaintance with their qualities and habits. He should also bear in mind that the above rule holds good more generally in breeding downward than in breeding upward.

Bakewell, Ellman and others, have well defined the points of a good mutton sheep; and with respect to form

the New Leicester breed may be regarded as a perfect model. With reference to wool, the Merino may be regarded as a perfect model. But as extraordinary fattening properties cannot be united with the growth of fine wool on any one breed of sheep, it will be necessary to take a view of each kind by itself.

MUTTON SHEEP.

What is requisite in a well formed sheep, is, that the proportion of flesh and fat should be greatest on those parts which are most valuable, and that the bones should be comparatively small, or only of a medium size. And this, not because that bone detracts any thing from the growth of flesh or fat—for it is mostly composed of ingredients different from those of flesh or fat—but because it has been found, by experience, that animals, having comparatively small well-formed bones, most readily take on flesh and fat.

Mr. Arthur Young, in a tour through some of the agricultural counties of England, visited Mr. Bakewell, and explains the general principles which guided Mr. Bakewell in breeding a beast for the butcher—and they are as follows:

First—"In all his exertions, his aim was, to obtain that breed which, with a given amount of food, would give the most profitable meat; that in which the proportion of the useful meat to the quantity of offal is the greatest."

Second—"Points of the beast. The points are those where the valuable joints lie, viz: the rump, the hip, the back, the ribs, and after these, the flank. But the belly, legs, head and neck, should be light; for if a beast has a disposition to fatten and be heavy in these, it will be found a deduction from the more valuable points. A beast's back should be square, flat, and straight, or if there is rising, it should be from a disposition to fatten and *swell about the rump and hip-bones;* and the belly should be quite straight; for if it swells, it shows weight in a bad point. He prefers to have the carcass well made, and showing a disposition to fatten in the valuable points. So far on seeing."

Third—"Mr. Bakewell, to judge whether a beast has the right disposition to fatten, examines by feeling. His friend, Mr. Cully, who has had an infinite number of beasts pass through his hands, agrees entirely with Mr. Bakewell in this circumstance, and when with him in Norfolk and Suf-

folk, was surprised to find that lean bullocks and sheep were bought there by the eye only. So absolutely necessary is the hand in choosing either, that they both agreed, that *if they must trust the eye in the light, or the hand in the dark*, they would not hesitate a moment in preferring the latter. The form of the bone in sheep is quite hidden; it is the hand alone that can tell whether the back is flat and broad, and free from ridge in the back-bone, (*as it should be in all breeds;*) or can examine correctly, if the other points are as they should be. The disposition to fatten is discovered only by feeling. Speaking of sheep particularly, the points to examine are the same as in the ox; *flatness, breadth of back, a spreading barrel carcass*, and by no means curved and hanging. The essential is the carcass, and a disposition to fatten in the carcass, and perhaps to have the least tallow on the sides."

"In explanation of these principles, it may be observed, that the head should be small, short, and thin, that is, narrow in the forehead, both because it contains little flesh, and also, that it may not cause difficult parturition.

Extraordinary powers for travelling are not necessary to the mutton sheep, and, therefore, the legs should be comparatively short, but well formed, and standing wide apart both before and behind, so as to give room for a well-formed chest and abdomen.

With legs comparatively short, the neck also should be. With such legs, a short neck will have length sufficient for the animal in grazing. The neck should be thin toward the head, in order to avoid coarseness of form; but it should be thick toward the shoulder and chest, in order to obtain that breadth of chine, and capacity of chest, which are necessary to a good constitution and fattening properties. The drooping neck—the thin ewe neck—is rarely or never connected with the quick accumulation of outward fat: it is usually an indication of weakness of condition, and although not the first, is one of the most unerring proofs of deterioration. If the head of the sheep be light, there will be no necessity that the withers should rise high, in order to give extra room for the insertion of muscles for the support of the head. Hence, a rising at the withers is a bad point: it indicates a large, heavy head, and is inva-

riably accompanied with a chest which is narrow, and incompatible with a disposition to fatten readily.

The bones of the back should be straight, from the rump to the neck, and the vertebræ thick and short, so as to bring the short ribs near to the hips, thus forming a short strong back.

The back-bone of the horse contains 18 vertebræ, to which are attached 18 ribs on either side. For this animal, length of carcass is necessary, in order to make room for large lungs, and the insertion of powerful muscles, on the action of which its speed depends. The ox and the sheep are less active, and have each only 13 ribs on each side; but the slightest inspection of a well-formed sheep will show how much more horizontally its ribs spring from the spine, than do those of the horse, or even of the ox, and, consequently, its chest is rounder, and proportionately more capacious.

On the roundness and capacity of the chest, depend the size and power of the heart and lungs; and in proportion to their size, is the power of converting food into nourishment; and the great cardinal point in animals designed for fattening, is, that the chest should not only be round, but also large in proportion to the size of the abdomen, and other parts of the body.

Within a given circumference, a circular form comprises a greater bulk than any other possible shape: it gives the most room for the laying onward and inwardly of muscles and fat, and for large lungs and abdominal regions, and for the proper expansion of the lungs, and peristaltic motion of the bowels.

The food is concocted in the abdomen, and nourishment is there eliminated from it; but this nourishment (or carbon,) cannot be used in the formation of muscle and fat, until it has passed through the lungs, and has been duly oxygenized by them. The lungs have a two-fold purpose to accomplish: one is, to produce warmth for the animal system; and the other is, to communicate oxygen to the carbon, which is contained in the blood, so that it may accomplish the metamorphosis of the tissues of muscle and fat; may form and preserve them. If, then, the lungs are sufficiently large, so as to accomplish both these purposes at all times, a due proportion of the carbon, which is received into the system in food, can be fully used in the forma-

tion of flesh and fat, as well as in the production of heat; and be the lungs ever so large, only so much carbon will be used in the production of heat in a quiet, healthy animal, as will be sufficient to preserve the even temperature of the body.

But if the lungs be proportionably small, as they are in flat-sided animals, too large a proportion of the carbon will be wasted in the production of heat, especially in cold weather; and it will be only in warm weather, that such animals can gain flesh and fat rapidly; and at no time so rapidly as round, large chested animals.

Hence, as a general rule, round, large chested animals require the least food, and possess the greatest strength, according to their size. On this account, the horizontal projection of the ribs from the spine, and the consequent roundness and greater capacity of the chest, are reckoned among the most important points of the sheep. Doubtless Mr. Bakewell clearly perceived the importance of these points in a well formed animal; and hence we see that the New Leicester breed possesses a broader and larger chest, in proportion to its size, than any other breed, and, in this particular point, excels to this day, so as to render its form superior to that of all other breeds of mutton sheep. In accordance with these principles, the chest should be broad and deep; the back and loins broad, and the rump both long and broad, thereby securing large abdominal regions, and large hind quarters—the most valuable part of the sheep.

The lower line of the belly should be nearly level or parallel with that of the back. A pot belly apparently gives the most room; but it indicates weakness of the muscles of the abdomen, and an inability to afford its contents that support and pressure, which are necessary for the proper discharge of the digestive functions, and a tendency to increase of offal at the expense of more valuable points.

"A general squareness of frame is indicative of large muscles, particularly of the quarters; and a large developement of flesh is pretty sure to be accompanied by a disposition to fatten; but for profitable feeding it is essential that their qualities should be developed early—constituting early maturity."

A soft mellow feeling of the skin and parts beneath it, is justly regarded as an extremely favorable point. It de-

notes that healthy condition of the skin and the adipose membranes underneath it, which is necessary to all animals possessing good fattening propensities.

"But," says Mr. Sparrow, "there are various points that are sought after, not because of the particular value of those points, but because they are evidence of other valuable qualities. Thus, in the South Down breed, small bones are esteemed, as they are qualities which are found connected with fattening propensities. Black muzzles and legs are also valued, probably because they denote the good constitution and hardihood of the animal. We must, however, take care, lest in carrying these points to an extreme, we neglect other valuable qualities."

Hence, as most breeds of animals which possess extraordinary fattening propensities, are apt to be somewhat deficient in their prolificacy and milking properties, each of these qualities should receive its due attention.

In order to improve a breed of sheep, or preserve the good points and qualities of those which are already improved, it is necessary that they should be ever well fed and sheltered. Poverty, and undue exposure to cold, wet weather, have a direct tendency to produce deformity and disease.

Upon the practical part of breeding for improvement, Mr. Spooner remarks as follows:

"The improvement of a flock by means of breeding, requires very considerable and long continued care.

"The qualities of both parents must be considered, both with a view of correcting bad, as well as perpetuating good qualities."

"In breeding animals of a pure kind, the principal rule to be observed is, to breed from the very best of both sexes; to cull the faulty ones every year, saving only the female lambs for the future flock, that are as free from defects as possible. Of course the flock must be kept to its proper size; but, year by year, the finest animals should be selected, until, in the course of time, the flock will consist entirely of them.

"And if a superior ram of the same breed can be procured from another flock, by all means make use of it, and give it the preference, if it is equal to our own.

"The stronger the resemblance there is in the qualties

of both parents, supposing those qualities are good, the more likely is it that the offspring will be perfect.

"Then again with regard to size; animals that grow most in stature, have the greatest developement of bone, are in fact the coarsest. In improving the flock, such animals are avoided, not on account of their size, but their coarseness; and then in the course of time, the larger sheep having been drafted, the flock consists of the smaller and kinder animals.

"The offspring of some animals is very unlike themselves. It is, therefore, a good precaution to try the young males with a few females, the qualities of whose produce has been already ascertained. By this means we shall know the sort of stock they get, and the description of females to which they are best adapted." (Seabright on the art of improving domestic animals.)

As to horns, as a general rule, if any breed has naturally horns, as the Merino, it is best to breed from those which have well-shaped horns; for if polled rams of such breeds are used, their progeny are very apt to have an unusual growth of hoofs, which need very frequent paring, and are apt to turn up so as to cramp the fleshy part of the foot, and produce foot rot. Moreover, the growth of horns on such sheep, does not appear to lessen the growth of wool, or propensity to fattening.

It is supposed, with good reason, that Bakewell, in forming the New Leicester breed, made use only of the long wooled sheep of different flocks of the same race of sheep, which were in his neighborhood; and it is certain that Ellman used none but the pure South Down in perfecting his flock of that breed. These are strong precedents to show that the best mode of improving races of sheep for mutton, is to improve each kind by itself.

In Spain, each breed of Merinos has been bred and improved by itself, breeding in and in for ages, and the best of wool has been produced. The number of sheep in each cavana being very large, continual changes of affinity are made, and no detriment results from this course of breeding. And in Silesia and Saxony, the wools of the pure, unmixed Escurials have been improved, so as almost to defy competition.

These numerous precedents afford an argument still

more weighty, that the best wool can be produced by improving each breed by itself.

FINE WOOLED SHEEP.

For fine wooled sheep, the form of the Merino may be considered a model; and though the various breeds of Merinos differ much in their appearance, the forms of every breed are well adapted to travelling. Being compelled to travel annually, in Spain, 800 or 900 miles, their forms have been moulded to this purpose, and the production of fine wool. They are kept at breeding or travelling nearly the whole year; are truly working animals; and, doubtless the want of hardiness of the fine wooled sheep of Saxony, may be imputed, in some measure, to the great confinement to which they are subjected in that country.

Hence, in breeding the Merino, it is necessary that we adhere to the forms and other peculiarities which distinguish the Merino from the mutton sheep. The best specimens of each breed of Merinos are well enough for all practical purposes; and these best specimens of the Merino, are only an approximation towards the best forms of the perfect mutton sheep. As the Merinos in the United States do not travel; are not working animals, as in Spain, we should be cautious not to mould them into the form of the perfect mutton sheep; else they will be too strongly inclined to take on flesh and fat, and the quality of their wool will become inferior, both coarser and harsher. And if we breed for size, we shall be in danger of the same results, without increasing the profits; as large animals consume a proportionably greater amount of food. Moreover, small animals have a larger surface (skin), according to their weight, than larger ones, and, therefore can more readily produce the same weight, and a superior quality of wool.

On the other hand, as the weaker and more unhealthy animals of any breed of sheep are apt to produce a smaller fibre of wool, than those which are strong and healthy, we should carefully abstain from breeding with such weak or unhealthy animals, or the flock will become less hardy. The health and strength of the flock should never be sacrificed, to any refinement in breeding.

In breeding Merinos, it is particularly necessary, in all

northern climates, to select well formed animals of both sexes for breeders; the finer the wool, the more perfect should be the form.

In each of the original breeds, time has adjusted its different properties to each other, and these should not be disturbed, by unsuitable crosses, with other breeds.

The great desideratum is, to breed from such aaimals, as will pepetuate the superior quality of the fleece; and for that purpose, I shall insert the following remarks, which were communicated to the Commissioner of Patents, of the United States, by Charles L. Fleischman, Esq., and inserted by said commissioner in his annual report for the year 1847, relative to Spanish and German rules for breeding fine wopled sheep.

"According to Petri, who travelled in Spain, with the view of collecting information upon wool culture, the Spanish consider Merino sheep, with folds, as a sign of an improved and thorough breed. More or less folds upon an animal, give proof of the greater or less qaantity of wool; but these folds must be covered with as fine and good a wool as it is on the adjacent parts of the body. The Spaniards kill all those lambs which are born with few folds, and fine short hair, or almost naked, because experience has taught them, that the offspring of such animals bear a fine wool, but produce, by degrees, animals with light, flabby fleeces, which gradually lose the folds, and become thinner and thinner in the fleece, and are consequently less advantageous to the wool-grower than those sheep which are produced from lambs with plenty of folds, and a cover of fine, soft hair.

"When we examine such a sheep, after the fleece has its full growth, the wool must be, on all parts of the body, even in fineness; the folds must be covered with as fine wool as on the shoulders and sides.

"Twenty years ago [in Germany] bucks with a smooth tight skin, which had extremely fine wool, were considered the best; but their fleeces were light in weight, and had a tendency to run into twist. The German wool-grower had to come back to the original form of rams, with a loose skin, many folds and heavy fleeces, and since then they have succeeded in uniting, with a great quanity of wool, a high degree of fineness. This kind of heavy folded ani-

mals are now considered the best for breeding and wool-bearing.

"The lambs of the Electoral flocks of Saxony have been of that smooth kind just mentioned, and produced the Electoral wool, which was found to be similar to that grown in Spain from the *Merinos-estantes*, which is but a small quantity when compared with the clips from the *transhumantes*, the flocks of which generally bear heavy fleeces.

"The common country sheep, on the continent of Europe, have no folds, and they get them only when they are crossed with full-blooded Merino bucks, whereby the fleece becomes thicker and closer.

"Only to the Merino belongs the close and thick set fleece which, in respect to their size, produces the greatest quantity of wool. The folds are not a necessary condition of *fineness*, but of *quantity*, and are peculiar to the Spanish full-blood Merino. Almost all superior Merinos have folds upon the ribs, where the finest wool grows, and the wool of these animals is of such an uniform character that the folds are only discernible after the animal is shorn.

"Petri observed that the lambs which bring into the world fine soft hair, and a great number of folds, and whose tails are, in appearance, shortened by the large folds around them, bear the indication of great softness and quantity of wool.

"Experience has shown that only *thorough* blood should be employed in the improvement of stock. Sometimes, in an inferior flock, an animal is found which has all the qualities of a super Electoral; but such an animal will produce lambs inferior to himself, and full of the faults of his original parents.

"It is likewise to be noticed that the powerful, thick, and rich wooled bucks more strongly transmit their peculiarities, than the thin and fine-wooled; so that it is easier to increase the weight of wool of a highly refined flock, than to bring it to a yet greater degree of fineness.

"We must also aim at the production of a wool of an uniform character, and the growth of a staple free from faults; since, in most of our sheep-folds, we now find, at the same time, long and short, coarse and fine wool, thick and thin, slight curled and uncurled fleeces. In order to attain gradually to an entirely uniform kind of wool in a

sheep-fold, according to the opinion of judicious sheep-breeders, we should make use of bucks of an uniform character, that is, of equally long or equally short wool, &c., according as any one, guiding himself by local circumstances, wishes to produce a longer or shorter wool; and not, as happens at the present day, choose bucks of different kinds of fleeces for coupling in one and the same flock of ewes. The bucks must be chosen from the sheep-folds of exactly the same kind of growth and formation of staple, and the wool must, at the same time, be of equal fineness in the hair, on all parts of the body; that is, *exactly even;* for only with such can we reckon on continuing the blood and securing a good stock in future. The transition from one variety to another, when it becomes necessary, must be made only gradually; consequently, every one should avoid rapid transition at every coupling.

The choice of the buck must be made in the months of March and April, or at least before the shearing, by one who is a judge in such matters, with circumspection and prudence; but not as is frequently done shortly before the crossing—by the shepherd, who then, even if he understands it, can make no proper choice.

"Whoever makes the production of a highly fine wool the object of his breeding, will finally obtain a flock, each of which bears scarcely more than one pound of wool; but, on the contrary, whoever merely directs himself to secure a rich weight of wool, will, *by richer nutriment*, obtain sheep which will produce four pounds and over of wool. In an economical respect, it is, in most cases, advisable to avoid both extremes.

"But, above all, in order to obtain a sufficiently profitable sheep-fold, whether it be by the production of a highly fine wool, or by the quantity of wool, one must be careful, and one must indeed know what he would have, and not waver and change the wool in his experiments; he must know what he would have, and that by proper means."

POINTS OF THE MERINO RAM.

The different breeds of Merinos differ widely in the proportions of their various parts; but on each breed the various parts should be rightly proportioned to each other. Therefore, in breeding, we should not endeavor to alter the

general form of any breed; but only to select and breed from the best specimens of the kind which we cultivate.—With this view, the following rules will be applicable to every breed:

The head should be of a medium size and length for the breed, but wide between the eyes; the eye full and bright; the nose convex, and covered with fine soft hair; the horns large, but not too near the eye or face; the neck short, and broad where it sits on the body, well rounded, and gradually tapering, and nearly straight from the withers to the head; the frame compact, but not over large; the bosom broad and full; broad shoulders; the back broad, level, straight, and short for the breed; and the top of the shoulder-blades on a level with the back-bone; the hind quarters full, and round at the rump, and the flesh deep and full between the thighs (or in the twist); the tail set well up; the belly round and full, but not over large; the legs strong, upright, and of a medium size and length for the breed, and standing rather wide apart both behind and before, so as to give room for a chest which is well rounded, but proportionally smaller than that of the perfect mutton sheep; sound hoofs; the testicles large, and well covered with wool; a large folded, mellow skin, which has a fine carnation hue; a large dewlap is indicative of a heavy fleece, and for that purpose the forehead, belly, and legs should be well covered with wool; the wool soft and compact, and as nearly as possible of even fineness, length, and thickness over the whole body; no hair (or jar) intermingled with the fleece; the wool well covered with yolk; if the ram has only a moderate quantity of yolk, the ewes—his progeny—may be somewhat deficient in this respect, and the ewe never has too much yolk for the benefit of the fleece.

"The following measures will furnish data by which to judge of the various breeds of Merinos. They are selected from the valuable work of Petri, a highly celebrated writer on sheep, and an admitted authority, in these matters, in Germany.

Table showing the form and dimensions of several Spanish Merino breeds, in Austrian measures—taken from flocks in Spain by Petri.

Names of the Spanish Merino flocks.	Weight including wool.		Length from the mouth to the horns.		Length from the horns to the shoulders.		Length from the shoulders to the tail.		The whole length.		Circumference of the belly.		Height of the fore-legs.		Height of the hind-legs.		Distance of the hip-bones from each other.	
	lbs.	oz.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
From the stocks of the Negretti.																		
Ram	97	..	..	9½	1	7	2	2	4	6¼	4	1¼	1	3	..	10	..	6
Ewe	67	..	..	8½	1	5	2	1	4	2½	4	½	1	1	..	9½	..	4½
From the stock of Infantado.																		
Ram	100	8	..	10	1	6	2	3	4	7	4	2	1	..	..	9	..	6
Ewe	70	..	..	9	1	5½	2	1	4	3½	3	11	1	..	..	8½	..	5½
From the Guadeloupe stock.																		
Ram	97	8	..	9	1	6	2	2	4	5	4	5½	1	..	..	8	..	6
Ewe	69	..	..	9	1	2	2	1	3	11	3	9	..	10½	..	6½	..	4
Merinos Estantes of Sierra de Somo.																		
Ram	96	8	..	9½	1	6	2	..	4	3½	4	2½	1	..	..	8	..	6
Ewe	62	8	..	9	1	2	2	1	4	..	3	10	..	11	..	7	..	5
Small Merino Estantes.																		
Ram	42	..	..	7⅓	1	3	1	9	3	7½	3	2	..	10	..	6½	..	3
Ewe	30	..	..	7	1	1	1	6	3	2	2	10	..	8	..	6	..	3

NOTE.—An Austrian pound of 16 oz. equals 1.037 lb. avoirdupois. An Austrian foot of 12 inches equals 1.234 English foot.

The Infantado breed of Merinos, highly improved by selection and good management, is cultivated at Alesuth, in Hungary. Their fleeces are there washed in the nicest possible manner upon the sheep's back, and the average weight of their fleeces, as ascertained by personal examination by C. L. Fleischman, and by reference to the bills and books, is as follows:

Rams' fleeces,	-	-	-	-	3	lbs.
Wethers' "	-	-	-	-	$3\frac{1}{2}$	"
Ewes' "	-	-	-	-	$2\frac{1}{2}$	"
Lambs' "	-	-	-	-	14	oz.

SECTION XXIX.

BREEDING IN AND IN.

By *breeding in and in* is meant, the copulation of individuals of the same family or race, between which there exist near relationship of blood.

In the human family, breeding with too near affinity produces deformity of body and imbecility of mind, and the supreme power has given to man discretion to avoid this evil; but as to other animals, no such discretion was given —breeding with near affinity among them rarely produces deformity: it only produces weakness and inferiority of size.

It is well known that male animals, of various kinds, are frequently copulated with their own dams or progeny, without producing badly formed animals.

Animals in a state of nature, are sure to breed occasionally from the nearest affinity; and the evils which would arise from this course, if steadily pursued, are prevented, in a great measure, by the circumstance, that in a state of nature, the strongest animals are continually the principal sires of the flock, and are always making some change of affinity in the crosses which they make, so as to produce a strong progeny in most cases.

Now, though we cannot understand why the copulation of animals, having a very near affinity, will have the above effects, either in the human family or among other animals, it is sufficient for our purpose to know that such breeding produces a defective organization, and that the continual selection of the best formed and healthiest animals cannot entirely prevent its evil effects, especially where such a course is pursued for several generations.

In support of this theory are the observations of Mr. Dick, of Edinburg, in Scotland. "He has been informed by eminent farmers, that cattle *bred in and in*, are subject to clyers in the throat, after they have attained their first year." By *clyers*, are meant enlarged lymphatic glands, which are a sure sign of what is termed a scrofulous habit—a breaking up of the constitution."

In a number of the Quarterly Journal of Agriculture of Edinburg, Mr. Dickson remarks that, "the evil of breeding in and in, is manifested, in the first instance, by a tenderness of constitution; the animals not being able to withstand the extremes of heat and cold, rain and drouth. If the evil is prolonged through several generations, the forms of the animals become affected, the bone becomes very small, the neck droops, the skin of the head becomes tight and scantily covered with hair, the expression of the eye indicates extreme sensibility, the hair on the body becomes thin and short, and the skin as thin as paper; the whole carcass becomes much diminished in size."

The objects sought to be accomplished by breeding in and in, are, the preservation of good points or qualities, which are supposed to exist in one or both parents, or in the breed.

In order to succeed in breeding from animals having very near affinities, it will be necessary that the climate and soil be very favorable, or that there should be a masterly selection and management of the individuals selected for breeding, or that all these circumstances attend the undertaking; otherwise, some weakness or imperfection of some part of the flock, will surely succeed and show itself. Mr. Bakewell bred in and in to a certain extent, but it should be remembered that this was done by the hand of a master.

"Mr. Cully, the eminent breeder, expressed the opinion that less risk was incurred by breeding in and in, than was

generally supposed; yet appears to have preferred the practice of breeding from different families of the same race, as he hired his rams from Mr. Bakewell for many years, and, at the same time, other breeders were paying him a liberal price for his own valuable animals." And Blacklock observes, "this is of all methods deservedly the best, as the males, which are interchanged, have always had shades of difference impressed upon them by various soils and treatment, so that the defects of each family have a good chance to be counteracted by the perfections of the other."

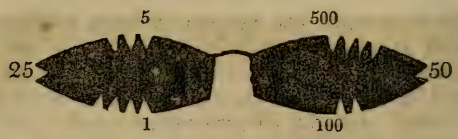
In this manner, by proper selection of males, good points and qualities may be heightened, and bad points and qualities may be gradually exhausted. This course is more particularly necessary where the flock is small, so that not many crosses can be made, without breeding from those which are too nearly related.

Where this mode is not practicable, breeding from rams of the same flock in such a manner as to preserve a distant affinity between sire and dam, is the next best mode of proceeding.

This may be done in a convenient manner by keeping several sets of rams, and marking each set of rams and its progeny, both ram-lambs and ewe-rams, with a particular ear-mark or nick, and crossing the ewes, descended from any one set of rams, with rams of, or descended from, a different set. By making use of several sets of rams, a continual change of affinity will be made, by which means a flock may be preserved in full perfection, especially where the climate and soil are favorable to the breed improved, and if the strongest and best bodied rams are selected for sires.

In Germany, breeding registers are kept by many persons, and each sheep receives distinct marks upon the ear, by which its affinity to the rest of the flock is readily known, and its ear-mark and the quality of its wool is duly registered; so that good blood and a distant affinity may be preserved.

The following cut exemplifies one mode of numbering on the ears, which is much used in Germany.



EXPLANATION.

On the point of the left ear - - -	25
below four times one - - - -	4
above three times five - - - -	15
On the point of the right ear - - -	50
above 4 times 500 - - - -	2000
below 2 times 100 - - - -	200
	2294

The following form of a breeding register, as kept by Mr. H. D. Grove, together with his notes of explanation, as contained in the fourth of Colman's Massachusetts Agricultural Reports, will exemplify the German mode of registering sheep.

Breeding Register, from July 1, 1838 *to July* 1, 1839.

No	Year in which born	Tupped by ram No.	Date of lambing	No. of lambs rams	No. of lambs ewes	Classification of the lambs, &c.	General remarks
25	1833	27–4	6–4	1		1st. Small and close curbed.	Thin lambs; 1 very feeble & died
1	1834	26–4	7–4		1	2d. Middle, small curls.	Lambs had a few fine hairs under the belly, &c

"In the first column is the number of the ewe; in the second, the ram's age, and instead of writing it out, I merely write 3, 4, 5 and 6, which means 1833, 34, 35, 36, &c. In the third column is the number and age of the ram, thus 27–4: 27 means the number, and 4, his age; namely, 1834, &c. In the fourth column is the day and month when the lamb is yeaned—thus 6–4 means the 6th day and 4th month. In the sixth columns are the number of ram and ewe lambs. In the seventh is the classification of the lambs, when a few days old, and the last column is for general remarks."

Mr. Grove says, "I am very particular in classifying my lambs with as much accuracy as possible, to enable me to decide upon the good or bad qualities of a progenitor or breeder. If his progeny is not such as I desire, he is rejected at once. I select my stock of rams with the greatest care, for I consider this the most important point in breeding; and here I find my records of great value. If I have two rams before me of equal quality, and hardly knowing which to give the preference, my records decide the question; for the one which has the best ancestry is preferred to the other."

SECTION XXX.

CROSSING.

Crosses are made with reference to different purposes. And *first*, with reference to forming new breeds of sheep. This is a difficult task, and requires the application of correct principles, and much practical judgment. In order to success, it is necessary that the soil, climate, locality, quantity and quality of food, and management, should be suitable for the breed intended to be formed. Also, there should be an affinity of constitution, between the breeds which are to be united; each breed should possess properties which are compatible with those of the other; and the stronger the resemblance between them, the less the difficulty in blending them.

Thus, two breeds of Merinos which resemble each other in form, may, in many cases, be thoroughly amalgamated, after a few generations. But if they differ widely in form, very many crosses may be necessary to consolidate them, so as to retain the good properties, and avoid the defects, which each possesses. Hence, it has been found almost impossible to form a good cross between the Negretti and some other breeds.

So also, most of the long wooled breeds of England have been improved by crossing with the New Leicester ram;

but it has generally failed in making any permanent improvement in short wooled sheep, among which the South Down has been far more successful. Hence, breeds of sheep, between which there is a wide contrast in their qualities, as the Merino and New Leicester, should never be copulated for the purpose of perpetuating their progeny; unless for the purpose of substituting one breed for another, by continued crossing, or, unless the immediate progeny is intended for the butcher. For the latter purpose, such crosses are very useful, generally producing, in the progeny, great thriftiness and strength of constitution.—Great length of staple cannot be united with extreme fineness and softness, on any one breed; it supposes a rapid and strong growth of the fibre, which is inconsistent with the production of fineness and softness. Lord Western has experimented in England, upon a large scale, in crossing the Merino with the New Leicester, and other long wooled breeds, for many years, but without establishing a breed, which can be said to have fixed characteristics.—Even if this object is attainable, a very great length of time and much judgment would be necessary in order to accomplish it.

In breeding from mongrels, produced by such crosses, the rule, that "like produces like," cannot be depended upon; even if these mongrels have been bred together for many generations, the form and size of the progeny, and qualities of their wool, will frequently vary; often resembling some remote ancestry, or possessing some defect which was not foreseen.

In crossing, to form a new breed, the breeder should have have a sufficient number of animals, from which to select, so so that there may be an opportunity of obtaining the points he wishes for, without the concomtiant defects. Range for selection is very important, and much disappointment has frequently been experienced, from inattention to this particular.

The successful results should be carefully selected for breeders; rejecting the others, and using for this purpose only healthy animals, which have not too near an affinity by blood.

The selections must be continued for many generations, before the distinct qualities of the new breed can be fully established.

Crossing should be adopted cautiously, and at first with only a portion of the flock: for we should not run the risk of spoiling the whole; and the success of the first experiment will regulate the second.

If we cross to correct a bad, or produce a favorable quality, then we should immediately return to our own breed, as soon as such effect has been obtained; always bearing in mind that we are making an experiment, which may, or may not succeed.

Under such circumstances, the safer and surer course, for those who wish for a breed which possesses uniformity of character, and which can be depended upon, is, to select and adhere to some one breed, whose qualities have been long inbred, and are well known. It would seem that there is already in existence, a sufficient variety of breeds, to satisfy the fancy or judgment of the most fastidious.

Second—Crossing, in order to substitute one breed for another.

This may be done conveniently by using the male animals only of the new breed as sires, until the old breed is lost; especially if the new breed is smaller than the old one. In this case, the ewe being proportionally larger than the ram, she will yean without difficulty, and will supply an abundance of milk for the growing lamb. But if the new breed be larger than the old one, it will be necessary, in the first cross, to use the smallest sized rams of the new breed as sires; otherwise the ewes will be very liable to be injured in lambing, in consequence of the large size of the lambs, and an insufficient supply of milk may be afforded, so that the progeny will be apt to exhibit the appearance of starvelings.

The crossing should be continued until every point and peculiarity of the new breed is fully developed in the progeny; and this object will be soonest attained by using only thorough bred animals of the new breed as sires.

Third—As to alteration in the fineness of the wool.

It is a general rule, that the alteration will be nearly in exact arithmetical proportion to the relative fineness of the fibres of the wool of the sire and the dam. If the fibre of the wool of the sire be represented by 800, and that of the dam by 600, that of the progeny will be 700. Hence, in crossing the pure Merino with coarse-wooled sheep, four

crosses are generally considered sufficient in order to obtain wool as fine as the pure Merino. But if the sheep with which the Merino is to be crossed, is very coarse, five or more crosses may be necessary before that object is obtained; and ten, or even thirty crosses, with pure blooded Merinos of the most improved breeds, may be necessary before every perfection of such breeds can be fully obtained.

Fourth—With reference to the color of the wool.

In the middle and northern parts of the temperate zones, sheep seem disposed to put on white fleeces; and black, or other colored fleeces, appear to be only accidental varieties. For, if black sheep are copulated with white ones, either a black ram with white ewes, or a white ram with black ewes, the progeny will be almost invariably white.

In order to procure progeny having black fleeces with certainty, it is necessary that both sire and dam be black. In such case, the wool of the progeny will generally be black, or nearly so.

It seems that anciently in Italy, special care was used not to breed from rams having a spotted tongue or lips, lest a dark colored or spotted progeny should arise from such connection; and the same care is used in Spain to this day; but there seems to be no good foundation for this notion.

Fifth—With reference to obtaining the greatest number of lambs.

If twin lambs are desired, a ram should be used which has been dropped a twin lamb himself. Mr. John Ellman, in speaking of the South Downs, says: "Experience has satisfied me, that a ram, which may be a twin, will get double the number of twin lambs that other rams will."—And Mr. Tusser says—

> "Ewes yearly by twinning rich masters do make,
> The lambs of such twinners for breeders go take."

Mr. Youatt also remarks that "No fact can be more clearly established than a hereditary tendency to fecundity."

Sixth—With reference to the form of the progeny.

M. Charles Giron de Busareinges, an agriculturist in the south of France, has ascertained, by numerous experiments upon animals of different kinds, that, as a general rule, the law of nature is, "that in animals of mature age and perfect developement, the influences of the sexes on the exter-

nal form crosses in generation—the male progeny being more like the dam, and the female progeny more like the sire." This he has decided by experiment and observation. And if we reflect upon the course pursued by animals in propagation, it will be seen that this law of nature was intended by the supreme power for the perpetuation of races. Among animals left to themselves, the sireship of the flock is determined by fighting, and the strongest animals become the principal sires of the flock. They communicate to their female progeny their own forms, and their female progeny transmit the same to the next generation of males. And thus strength of form will be communicated from generation to generation, equally both to males and females. And the sentiment that, "none but the brave deserve the fair," is entirely in unison with this law of nature. If, therefore, rams are wanted which shall have a particular form, ewes should be chosen which are as near as possible of the form desired; and then, if the sire with which the ewes are to be coupled, is a vigorous animal, and does not differ very widely in shape from the ewes, we may expect ram-lambs of the form desired: but the ewe-lambs will inherit the shape and qualities of the sire, except as to wool, as aforesaid.

Seventh—With reference to sex of progeny.

M. Giron has also by numerous experiments ascertained what appears to be the law of nature in this respect. And it is, "that in regard to sex itself, the influence is direct; the sex of the progeny will correspond with that of the parent which had the strongest constitution, and was in the soundest health at the time of union."

As to this proposition, his first remark was, "that in his flocks, those females which were at the most vigorous age generally produced females, whether united to strong or weak subjects; while those females that had neither not attained, or had passed the prime of life, produced males when united to prime subjects, or females when united to very old males.

"To ascertain whether this discovery corresponded with general observation among practical farmers, M. Giron made inquiries of the neighboring agriculturists, who informed him that they had constantly remarked, that when the male was young, and the female vigorous, the product

of their union was female, while the contrary had as uniformly happened when the conditions were reversed.

"In order to test this matter still farther, M. G. announced, in 1825, to the Agricultural meeting of Severac, that a part of his flock, already marked, would give him, at the next lamb time, more females than males. The Society nominated two commissioners to ascertain the facts; and it turned out that the proportion of males to females was 1000 males to 1472 females."

At a subsequent meeting, July 3d, 1826, M. Giron offered to effect the production of a majority of males or females in a given flock, at the choice of the Society. Two flocks were immediately furnished by the members of the Society.

"*The first flock* was divided into two equal parts. The first part, being supplied with very young rams, gave a product of 30 males to 76 females. The second part, being supplied with strong and vigorous rams four or five years old, gave a product of 55 males to 31 females.

"*The second flock* was also divided into two sections, but with more regard to the other conditions referred to.—The first section was composed of strong sheep four or five years old, and sent into a rich pasturage, and visited by yearling rams: it produced 15 males and 25 females. The second section, composed of feeble sheep under four or five years old, was placed in dry pasturage, and received two strong rams over three years old. The result was 26 males and 14 females. In both experiments it was observed, that the lambs produced by the young rams were equal in appearance to those produced by the most vigorous.

"The experiments were continued in other classes of animals, birds, and insects, with the same result. In the poultry yard, (e. y.) where the preponderance of maturity and vigor was on the part of the hen, there resulted 725 males and 1000 females; and where the male parent was the most vigorous and of the ripest age, there resulted 1415 males and 1000 females.—(New England Farmer.)

The principles of Breeding cannot be used so as to produce exact results, like mathematical rules; but the experiments of M. Giron are very satisfactory, and long observation has convinced me that the principles set forth by him are correct, as applied to sheep.

SECTION XXXI.

SELECTION OF BREEDS.

The two great purposes for which sheep are reared are their wool and mutton. Consequently, in the selection of breeds, it becomes necessary, not only to select a breed which is adapted to the soil and climate, but also with reference to the value of its wool and mutton where it is reared. If the locality be far from a market for mutton, the production of very fine wool or a great quantity of long combing wool may be most profitable, and mutton only a secondary consideration. Under such circumstances the breed, whether fine or coarse wooled, should be particularly adapted to the soil and food. If the locality is near a good market for mutton, that may be the principal object, and wool the lesser. In such cases, the deficiency of the productions of the farm may be in some measure supplied by purchase, if necessary.

When two breeds of sheep are equally well formed, the expenditure of food will be nearly in exact proportion to their relative size. But as animals, which are well formed, consume less food in proportion to their size, than those which are ill formed, and are also generally the hardiest and healthiest, every breeder should carefully select a well formed breed, whether it be coarse or fine wooled.

As a general rule, animals of a moderate size, of any breed, with thriftiness of habit and hardiness of constitution, are best adapted to most parts of the United States, and produce the best wools. Animals of the largest size, of any breed, may be more pleasing to the eye, but, generally speaking, are less hardy and less capable of enduring a scarcity of food from drought, or other causes, or hard usage of any kind; and consequently to most persons are less profitable than those of a medium size.

For the production of fine wool, the various breeds of Merino possess all the qualities which are necessary on dry soils of a medium or inferior quality. For the production of mutton or mutton and long wool on very rich grass lands, the various improved breeds of English sheep, and their crosses with the Merino, are best adapted; and

with reference to these English breeds, the remarks of Mr. Spooner will fully illustrate the subject, as follows:

"The management and selection of any breed of sheep, must after all become a matter of pounds, shillings and pence. The question the farmer has to consider is, what description of sheep will, in the long run, return the most profit; and this question must be viewed in strict relation to the management he will be able to adopt, on the particular farm on which he may be located. It is not, therefore, a simple, but a compound question. It is not merely which breed will make most flesh and fat, but which will make it in the shortest time, and on the least food; which can bear the weather, or hard keep, or travelling, or a particular mode of management, with the greatest impunity. All these considerations must enter into the farmer's mind, before he can come to a sound conclusion. From the want of making these considerations, many fatal mistakes have been made and a flock has been selected, altogether unsuitable to the soil, and incapable of bearing the severity of the weather."

"The two breeds which appear as rivals, in their claims on public attention, are the *New Leicester* and the *South Down*. It cannot be doubted, that as far as propensity to fatten and early maturity are considered, the Leicester will not only rival, but eclipse all others; for these qualities the form may be justly considered a model, and all other breeds will possess these qualities in a greater or less degree, in proportion as they possess the similitude of the form and points of the Leicester sheep. The South Down itself will not be an exception to this rule. For if the improved and the neglected specimens be compared together, it will be found that the excellencies of the former consist in those points which approximate most to the Leicester. The wool, too, is also a consideration; for the fleece, from its greater length and weight, will bring in nearly double that of the South Down. When, therefore, the pasture is very fertile, the Leicester may be justly regarded as the most profitable of the pure breeds. Its drawbacks are, the incapability of the animal for bearing exposure, or travelling, or living hard; in fact its weaker constitution, and greater liability to inflammatory disorders.

"Then again, the mutton is not so good as the South Down, which, however, is, partly, not wholly owing to

the early period (twenty months) at which they are fit for the butcher, and partly to the large proportion of tallow in proportion to the lean. Thus it is not a favorite in the London markets. Accordingly, of late years, the first cross between the Leicester and the Down has been produced, instead of the Leicester. And it is contended that this first cross is the most profitable sheep that can be fattened, making greater and more rapid progress than the Down and better meat than the Leicester. But it is better to stop at the first cross, devoting the produce entirely to the butcher, and preserve the stock sheep pure."

"The *South Down*, or rather the improved South Down —for there is a great difference between the two—possesses most valuable qualities; with a propensity to fatten inferior only to the Leicester, but with later maturity, (often thirty-two months, though considerably shorter than it once was,) this breed are excellent travellers, well adapted for folding, hardy, compared with the Leicester, and capable of living on short pasture, and perhaps the best of all breeds for the Down farms of the south of England. The mutton, too, is more esteemed than any other, with the exception of the small mountain sheep.

"Perhaps there is no ancient pure blood of sheep that has undergone so much improvement as the South Down; and it affords the owners of other breeds a proper example, showing what can be done by care and attention, and the application of correct principles.

"The *Cheviot* sheep possess many valuable qualities; decidedly inferior to the South Downs in their fattening powers and their early maturity, they are superior in these points to all other mountain sheep, and, in hardihood, even to the South Down, and are thus adapted to their native hills, and all other pastures of a similar character.

"These three breeds, the Leicester, the South Down, and the Cheviot, may be considered as the principal pure breeds which this country (England) possesses; they are essential to the variety of pastures, and without them this country could not be properly stocked. Other breeds, which it may be advantageous to adopt, either possess peculiar qualities, which render them valuable, or have been crossed extensively with more improved breeds.

"The *Dorset* and the *Somerset*, for instance, are valua-

ble on account of the ewes taking the ram so much earlier than other breeds, so that the lambs come into the market when scarce, and thus command a higher price. These qualities have caused this breed to be diffused to a great extent within the circuit of a hundred miles of London.—The qualities of this breed, in other respects, are inferior to the Down: the mutton is not quite so much esteemed, the sheep are not so hardy, and do not possess equal fattening powers.

"The South Down and the Cheviot rams have been used extensively for the purpose of improving the mountain breeds, both of Wales and Ireland, and when care is taken to retain a preponderance of the indigenous breed, the result has generally been successful.

"The Leicester have been extensively employed in improving the breed of other sheep, and so successful has this practice been in many instances, that the result of the cross has produced a breed more profitable than the Leicester itself—retaining the fattening qualities of the sire, with the greater hardihood of the soil possessed by the native breed. The Lincoln, the Romney Marsh, the Bampton, and the Cotswold sheep have been thus improved; the large frame and length of wool of the Cotswold have been retained, together with much of the fattening qualities of the Leicester sire."

The above is the opinion of Mr. Spooner as to the cross of the Leicester and the Cotswold breeds. But, "There are many of the Cotswold breeders, who say they have not a drop of the Leicester blood, but have improved their symmetry by a close attention to the smaller male of the original, with a fat back and curly skin in view, still keeping their long faces and ears, rumps, and legs of mutton; thus producing earlier maturity, and a better mixture of fat and lean, than the Leicester cross.—(A. Agriculturalist.)

From the observations of Mr. Spooner, it would seem that the Cheviot breed are best adapted to the high, mountainous regions of the Northern States; the New Leicester, the Cotswold and the Lincoln breeds, to rich, low lands and to the flat prairie, and other level grass lands of the Western States, and the South Down to the shorter pastures of hilly lands. To such pastures, also, the various breeds of Merinos, and their crosses with coarse wooled

sheep, are best adapted, and the mutton of the Merino, when fatted on such lands, is excellent.

The prudent farmer, therefore, will do well to make himself acquainted with the inherent qualities and peculiarities of the different races of sheep, within his reach, and to make choice of, and adhere to, some one breed, which under all circumstances, promises to pay best, for his outlay of capital and attention.

SECTION XXXII.

SHELTERS.

In all past ages, the common sense of mankind has decided that shelters were necessary and useful for sheep in winter. Among other picturesque objects, which Homer delineated on the shield of Achilles, nearly three thousand years ago, was a pasture with many white sheep, in a beautiful valley, and shepherds' tents, and hurdling stakes, and *sheep cotes, well roofed over*.

Virgil, in his Georgies, (i. e. poetical works upon husbandry,) specially directs that sheep should be foddered in stalls through the winter: and he informs us that the Germans, and other northern nations, kept their herds in stalls in winter.

Less care has formerly been used in Britain, with respect to shelters, than in other northern parts of Europe, in consequence of the greater mildness of the climate; but of late years more attention has been paid to the benefits of protection.

Sir G. S. McKenzie, of Scotland, thus remarks upon this subject: "Shelter is the first thing to be attended to in the management of sheep. While every good shepherd is decidedly hostile to their being confined, or to their being forced into shelter, whether they wish for it or not, it cannot be too strongly recommended to all sheep farmers, to put the means of avoiding the severity of stormy weather within the reach of their flocks at all times."

In this matter, the comfort of animals, and the profit of man, are promoted by the same means. Shelters are beneficial in many respects; and *First*, they save a very considerable amount of food.

All practical farmers know full well, that every description of stock may be fattened much more rapidly in a mild temperature, than when the weather is extremely cold, and that animals will consume more food in extreme cold, or only moderately cold weather, than when the temperature is mild; and sheep managers are fully sensible that the sheep is not an exception to other animals, in this respect.

Hence good shelters, by lessening the cold to which the sheep is exposed, diminish also the amount of food which is necessary for them.

But in order to understand this subject scientifically, it will be necessary to bear in mind, that all the varieties of their food is composed principally of carbon, and also that their flesh and fat, wool and horns are composed mostly of the same material, as may be seen by the following table:—

	Hay.	Oats.	Flesh	Mutton fat.	Wool	Horns
Carbon, - - -	45.8	50.7	51.9	79.99	50.65	51.54
Hydrogen, -	5.0	6.4	7.6	11.70	7.02	6.77
Oxygen, - -	38.7	36.7	21.2	9.30		
Nitrogen, - -	1.5	2.2	15.1		17.71	17.28
Athes, - - -	9.00	4.0	4.2			
Sulphur & Oxygen, - - -					24.60	24.39
	100.0	100.0	100.0	100.00	100.00	100.00

By this table it aapears, that hay and oats, flesh, wool, and horns contain carbon, in nearly equal proportions. Hence, at first view, it would seem that a given amount of hay and oats ought to produce a regular proportional amount of flesh, wool and horns. But the carbon which is taken into the animal system by digestion, is used for distinct purposes: one is the production of flesh and fat, wool and horns; and the other purpose is, the production of animal heat, by slow combustion in the lungs. When-

ever, therefore, for want of shelter, the animal is exposed to extreme cold weather, or wet weather, which chills the body, an increased amount of carbon will be necessary as fuel in the lungs, in order to keep up that even temperature of the body, which is necessary for the proper action and preservation of the animal system; and unless the carbon be supplied in food, the tissues of flesh and fat will be wasted, in order to furnish the necessary quantity. In such case, shelter, by lessening the cold to which the animal is exposed, will lessen the amount of food which will be necessary to the system, in order to keep it at the proper temperature, will be in part a substitute for food.

Second. Protection increases the quantity and preserves the quality of the wool.

Whatever contributes towards the preservation or increase of flesh and fat, also promotes the growth of the wool and the secretion of yolk. For, if the sheep be in good condition, the glands of the skin will act with strength and regularity; the fibres of wool will consequently be uniform in size, and a full supply of yolk will be produced, so as to give the wool all that softness, pliability and brilliancy which can be obtained only by keeping the sheep in a mild temperature, as in Spain, or by a full measure of protection as, in Saxony.

Third. With proper protection, sheep are much less liable to disease and death, than if exposed to the severity of the weather. Cold and wet weather have a direct tendency to produce foot rot, scab, coryza and dropsy, and, above all, poverty and rot, which last mentioned disease is very frequently an unsuspected cause of death. Cold and wet weather close the pores of the skin, and if the fleece be wet through, have the same injurious effect upon the sheep as upon other animals.

Fourthly. As ewes which have the benefit of shelter, will be more healthy than those which are exposed to the inclemency of the weather, they will rarely need mechanical aid in parturition; a greater number of lambs may be raised, and the lambs will be healthy as their dams.

Fifthly. A greater quantity of manure can be saved, so as to be distributed on such parts of the farm as may most need it. Whereas, if the sheep be permitted to run

at large and find shelter as best they can, a large share of their manure, in winter, will be deposited by the sides of fences, and in other places where it is least needed.

Sixth. It is a great convenience to be able to fodder entirely under shelter; and the hay and straw of every kind will be eaten up cleaner than if it is exposed to wet weather.

Those who are opposed to the sheltering of sheep in winter, assert that the breath of sheep, and the effluvia of their manure are injurious to them. In ill-ventilated and ill-cleansed sheep stalls, these circumstances sometimes produce serious diseases; but with proper ventilation and removal of their manure, sheep will no more be liable to injury by their shelters, than are cattle or horses.

The experience of Mr. L. A. Morrell, of Tompkins county, New York, will illustrate this subject:

"Before he had provided shelter for his flock of Saxony sheep, 1,200 in number, he lost from 70 to 100 annually, during winter, and once lost 150. For four successive years after protection was provided, the average number wintered being 1800, the average yearly loss amounted to only 31, being less than 1¾ per cent."

Mr. L. A. Morrell is satisfied, that at least one ton to the hundred sheep, is saved by protection every winter, (*in his latitude*). He says, "Of oats which I fed liberally before protection, the amount saved is equivalent to 500 bushels each year, and yet my sheep have been in finer order than when they were grained; showing, notwithstanding the virtue of grain, that there is more virtue in warm shelter. The same successful manager has also found, that the aggregate increase in four clips of wool from his flock, resulting from protection, amounted to 1250 pounds; and that the increased number of lambs exceeded one hundred a year."—(Cultivator.)

SECTION XXXIII.

QUANTITY AND QUALITIES OF FOOD.

The great value of most articles, which are used as food for sheep and other animals in Europe, has induced a much greater attention to the economy and principles of feeding in those countries, than in America, where such food is comparatively much less valuable. Hence their experiments, and the observations of their writers furnish many details and principles which are necessary in order to fully understand this subject. In Europe, it has been ascertained by numerous experiments, that animals of the same species, after arriving at maturity, *if equally well formed*, consume food in proportion to their weight. This rule will not hold good in all cases, but it is sufficiently correct for practical uses.

By the estimate of Mr. Spooner, sheep take $3\frac{1}{3}$ per cent of their weight in hay per day, to keep them in store condition.

Thaer was a long time at the head of the distinguished agricultural school of Mogelin, in Prussia, where many experiments were conducted in sheep management under his eye. He states that "$3\frac{1}{2}$ lbs of dry fodder for a sheep daily are necessary, and *the greater proportion of this in nutritious hay, compared with dry straw, the better.*"

Veit was Professor of Agriculture in the Royal Institution of Bavaria. He makes the following observations, based upon experiments:

"The need of fodder is proportioned to the live weight of the sheep, and two and a half pounds of the value of hay is required daily for every 100 lbs. live weight, to keep the animal in a profitable state. Hence the following amount of fodder is required for store sheep."

	Live weight.	Daily.	Yearly.	Summer.	Winter.
For a long wool German sheep,	100 lb.	2.5	912	532	380
Rich wool Infantado, coarse wool	88 "	2.2	803	473	330
Moderately fine Merino,	80 "	2.0	730	426	304
Escurial Elect'ral i.e. pure Escurial	62 "	1.55	506	334	232

Now if we take Veit's estimate as a correct standard, and suppose the average weight of a flock to be 80 lbs. each, and the foddering time to be 150 days, or five months, this will be two pounds daily, to each sheep, and for 5 months, 300 lbs., and, consequently, in that time 100 sheep will eat 15 tons of hay. It should be borne in mind, that this estimate by Veit was made in and for the cold climate of Germany, where the winters are severe, and where animals, of course, consume more food than in more temperate climes. And, therefore, in latitude 41 or 42 in the United States, 15 tons of hay may be, and is considered by most farmers as an ample provision for wintering 100 full grown Merinos. Young sheep of any breed, if thrifty, require nearly as much food as when they have arrived at maturity; eat more in proportion to their size than full grown sheep. It must be understood, that in this estimate by Veit and others, good upland hay, well matured and well cured, is the standard of nutriment, and that if grain or other food is used as an equivalent, allowance must be made for it in proportion to its value, as compared with hay. Also if the hay be very succulent when cured, or is grown on wet lands, or in a wet season, or abounds much in stalks, or is made from grasses of an inferior kind, an allowance of from 10 to 33 or even 50 per cent. in some cases, must be made.

In dry seasons, the grasses will be fully perfected, and, therefore, in such seasons the same weight of grass, hay, or other fodder will be much more nourishing than in a wet season.

Special care should be used, that hay and straw of all kinds be thoroughly dried before they are put into the barn. Mouldy or musty hay or grain is far less nutritious than that which is well cured, and moreover has a strong tenden-

cy to create disease. Such fodder is much disliked by sheep, and consequently much of it will be wasted.

The above computations were made with reference to keeping sheep in good store condition only. Now whether they are to be kept merely in good order, or are to be fattened, nearly the same bulk of food will be indispensable, in order to produce the distension, which is necessary to the proper healthy action of the stomach and bowels; and, therefore, so far as the health and convenience of the animal is concerned, bulk constitutes an essential part of the value of food.

For the purpose of fattening, it will be necessary that the food should comprise, within the same bulk, a greater proportion of the elements of nutrition than in the above estimates. Consequently, it will be very convenient to know the amount of nutritious matter which is contained in each kind of food, and, also, its value, compared with other kinds—both for the purpose of fattening, and also in the use of equivalents for good hay.

The following table, given in Burger, from Petri's work on the care and keeping of sheep, may be considered as a test of equivalents. It will show that while of some an animal could scarcely eat enough to support life, of others the nutriment would greatly exceed what the wants of the animal demanded.

100 lbs. sweet meadow hay contains 50 lbs. of nutritious matter and is equal to—

90 lbs. of clover hay,			100 lbs. of which contain	55½ lbs. [of nutritious matter.	
90	do	tender Vetch hay,	do	55½	do
90	do	tender lentil hay,	do	55½	do
360	do	wheat straw,	do	14	do
500	do	corn straw (stalks)	do	20	do
180	do	barley straw,	do	27½	do
200	do	oat straw,	do	25	do
200	do	pea straw,	do	25	do
190	do	millet straw,	do	26½	do
200	do	horn bean straw,	do	25	do
180	do	chaff, (wheat and oat)	do	27½	do
200	do	potatoes,	do	25	do
200	do	cabbage turnips,	do	25	do

200 lbs. of yellow turnips,			100 lbs. of which contain	25 lbs. of nutritious matter.	
200	do	white do	do	$12\frac{1}{2}$	do
300	do	beets,	do	$16\frac{3}{4}$	do
500	do	white cabbage,	do	10	do
52	do	wheat,	do	95	do
52	do	Indian corn,	do	95	do
55	do	rye,	do	90	do
61	do	barley,	do	82	do
64	do	buckwheat,	do	78	do
71	do	oats,	do	70	do
54	do	peas,	do	93	do
105	do	wheat bran,	do	48	do
109	do	rye bran,	do	46	do

Petri gives the following, as examples of averages of fodder for an ewe, in the month of January, when the yeaning time commences in March.

1st Day—In the	morning,	$\frac{3}{4}$ lb. good oat sraw.
	noon,	$\frac{1}{2}$ lb. good hay or clover.
	evening,	$\frac{3}{4}$ lb. good barley straw.
2d Day—In the	morning,	$\frac{3}{4}$ lb. millet straw.
	noon,	2 lb. potatoes, with 4 oz. chopped straw, and 4 oz. oats.
	evening,	$\frac{3}{4}$ lb. barley straw.
3d Day—In the	morning,	$\frac{3}{4}$ lb. hay.
	noon,	$\frac{3}{4}$ lb. hay.
	evening,	1 lb. wheat, barley, or buckwheat straw.
4th Day—In the	morning	$\frac{3}{4}$ lb. summer straw.
	noon,	$\frac{1}{2}$ lb. chopped straw, with 3 oz. bran moistened with water.
	evening,	$\frac{3}{4}$ lb. winter straw.
5th Day—In the	morning,	$\frac{3}{4}$ lb. hay.
	noon,	2 lbs. potatoes, with $\frac{1}{2}$ lb. of chopped straw.
	evening,	$\frac{3}{4}$ lb. winter straw.
6th Day—In the	morning,	$\frac{3}{4}$ lb. hay.
	noon,	as in 4th day.

If the sheep be left to itself, and be allowed to crop such things as the God of Nature has provided for it, it feeds principally upon fine stalk grasses, and bitter, astringent, and diuretic leaves and weeds. When, therefore, it is compelled into a cold climate, the best fodder which can be provided for it in winter, is obtained from these same articles dried.

For this purpose, many kinds of grass are cultivated in Europe. But of those kinds which are most cultivated in the northern part of the United States, *Timothy*, or meadow cats tail grass, (Phleum pratense) appears to be one of the best on upland meadows.

Mr. Youatt says, "this grass is of much value for permanent pasture, mixed with other grasses, on account of its early herbage, its great productiveness, and the superior proportion of nutritive matter it contains. *A little time before the seed is ripe, at which time it should be cut*, it affords 11½ drachms of nutritive substance to the pound. It is most useful in the form of hay."

The proper time for cutting grass is here pointed out by Mr. Youatt. Grasses, which are cut when in flower, or previous to that time, are more succulent, but have less substantial nutriment in them, than those which are cut after the flower is fallen, and their seed is nearly matured. Such young grasses contain much saccharine matter, and when made into hay, readily produce acids in the stomach, and diarrhœa in consequence, especially if grown in a wet season, or on moist lands. Whereas, if grasses are cut while the stalks are yet green, but after the flower is fallen and the grain is formed, the saccharine matter becomes mostly converted into starch, and ceases to be injurious.—At this period, also, they contain the largest proportion of nutriment.

Kentucky blue grass, smooth stalked meadow grass, (poa pratensis) nearly resembles the June grass or spear grass (poa compressa) of more northern States, which is less esteemed. Dr. Darlington says, "Kentucky blue grass is decidedly the most valuable of all American pasture grass." It comes in spontaneously upon rich calcarious soils, and is, therefore, considered to be indigenous to the United States. It is also one of the best for hay. The Franklin (Kentucky) Farmer asserts that it flourishes only on cal-

carious soils; but that is not strictly correct; it flourishes where there is a fair proportion of lime in the soil. It is less liable to be affected by frost than other grasses, and, therefore, makes the best of winter pasturage.

Herds' grass—red top and *white top*—(Agrostis Vulgaris) is a spontaneous growth of the wet lands of the United States.—(Buel.) The *red top* and *white top* are different varieties of the same grass. It is very hardy, and is easily cultivated. If cut when it is fully matured, it makes excellent hay, and on moist soils is valuable for pasture.

Ox eye Daisy (Chrysanthemum leucanthemum) is generally considered a vile weed: but if it is cut when in flower, it makes good hay for sheep, cattle, and horses; and for pasture, sheep prefer it to almost any grass whatever; it is aromatic and mucilagenous.* It is very hardy, and will grow on dry, sandy, and gravelly, or other poor upland soils, where grasses will hardly live, much less flourish; and, therefore, on some lands may be advantageously sown for sheep pasture.

Creeping White Clover, (Trifolium repens) is a perennial plant, which is common to Europe and the United States, growing spontaneously in pastures, meadows, and woodlands, to the height of from 4 to 12 inches. It generally grows too short to be exclusively used for hay; but is useful when mixed with other grasses. It is very sweet and nutritious grass for pasture, and is much relished by sheep, but is not very productive.

Red Clover (Trifolium protense), is very nutritive, and is well relished by sheep for hay or pasture, especially when mixed with timothy or other upland grasses; but the bulk required for them is very great, and hence it will be no object for the farmer to cultivate clover, for hay for sheep, on soils where timothy, or blue grass, or other useful fine stalk grasses can be cultivated with less difficulty. But on dry ground, or sandy soils, where those grasses are cultivated with difficulty, and do not flourish, clover will be an useful substitute. It penetrates deep into the ground and bears the drought better than most grasses.

The above mentioned grasses, together with those other grasses and herbage which are indigenous to various parts

* See Livingston on Sheep, page 72.

of the United States, will furnish on most farms a sufficient variety of hay and pasture.

All the various kinds of straw of grains and leguminous plants, are to be viewed only as substitutes for good hay, and are to be fed only for the purpose of economy, or for the sake of furnishing a part of that great variety of food, in which the sheep delights. If the best of out straw be placed in the same manger along with hay, only a small proportion of the straw will be eaten by the sheep, as long as the hay lasts.

This is evidently the opinion of Thaer upon this subject. He says, "The quantity of hay which is given to sheep, (in Germany,) is very different. In poor sheep folds, it is considered much to allow 3,000 or 4,000 pounds of hay to 100 sheep for wintering. In better conducted ones, 7,500 lbs. is considered the minimum for sheep; 3½ lbs. of dry fodder for sheep daily are necessary, and *the greater proportion of this in nutritious hay, compared with dry straw, the better.*

Hence, in Germany, and other parts of Europe, where it is an object to raise as much grain as possible, large quantities of straw are produced, and much of this straw is fed to sheep in Germany, for the sake of economy, and the deficiency in nutriment of straw is made up by feeding grains, leguminous seeds, (beans, peas, vetches, and lentils), and roots; and the manure of sheep being more valuable than that of any other domesticated quadruped, the folding and pasturage of sheep alternates well with the raising of grain. In many cases it will be profitable to preserve the same course in America.

1.—*Oat straw.* Of those kinds of straw which are cultivated in America, oat straw is one of the best. If cut when rather green, there will be little or no diminution in weight or quality of the grain, and the straw will be very nutritious, and a portion of it is well relished by sheep.

2.—*Buckwheat* has rather a fine straw, and is well filled with leaves, and is equal in value to the straw of winter grain. As a large quantity of it may be raised on lands which are too poor to raise other grains or grass, in some cases, it may be very convenient and useful fodder for sheep.

3.—*Wheat straw.* The straw of bald wheat may be fed

with propriety to sheep. But the straw of bearded grains, such as bearded wheat, rye, or barley, (the straw of which is more nutritious than that of wheat,) should be fed to them only in case of great scarcity of fodder; as the beards of such grains frequently produce braxy.

4.—*Indian Corn*, (Maize). The blades and stalks contain much saccharine matter and are very nutritious. The finer parts of them are highly relished by the sheep. The hard stalks when cut up are eaten freely by cattle. The cobs of Indian corn may be ground with the grain, and being very nutritious may be fed advantageously to sheep. In very dry seasons, when there is a scarcity of hay, or on farms where the quantity of meadow land is small in proportion to that of the pasture, Indian corn may be sown broadcast, and cut and cured when it is three or four feet high, so as to form a very nourishing and productive substitute for hay.

5.—*Beans and Peas.* The straw of beans, peas and other leguminous plants, if cut and thoroughly cured when those articles are rather green, is much relished by sheep, and is nearly equal to hay. In such case, the straw and seeds may be fed together, without threshing. If the seeds of peas and beans are allowed to become fully ripe before they are harvested, sheep will not readily eat either the pea or bean straw. But such ripe pea straw is much relished by horses, and cattle prefer the pods of ripe bean straw to almost any other food.

6.—*Millet.* The grain of this plant contains much nutriment, and it produces a great bulk of straw which is much esteemed as fodder.—(London.)

Apples and Roots are fed advantageously to sheep, either as in part a substitute for hay, or for the sake of variety, or for the health of the flock.

Of these, the *potatoe* is one of the best articles. They are sufficiently succulent to keep the bowels open, and at the same time are very nutritious *Apples* answer much the same purpose as potatoes and are much relished by sheep,

Jerusalem Artichoke, (*Helianthus tuberosus.*) The tops of artichokes if cut and cured while green, and before they are injured by frost, are excellent fodder for sheep and cattle. The roots are the best of succulent food for sheep,

and they do not readily produce diarrhœa. They are not subject to rot by disease like potatoes; and as 600 or 800 bushels to the acre may be raised without difficulty, they are the least expensive roots which can be grown for sheep in the northern part of the United States.

Carrots are very nourishing, and are undoubtedly one of the healthiest articles which can be provided for sheep in winter. But as their cultivation is somewhat troublesome, they will be little used for this purpose on large farms.

Beets contain much nutriment, and are much used in Europe for the fattening of animals, and near large towns in the United States, where mutton is valuable, may, perhaps, in some cases, be used advantageously for the same purpose.

Turnips are used to a vast amount, and with great advantage, in Europe, for the same purpose. But in the United States, the climate is too dry and scorching, in most parts, to admit of their extensive cultivation, and, therefore, large flock-owners must depend principally upon potatoes, apples and artichokes, for succulent winter food for sheep.

As to food designed for fattening, the experience of farmers has already been in favor of the principle, that food, which contains oil, is most productive of fat. The oil contained in such food is assimilated by the digestive process to the fat of the animal using it. Beech nuts, Linseed oil cake, and Indian corn, each contain a large proportion of oil, and consequently are highly valued for this purpose.

Liebig has advanced the doctrine, that vegetable food, as wheat, potatoes, beets, &c., is fattening on account of the starch, sugar and gum which it contains; that starch, sugar and gum being composed of the same ingredients as fat, (viz. carbon, oxygen and hydrogen,) are readily converted into fat by digestion. This unquestionably is correct in principle; but yet in ordinary farm management, it is found cheaper and more expeditious, to use a proportion of food which already contains oil, rather than to wait for the transformation out of the starch, sugar, &c., which are contained in vegetables and seeds.

The following table will show the amount of oil contain-

ed in sundry kinds of vegtable food, and, consequently, their comparative value for fattening:

Indian Corn,	9	to	10	per cent. of oil.
Oats,	4	to	5	do
Wheat,	$2\frac{1}{4}$	to	$2\frac{1}{2}$	do
Bran,	4	to	5	do
Straw,	1	to	$1\frac{1}{2}$	do
Clover hay,	4			do
Meadow hay,	$3\frac{1}{2}$	to	4	do
Peas and Beans,	$2\frac{1}{2}$	to	3	do
Beach mast,	15	to	17	do
Sunflower seed,	15	———		do
Linseed,	11	to	22	do
Hempseed,	18	to	25	do
Linseed oil-cake,	9	to	10	do

These proportions are not constant; for the amount of oil depends upon the season, increasing with the brilliancy and dryness of the weather. Potatoes, beets, carrots, turnips, and mangel wurtzel, contain less than one-quarter per cent. of oil, and, therefore, are not so well adapted to fattening, when used alone; are best when fed with some kind of grain or meal.

One of the most successful articles in the list is Linseed meal, or oil-cake. But Linseed, or the oil-cake, are used most beneficially mixed with meal of oats, peas, or other farinaceous grains, or with cut straw, in order to preserve the health of animals. Indian corn, also, contains so much oil that it is used most advantageously in the same manner. These two articles—oil-cake and Indian corn—and all other grains which contain much oil, readily produce diarrhœa, unless used in moderate quantities, or combined with other ingredients; and being more difficult of digestion, are not so beneficial alone, as constant feed for stock sheep, as oats, barley, buckwheat, and other more farinaceous grains.

As a general rule in feeding, the quantity should always be adapted to the quality; and such combinations should be formed as both to distend the stomach, and afford the necessary nutriment. Grain alone, or roots alone, would not answer both these purposes, and, therefore, when used, they should ever be fed along with hay or straw. The leaves or straw of herbage, are also necessary for the process of rumination.

The following table will exhibit the results of the experiments of the distinguished Agriculturist, M. De Raumer, of Silesia, and the effects produced by an equal quantity of several substances, in increasing the flesh, tallow, and wool of sheep.

	Increased the w'ght of the living animal.	Produced wool.	Produced tallow.
1000 lbs. of Potatoes raw with salt,	46½ lbs.	6½ lbs.	12½ lbs.
do do do without salt,	44	6½	11½
do do Mangel Wurtzel, raw,	38½	5¼	6½
do do Wheat,	155	14	59½
do do Oats,	146	10	42½
do do Barley,	136	11½	60
do do Peas,	134	14½	41
do do Rye with salt,	133	14	35
do do do without salt,	90	12¼	43
do do Meal, wet,	129	13½	17½
do do Buckwheat,	120	10	33
do do Good hay,	58	7½	13
do do Hay with straw, without other fodder,	31	15½	6½

These resnlts agree nearly with those of De Dombal, and with those of a number of other agriculturists. De Raumer found, "that sheep ate with avidity eight pounds of mangel wurtzel a day, intermixed with straw; during which time they drank one quart of water, and remained in good and healthy condition."

"That of raw sliced potatoes, they ate, with good appetite, at the rate of seven pounds per day, also with straw, and drank three pints of water in twenty-four hours; also remained healthy.

"That they ate two pounds of peas daily per head, drank from two to three quarts of water, and remained fine and healthy. It was necessary to soak the peas to prevent injury to the teeth.

"That wheat produced nearly the same result as peas.

"That they do not eat rye readily, and it appears not well adapted to their use.

"That of oats and barley they ate about two and a half pounds per head daily, with avidity, did extremely well on it, and drank about three quarts of water in twenty-four hours.

"That buckwheat produced excellent effects upon them, and that they ate it with avidity.

"And that of good hay they ate four and a half pounds daily, and drank from two and a half to three quarts of water."

From the quantity of hay consumed, we may conclude that the sheep upon which these experiments were made, were of large size.

It will be perceived by the above table, that wheat produces the greatest increase in flesh of the living animal, though but little greater than oats; that barley and wheat produce the greatest increase of tallow; that hay, with some straw, produces the greatest increase of wool; and that peas, wheat, and rye are the next most valuable articles for this purpose.

That on an average, grain generally gives about three times the increase in flesh that roots and hay do, when in equal weights; that grain produces about twice as much wool as is caused by an equal weight of roots, and four or five times as much tallow as is produced by either roots or hay; that potatoes and mangel wurtzel produce a far greater amount of wool, according to the amount of nutriment contained in them, than hay, oats, wheat, or other grain.

From the results of the foregoing experiments, we may, therefore, conclude, that when wool is the principal object, we must depend, in winter, upon good hay with some straw, with a moderate daily allowance of oats, buckwheat, peas, or beans, together with some potatoes, mangel wurtzel, or apples, as green food, for the greatest amount of wool; and we may expect the greatest increase in flesh and fat, from the feeding a moderate portion of oil-cake, barley, or Indian corn, along with oats buckwheat, or other farinaceous grains.

That hay or straw may be used to the best advantage, it should be fed in racks or mangers, if possible. And for

this purpose, mangers or boxes are preferable to racks.—Sheep are very apt to pull the hay out of racks, so as to get their feet upon it; after which they refuse to eat it. Therefore, if hay or straw is fed to them by scattering it upon the ground, a very considerable portion of it will always be wasted.

Grain is fed most advantageously in flat-bottomed troughs. In such case, the grain being scattered, they do not readily gorge and choke themselves.

SECTION XXXIV.

WATER.

It is computed by physiologists that at least one half of the animal system is composed of water. Water, therefore, is not only nutriment, but it is also the vehicle by which all other nutriment is conveyed through the lacteal ducts, and other absorbents, into the blood. Hence, at no other time is the sheep so healthy and thrifty as when feeding on succulent grasses in dry summer weather. Such grasses, on an average, contain as much as two-thirds water, and one-third solid matter.

In summer, when no dew falls, the sheep occasionally drink a little water. But when dew falls regularly, sheep kept in pastures will, for months in succession, hardly taste a drop of water. They prefer feeding mostly early in the morning, or in the evening, when the dew is on the grass; and this dew ordinarily affords all the water which is necessary for them, in addition to what is contained in the grasses.

But when snow is on the ground, and they are confined entirely to dry hay or straw, their repugnance to eating snow is such, that an insufficient supply of water will be thus obtained, and they will become, in some measure, costive and feverish, and, in consequence, many of them will pine away and lose flesh.

By the experiments of De Raumer, it appears that when

confined to dry hay and straw, the sheep ate four and a half lbs. of dry fodder, and drank from two and a half to three quarts of water.

This experiment shows conclusively that, when confined to dry fodder, the sheep needs about one-fourth more weight of water than of hay or straw. For this purpose, a full supply of water should be provided for them in winter at least once a day. If they can have the privilege of access to a spring, or water running from a spring, at all times, it will be far preferable; otherwise, water drawn from a well will suffice. In such case, they will never injure themselves by drinking too much, let the weather be ever so cold. But if permitted to drink only once in two or three days, sheep, like other animals under like circumstances, may sometimes drink so much as to injure themselves.

It should be remembered that the principles of digestion are much the same in different kinds of ruminating animals, and that, consequently, the sheep, when fed upon dry hay, has the same need for its proper supply of water, as cattle when fed in the same manner. The sheep, it is true, can live, can exist, longer without water than most animals. M. Daubenton found by experiment, that a sheep could live a whole month on dry hay and straw, without water; but if deprived of it, even for one day, it would, on the succeeding day, drink an extra quantity, which showed that it was tormented with thirst.

De Raumer found that of raw sliced potatoes, a sheep ate, with good appetite, at the rate of seven pounds per day, along with straw, and *drank three pints of water in twenty-four hours*, and continued healthy. In this case, the sheep drank only half as much as when fed entirely on dry fodder. This experiment shows that green food, in winter, besides furnishing a portion of that great variety of food in which the sheep delights, and which contributes so largely towards their healthiness, is also, in part, a substitute for water. But if a full supply of salt and water is provided for them, they will seldom be troubled with costiveness, or the drying of the manifolds, which are indicated by stretches.

SECTION XXXV.

MANAGEMENT OF SHEEP.

A natural arrangement of the subject is, doubtless, the best of any, and will be adhered to as far as the nature of the subject will permit—selecting such rules as are of general application, and such as are generally used by experienced flock-masters.

FALL MANAGEMENT.

PUTTING RAMS TO EWES.

The proper time for putting ewes to rams, will depend in some measure upon the breed cultivated. The lambs of coarse-wooled sheep, when first dropped, bear cold better than those of fine-wooled sheep: and hence, coarse-wooled sheep may be put earlier to the ram than fine-wooled sheep. If the lambs of such sheep are intended for the butcher, and a supply of succulent spring food is provided, the ewes should yean early in spring. But those who choose to take that method, either with coarse or fine-wooled sheep, which is most convenient, and which affords the best chance for raising the greatest number of lambs, will put the ewes to ram at such time that the lambs may be dropped when there will be a good bite of grass in spring, so as to produce a supply of milk for the lambs. Consequently, the proper time for this purpose will depend upon the latitude and climate.

In Prussian Silesia it has been found, by experience, that Merino lambs which are dropped in summer, produce a quality of wool which is superior to that of those which are dropped in winter; and hence, the rams and ewes are there coupled in January, and the lambs are dropped in June.

The ewes of coarse-wooled sheep should not be put to the ram until they are about 20 or 22 months old; and the young ewes of fine-wooled sheep, not till they are 30 or 32 months old. Until they have attained these ages respectively, they have not the strength which is necessary to furnish a full supply of milk and raise strong lambs. These

which are of quite inferior size should not be permitted to breed at any age.

Ewes should be selected for breeders having not only the requisite qualities as to form, wool, and good constitutions, but also those having good milking qualities should be preferred. For this purpose, see that they have good teats and udders; that there are no hard schirhus lumps upon their udders. Ewes, having defective udders, cannot give the supply of milk which is necessary for the lamb, and, therefore, such ewes should be rejected; as all those which have had difficulty in lambing from malformation; they will be again subject to the same difficulty. No other but healthy animals of either sex should be used for breeding.

Old ewes should be excused from breeding. The best flock-masters in England, fatten and sell off their ewes (coarse-wooled ewes,) at four, or, at most, at five years old. It was the opinion of the celebrated Mr. Ellman, that though an old ewe would bring a large lamb, yet, generally speaking, such a lamb would not make as large or fine a sheep, or fatten as well, as a lamb from a younger ewe.—Merino sheep are longer in coming to maturity than British sheep, and the ewes may, with propriety, be kept breeding until they are seven or eight years old. After which, it will be well to fatten and dispose of them, unless their teeth and constitution are more than usually good.

Rams should be selected having, as nearly as possible, all the points and qualities most desirable, and of a size properly proportioned to that of the ewes. The ram should not be too large in proportion to the size of the ewe; if too large, there will sometimes be difficulty in lambing, and the ewe may not have a supply of milk for such large sized lambs. Rams and ewes should be selected for each other, so that the good points of one may remedy the defects of the other, as far as possible, in their progeny; and always preferring the best blooded animals, if equally perfect in other respects.

For a few weeks before the rams are used, they should have first-rate pasture or hay, with as much grain, and only so much, as will be necessary in order to put them in first-rate order. A gill of oats, or its equivalent in wheat, buckwheat, or other grain, daily, will be sufficient. If extra services are required, a little more than the usual quan-

tities of grain should be allowed them; and in such case, this extra feeding should continue during the rutting seasons, and for two or three weeks after the rams are taken from the ewes, lest they should become impoverished.

The number of ewes which may be put with each ram, will depend upon the breed, the age and vigor of the ram, and the manner of management.

If a number of rams be turned into good pasture along with the whole number of ewes, as in Spain, it will be proper to admit only about 25 ewes to each ram. This mode is practised in Spain from necessity, but is not the best method. The rams are very apt, in such case, to fight too much, and the strongest rams are apt to obtain for themselves a greater number of ewes than are consistent with the retention of their own vigor, and the strength of their progeny.

If each ram be kept in a separate fold or pasture by himself, and eight or ten ewes only be turned in with him the first day, and only about the same number each succeeding day until 40 or 50 are put with him, in such case neither he nor his progeny will be injured by his being overtasked,

If the ram be kept in a yard by himself, and the ewes, which are rutting, be ascertained by an aproned teaser, and are brought to the ram at regular intervals during the day, such ram, if of mature age and vigor, will be sufficient for 150 or 200 ewes. In such case, the ewes should be thrown out as fast as they are tupped. And in all cases where large services are required of rams, it will be prudent to keep them from the ewes at night, and feed them well.

The above calculations are based upon the supposition, in each case, that the rams are of mature age and vigorous. If the rams are very young, (yearlings or two year olds,) or are oldish and past their full vigor, only one-third or one-half as many ewes should be put with them.

Improved British breeds come to maturity sooner than the Merino by one year, on an average—are as far advanced at 18 months old as the Merino at 30 months, and may be used proportionally sooner. The Merino ram does not attain its full size and vigor till past three years old.

Overtasking the male produces a weak progeny, and, therefore, should be avoided. Nothing is gained by coupling the ram with too many ewes at an early age, as his

vigor fails him proportionally sooner. If not overtasked when young, the coarse-wooled ram may be used for breeding till six or seven years old, and the Merino till eight or nine years old. Merinos, of both sexes, have been known to breed till 15 years old.

While the rams are with the ewes, the ewes should have better feed than they previously had. If they are neither very fat nor very thin in flesh, and are moderately fed with stimulating food during the rutting season, and are allowed to range about in fields, or are driven about so as to obtain suitable exercise, which helps to bring them in heat, but few will remain barren.

The ewe comes in heat at intervals of about seven days. Therefore, as, during the lambing season, special attention to the ewes will be necessary; it will be most convenient to leave the rams with the ewes only about three weeks or a month; within which time, if proper care is used, but few will remain barren; and by noting the time when the rams are placed with the ewes, and when removed from them, we may know when to relax our attention to them in spring.

FALL FEEDING.

As soon as severe frosts come on in fall, the grass becomes less nourishing and wholesome; and though animals, having the appetite sharpened by cold weather, eat it freely, and fill themselves well and look plump, they gradually lose flesh, unless something be afforded to them which is more nourishing than grass. At this time, therefore, lambs, old sheep and breeding ewes should be fed with a portion of hay or grain, or both, in order to prevent their declining in health. Hay, besides affording good nourishment, helps to prevent diarrhœa. Lambs and feeble sheep should have access to shelters early in fall.

Strong wethers, and rams which are not used for breeding, need less attention, and with the necessary condiments, and some grain, may be kept mostly on grass through the winter, if the ground is bare, or on hay without grain.

If the flock begins the winter in good condition as to health and flesh, there will be little difficulty in getting most of them through the winter with proper care. But if they are in bad condition on the approach of severe weath-

er, it will be almost impossible to put flesh on them during its continuance. For this reason, the same quantity of grain fed in November and December, will be worth to them at least three times as much as if fed only in February and March. The extra flesh and fat, which is laid upon them by good feeding early in fall and winter, helps to defend them against the influence of cold—fat being a non-conductor of heat. Whereas, if the same grain be fed to them in February and March, after the digestive powers of many of them have failed, such ones cannot be restored; they must perish.

SECTION XXXVI.

WINTER MANAGEMENT.

SORTING.

On the approach of winter, sheep should be sorted with reference to sex, age, size, and condition as to flesh, so as to give to each kind the requisite proportion of food, and a chance to obtain it, without being driven away by others.

Barren Merino ewes, if in good condition, will take the ram at any season of the year, and, therefore, neither they nor ewe lambs, after being weaned, should be permitted to run with rams at any time, except for the purpose of breeding.

And as, notwithstanding the most skilful management, some will generally become during fall or winter, more than usually poor or diseased, such animals should be sorted out, and a comfortable place should be provided for them, where they may receive all the extra food and attention which their case requires, until they are restored; and if any are seen declining, they should be removed to this place in due season. By delay of attention, poverty and disease increase, and restoration becomes more difficult.

MANAGEMENT OF LAMBS.

If first-rate animals are wanted, they should not be over-

fed, so as to force them, but should always be well fed from the earliest period of their existence until their growth is complete. If they are scantily fed for any considerable time while they are growing, they become stunted, and no after management or nourishment can eradicate the effects of short feed or neglect at this period.

With this view, a few old sheep or wethers, should be placed in each flock of lambs, in order to learn them to eat hay, grain and roots, &c.

After the grasses are injured by frost, they should be fed daily, in the morning, a little first rate hay, and at noon or evening a half gill or less of oats to each of the flock, if Merinos or other small sheep's lambs; taking care to distribute the grain so far along in the troughs, that each one may have a chance to partake of it.

After ten days, the quantity of grain may be gradually increased to twice the above amount, or, for the sake of variety, an equivalent in buckwheat, barley or other grain; but for lambs, either of those three articles will be preferable to Indian corn; less injurious to their tender teeth.

If the lambs are of the large, coarse wooled breeds, nearly or quite twice as much grain may be fed to them daily. Such lambs grow faster than Merinos, and need more food in proportion to their size. And these largest portions of grain should be fed to them daily, through the remainder of the season, to each kind its proportion.

Whenever, for the health of the flock, or the better growth of wool, it may be thought best to feed them with potatoes or other roots, these articles should be cut or chopped fine with a root cutter, spade or otherwise, so that they may be eaten by them, and should be sprinkled with meal of oats, or other grain, and a little salt, until they learn to eat them without meal. A bushel of roots or apples may be fed to each hundred daily, or thrice weekly, as may be expedient. They will generally eat apples very readily, without meal.

Some persons feed more largely than the above proportions of grain, especially in severe cold climates; but those who wish to produce the first quality of wool will feed so much, and only so much grain, either to lambs or other sheep, as will keep them in good thriving condition. This

amount will vary in different climates, and may be determined by experience.

As soon as cold, rainy or stormy weather comes on, the lambs should have the benefit of shelters, which they can use at pleasure; and care should be used that lambs, and all other kinds of sheep, have sufficient room at their racks or mangers, so that each one may feed without being crowded, and that hay, or occasionally straw, be fed to them at least twice daily.

YEARLINGS AND BREEDING EWES.

Some persons winter sheep of these kinds upon hay only. But if the flock be large, the hay must be of an extra quality, or they cannot be kept in good store condition through a northern winter in this manner. Breeding ewes are generally somewhat exhausted by raising lambs, and yearlings are still growing and need more nourishment in proportion to their size, than full grown sheep. Animals of mature age require only food sufficient to keep the system as it is; but growing animals not only require enough for this purpose, but also in addition sufficient to form new parts; and, in so doing, their digestive organs are more active than those of full grown animals, and consequently they use a larger proportion of food according to their size.

Yearlings, therefore, of all kinds, will need quite as much food as breeding ewes; and both should be fed as much grain and succulent food in addition to hay and straw, as will keep them in good condition.

For this purpose a gill of oats, or its equivalent in buckwheat, corn, peas, or beans, or a mixture of some of these articles may be fed to them once or twice a day, as may be found necessary, increasing the quantity of grain at times as may be expedient. Beans seem to be particularly adapted to the use of the sheep, on account of the large proportion of soda which they contain, and are highly relished by them. When the ground is covered with snow, so that they are confined to dry fodder, a bushel of apples, or roots may be fed to them twice or three times weekly, with good effect.

RAMS AND WETHERS.

If rams and wethers begin the winter in good condition,

they may, generally, be well wintered upon hay and some straw, without grain. But if any of them are quite thin in flesh, or if rams have been used for propagation, they should be sorted out and should receive better feed and attention than the rest of the flock; and if any are designed to be fattened off on grass the ensuing summer, they also should be better fed than others during winter.

REGULARITY OF FEEDING.

The digestive process in healthy animals is very regular; the stomach needs and can digest in a given time its regular quantum of food. This quantity, therefore, should be supplied with as much regularity to animals as to man, if we desire them to thrive; and they have the same sufferings, if it is withheld.

The quantity, as well as kinds of food, which should be fed to them, will depend upon the temperature of the weather, the quality of the fodder, and the condition of the flock. And judgment must be used, in rightly proportioning the quantity to the quality, and in making the proper changes of food; and, in order to keep them in a healthy and thrifty condition, they should never be compelled to eat much at any one time, of any article of food, which they do not relish.

As it is generally desirable to make use of such grains and other articles as are raised on the farm, the table of equivalents will be found very useful, in adjusting the quantities of each kind of food.

In summer time, when the sheep is at pasture, the principal feeding is done mornings and evenings; a large proportion of the middle parts of the day, being devoted to rest and rumination. In winter, we should allow them to take much the same course.

The hay and straw, therefore, should be fed principally mornings and evenings. But if the weather be severely cold, a small additional foddering of hay at noon will be necessary along with grain, or succulent food. But in moderate winter weather, if grain or succulent food is fed but once daily, it should be at noon, and in such case, will be sufficient without hay.

At each foddering, so much, and only so much, should be fed, as will be fully necessary for them, in the intervals

of foddering. In such case, the fodder being always fresh and uninjured by their breath, they will eat it cleaner than if over-fed, and little will be wasted. If, however, at any time, orts of hay or straw be left in the racks or mangers, such orts may be occasionally sprinkled with weak brine, and will then be readily consumed. For this purpose, a watering pot will be found a very useful and convenient article; or, the orts may be used for litter.

And the necessary condiments should be provided for them at all times, so as to ensure perfect digestion.

EXERCISE.

In a state of nature, graminivorous animals are continually moving from place to place, in order to procure sustenance. This exercise is indispensable to perfect digestion, health and vigor; and is more especially necessary to young animals, in order to the proper growth and developement of muscle and bone. Hence, close confinement, for any great length of time will be, in some measure, injurious to stock sheep. In winter, when there is much snow on the ground, necessity compels the domesticated sheep to remain quiet. But in climates where the ground is bare or partly bare, at intervals during the winter, it will be very economical, and will contribute greatly to the strength of the flock, if they can have an extensive range upon hilly pastures, which have been permitted to grow up during autumn, or upon rye fields which have been sown early. They will thus obtain the necessary exercise. In such case, they will need some grain daily, in order to keep them in good flesh; but much hay will be saved. At the same time, the necessary condiments should be carefully provided for them, as they are very liable to diarrhœa and braxy, when feeding on such pastures in winter.

Fields of blue grass will be very useful to those who adopt this course of management; blue grass being less liable to injury by frost than most other grasses.

For lambs, short pasture, with plenty of hay and grain, will be more beneficial; and if the land be rich, and the climate or soil is moist, very short pasture, with a good supply of hay, &c., will be preferable for every division of the flock, until the grasses are well sprouted in spring.

SECTION XXXVII.

SPRING MANAGEMENT.

In spring, sheep of every kind which have been wintered mostly on hay, or other dry fodder, should, if possible, be induced to continue on eating a portion of such fodder daily, until the grasses are well started, so as to afford a full supply of food. Dry fodder, at this time of the year, helps to prevent indigestion and diarrhœa; but as they do not willingly eat much of it at this time of the year, if any grass can be obtained, they may be induced to relish it by sprinkling such dry hay, or other fodder, occasionally with weak brine. And in order to keep up their strength, when first beginning to feed on such young grasses, it will be well to continue feeding grain moderately, for a short time after they have discontinued eating hay.

Before they are sent off to their summer pastures, all such as have much filth adhering to their hind parts should be tagged, especially coarse wooled sheep, in order to prevent the deposition of fly blows, whereby sheep are sometimes much injured or destroyed. Breeding ewes, which are heavy with lamb at this period, should be managed with caution in handling them; otherwise abortion might follow. For this purpose let them stand upright upon the legs, and be held by one person, while another clips off all the wool and filth which it may be necessary to dislodge. But no wool should be pulled or clipped from the udder of the ewes at this time; if the udder be partially or wholly denuded before lambing, it will have a strong tendency to produce garget, and endangers the life of the ewe. If the ewes be properly tagged at this time, the lamber will more readily see the stain of blood on the parts behind, which, and which only, will sometimes tell him when the ewe has yeaned; for it is no uncommon thing for a young ewe to desert her lamb, and be found grazing unconcernedly with the rest of the flock, as if nothing had happened.

Also, the male part of the flock should be examined, and, if necessary, the wool should be cut off for two or three inches around the extremity of the sheath, whenever the wool appears to be constantly saturated with urine, so

that there will be danger of its producing soreness or ulceration.

As the ground is usually wet at this season of the year, their hoofs will be softer than at most other times; and this opportunity should be improved for cutting and paring them. In this operation, breeding ewes should be handled carefully; and their hoofs should be attended to three or four weeks before parturition.

THE LAMBING SEASON.

In breeding for improvement, a number should be placed upon each ewe with paint, about a month before the time of parturition. Shortly after each lamb is dropped, the number of its dam should be put upon the lamb. In this manner, by reference to the breeding register, the necessary selections of lambs for breeders may be made, with reference to their progenitors.

The average period of gestation of the ewe is stated to be 152 days. T. E. Pawlet states, in the London Farmers' Magazine, that he found, by observations carefully made, that the times his ewes went with lamb were as follows:

	Weeks.	Days.
The longest time any ewe went with a ram lamb was, - - - - - - - - - - - - -	22	4
The shortest, do do do do	21	4
The longest time that any one went with a ewe lamb was, - - - - - - - - - - - - -	22	2
The shortest, do do do do	20	4

From these experiments, it would seem that the sheep (and, perhaps, all other animals) go longer with males than with females; though the difference is trifling.

The proper time for parturition must be determined by climate, locality, and the purposes for which the flock is principally reared.

During the latter part of the time of gestation, more particular attention should be paid to the ewes. If it is intended that the lambs shall drop in March or April, or at any time of the winter or spring, before grass grows, in order to raise early lambs for market, or other purposes, the ewes should be fed, for a week or two before lambing, with succulent food, or wheaten shorts, or barley ground or boiled,

or should have a chance to feed upon early sowed rye, and have, at the same time, a little grain daily. If the lambs are to drop after the grass is well started in spring, a moderate portion of grain, with a little hay, daily, will be sufficient for them.

As to quantity of feed, a middle course should be pursued, in order to enable the ewe to produce the lamb with comparative safety. Too high feeding disposes to fever. On the other hand, with too poor keep, the ewe will not have strength to go through with the process of lambing safely, nor will she have milk enough for the lamb. If the dam has not previously had sufficient support, the lamb will be weakly when it is dropped, and will not thrive as well afterwards.

When the time of yeaning approaches, suitable care may prevent considerable losses. The ewes should be placed in a smooth, dry, nearly level, grassy field, which is as free as possible from ditches and hollows, or in well littered yards, near good shelters, as, even if the lambs are dropped late in the season, it will sometimes be necessary to pen some ewes by themselves; and in case of cold rains or extreme cold weather, all should be under shelter, especially at night.

If the lambs are to be dropped early in the season, before grass appears, and while the weather is rather cold, the ewes should be kept, at this season, principally in yards near their shelters, or in small pasture fields; but they should not be too much confined, as moderate exercise is essential to breeding ewes.

For ten days or a fortnight before the time of yeaning approaches, the ewes should be visited often during the daytime, lest some of them should be cast, and being unable to rise, should suffer abortion, or should continue to struggle occasionally, until death overtakes them by exhaustion and suffocation.

As storms appear to accelerate the birth of lambs, the sheep-fold should be frequently visited at such times, after the ewes begin to yean.

As oftentimes some ewes will drop their lambs before the average time of lambing is completed, the attention of the shepherd should be increased as the time of parturition approaches; and after it has commenced, he should carefully

observe every ewe that appears to be in labor, in order to render assistance, if necessary; but, at the same time, the operations of nature should not be hastily interfered with. In case of difficult parturition, the following observations, from an essay by Mr. Cleve, in the first volume of the Journal of the Royal Agricultural Society of England, will be found useful, and worthy of particular attention:

"The shepherd must not be led by the appearance of uneasiness and pain to interfere prematurely; he must watch the ewe closely, and so long as she rises at his approach, he may rest assured that whatever uneasiness she may exhibit, all is well. Much uneasiness is generally apparent; she will repeatedly lie down, and rise again with seeming distress. If this occurs when driving her to the fold, he must be very cautious in urging her. These symptoms ought to be continued for two or three hours, or even more, before he feels imperatively called on to interfere, except the lamb is in such a position as to warrant fears of losing it. In cold weather particularly, the labor is likely to be protracted. Should the ewe appear exhausted, and gradually sinking under labor, it will be right to give her some oatmeal gruel, with a little linseed, in the proportion of a spoonful of the latter to two of the former. When the ewe feels that she is unable of herself to expel the lamb, she will quietly submit to the shepherd's assistance. In giving her this assistance, his first duty is, to ascertain whether the presentation is natural. The natural presentation is, with the muzzle foremost, and a foot on each side of it. Should all be right in this respect, he must proceed to disengage the lamb, first very gently drawing down the legs, and with all possible tenderness smoothing and facilitating the passing of the head with his fingers, rather than forcibly extricating it, the particular attention of the shepherd being given to these points. This may be effected by passing the finger up the rectum, until he feels the back of the lamb's head, and then urging it forwards, at the same time that he gently pulls the legs. Sometimes the head is sufficiently advanced, but the legs are too backward. In this case, the head must be gently pushed back, and the hand being well oiled, must be introduced into the vagina, and applied to the legs, so as to place them in their natural position, equal with the head. Should the fore feet, on the

other hand, protrude, they must in like manner be returned, and the same assistance given to the head. If the hinder quarters present themselves first, the hand must be applied to get hold of both hind legs together, and draw them gently but firmly; the lamb may often be easily removed in this position.

It is no uncommon occurrence to find the head of the lamb protruding and much swollen; but still, by patience and gentle manipulation, it may often be gradually brought forward; or even nature will complete the work, if the pelvis is not very much deformed. Should, however, the strength of the mother be rapidly wasting, the head may be taken away; and then, the operator, pushing back the lamb, may introduce his hand, and laying hold of the fore legs, effect the delivery.

It also often happens that the legs are thrust out to the shoulder, and from the throes of the ewe, it is not possible to replace them, so as to get up the head of the lamb. By partially skinning the legs, you may disunite them from the shoulder joint; there will then be room for the introduction of the hand, and by laying hold of the head you can deliver the ewe.

A single season of practice, will do more than volumes of writing, to prepare the farmer for the preceeding, and some other cases of difficult labor. But let him bear in mind, that, as a general rule, the fœtus should, if possible, be placed in its natural position, previous to any attempt to extricate it by force. When force must be used, it should be as gentle as is consistent with the object of delivery. I need scarcely observe, that the ewe must be the object of careful nursing and management, until she is completely restored."

In addition, it may be observed that, sometimes, the lamb dies within the uterus before parturition, and in such cases there is very apt to be a wrong presentation, the breech frequently coming foremost; but in such, or other wrong presentation, the ewe may often be saved by introducing the hand into the vagina, or even into the uterus, and pushing back the lamb and turning it so as to bring the hind legs, or the head and fore legs, foremost, and then gently extracting it.

In such cases, or any other, if the lamb is dropped alive,

so much wool, and only so much, should be pulled or shorn from around the teats, that the lamb can conveniently suck. It should then be placed before the ewe, and the ewe, by its scent, will generally know it and own it. But as she is apt to be frightened, in some measure, by such intervention, so as to run off and leave the lamb, the surest way is, to place the ewe, along with her lamb, in some small enclosure, or division of a shed or barn. Should the ewe, under such circumstances, or any other, refuse to suckle the lamb, she should be held, and the teat should be placed in the mouth of the lamb. If she has plenty of milk, she will seldom refuse to suckle the lamb. The sooner the lamb can suck after it is dropped, the better; the milk gives strength to the lamb immediately.

The lower end of the teats of the ewe are filled with gluey inspissated milk before the lamb is yeaned, and, consequently, it is with difficulty sometimes that weak lambs can draw any milk from the teats: and, therefore, it is well, in most cases, to draw a little milk by hand from each teat, when the lamb is first yeaned.

After the lamb has sucked, the ewe will generally own it. If, however, she does not, a little fine salt rubbed on its head and back, will help on this purpose; and, if necessary, the ewe may be confined for a few days alone with her lamb, and held three or four times a day, or tied up so that the lamb can suck. With such care, the ewe will rarely refuse to own the lamb after a short period.

Sometimes an ewe, after having dropped a good lamb, will leave it, and run off to pasture. Such ewes should be looked up and placed with their lambs. Perhaps the ewe will show her affection for the lamb when her udder begins to be distended with milk. When the ewe is separated from her lamb in this manner, care should be used not to have the lamb wrapped or touched by any thing which is offensive, as the scent of the lamb is the principal source of recognition by the dam. Ewes, which have dropped their lambs over night, should be examined in the morning, and see that their lambs just dropped are capable of sucking, which may generally be known by the distention of the lamb's belly, or by the appearance of the ewe's teats.

The ewe may give too little milk, when her lamb is first dropped early in spring. In such case, it pays well to

aid the lamb by milk fed from a bottle; or another ewe may be compelled to suckle the lamb, until its dam affords a full supply of milk. This care will prevent the lamb from being stunted. The milk from a new milch cow, or cream warmed, should be fed to the lamb. Milk from a farrow cow is not suitable to feed to young lambs when they are first dropped; it is not sufficiently oily and purgative.

In such cases, the milk of the ewes may be greatly increased, in a short time, by feeding them with apples, potatoes, bran, or barley mashes, &c.

If lambs become chilled soon after they are first dropped, they may, in many cases, be resuscitated by placing them in warm water, and then rubbing them until they become dry; or simply, by wrapping them in a warm blanket, and placing them in a warm room, but not too near the fire.—In such cases, give the lamb no milk until it calls for it, and then it should be fed with warm milk, moderately at first.

It sometimes happens that an ewe, with an abundance of milk, loses her lamb. In such case, it may be profitable to provide her with another, which does not get plenty of milk. To affect this, place the skin of her dead lamb on the body of the live one, and she will generally own it. The skin need not remain on more than a day or two.

If no lambs are provided for ewes which lose their lambs, it may be well to see that they are milked a few times at intervals, in some cases in order to prevent garget.

The young lambs of fine-wooled sheep are very sensitive to cold and moisture, and, therefore, in order to prevent undue exposure of them, it is necessary to anticipate storms, and place the ewes and lambs under shelter. Storms appear to accelerate the birth of lambs, therefore, the ewes, which have not yeaned, should be put under shelter at such times, lest some lambs should be lost for want thereof, and the necessary attention.

As fast as the lambs are dropped, it will be well to keep what are dropped each twenty-four hours, in pens or yards by themselves for a day or two, until each lamb has learned to know its mother, or each mother owns its lamb; and then it will be convenient to turn all such ewes and lambs into a flock by themselves, separate and apart from those

which are yet to yean; the young lambs which are lately dropped by the remaining ewes, may then be readily discerned and attended to. For this purpose, it will be very convenient to have two or more lots adjacent to shelters, where the ewes and lambs may be kept until all the lambs are yeaned, and until the lambs are large enough to be castrated; after which operation, as hereafter mentioned, they may soon be placed in their summer pastures.

During the time of yeaning, their pasture should be neither very luxuriant nor very poor; but when this is past, they may be put into better pastures, which should be dry and free from undue exposure: and all necessary condiments should be provided for them in every pasture, lest some should become diseased.

SECTION XXXVIII.

SUMMER MANAGEMENT.

WASHING.

A day or two previous to the washing of sheep, they should all be tagged in the nicest manner, by shearing all tag-locks from their hinder parts, and all burs, which are visible, should be cut off or picked off. The washing and shearing may then be performed with much more ease and cleanliness than if tagging is neglected at this time.

The time for washing will depend upon the latitude and the season; but as soon as settled warm weather comes on in spring, it may be done with propriety. Coarse-wooled sheep, in latitute 41 or 42, should be washed in May, before their wool begins to shed; Merinos may, with more propriety, be washed in the last of May, or early in June.

Fair and warm weather should be improved for this purpose, and the water should be comparatively warm. If possible, they should all be washed in the fore part of the day. If the washing is finished a few hours before sunset, they will become partially dry before the chilly air of night comes on, and, of course, will be less affected by it.

The most convenient place for washing, is in a stream of clear water, with a gravelly or stony bottom, and sufficiently large to carry off the filth; or a small stream may be damed, or may be turned into a vat so as to answer this purpose.

The sheep should be taken into the water, and keeping the head sufficiently elevated, the washing should be performed by squeezing portions of the fleece between the hands, until the water flowing from it will not be colored by the dirt. Then, if convenient, the sheep may be taken to some higher and purer part of the stream, and rinsed.—When the sheep is taken out of the water, if it is a weak sheep, or if the fleece is so filled with water that it cannot stand, it should be supported until the fleece is drained, so that it may not fall upon the sand or mud.

During the process of washing, it should be borne in mind, that the sheep is taken into an element for which it feels the greatest abhorrence, and which it ever avoids as far as possible, except to quench its thirst; and, therefore, it should be kept in the water no longer than is necessary for clean washing, and should be handled and treated as kindly as is consistent with perfect cleansing. In putting the sheep into the water, the arms and hands should be applied round the neck or body, or to the hind leg; and the sheep should never be lifted up or tossed about merely by clinching the wool, nor be thrown violently into the water, so as to injure it by contusion, as is frequently done in sport.

The above method of washing sheep will render the wool sufficiently clean to be fair, merchantable wool. But if it is desirable to make the wool extra clean, the sheep should be washed immediately after a rain, by which their wool has been well soaked; or they should be taken to the washing pen, and each sheep should be dipped into the water, or all may be thoroughly sprinkled with a watering-pot; and then, after being wet in either of these modes, they should be allowed to huddle together for an hour or more before they are washed. This method is more particularly necessary in washing Merinos.

After washing, they should be kept, till sheared, in clean, grassy pastures, which are free from burs, thistles, and half-charred wood.

SHEARING.

Shearing may, with propriety, be commenced in about five or six days after washing, if the weather has been fair, so as to fully dry the fleece; otherwise, a longer time may be necessary for that purpose. The yolk, in that time, will be started into the fleece, so as to soften the wool, and preserve it from moths after it is packed away.

A small flock only should be taken to the shearing place at any one time; that is, only about so many as can be sheared each half day. A clean, smooth floor is the most convenient place for shearing—either on a common barn-floor, or a floor of plank, made temporarily in a sheep-barn or shed.

In shearing, as well as at all other times, the same caution should be used in handling sheep as in washing.

Shearers differ somewhat as to the minutiæ of shearing; but the principal points to be attended to, are, to cut the wool with one clip of the shears, and not in twain, as persons shearing too fast are apt to do; and to shear it even and close, without cutting any part of the skin; and special care should be used not to cut the udder, or teats, or any delicate part of either sex; and if a wound is made by the shears, a little tar and grease mixed, or a little powdered charcoal, should be applied to the wound, in order to heal it, and keep off flies. The shearer should hold the sheep in positions which will be easy for it, and should be permitted to shear no faster, nor greater number in a day, than what he can shear in a workmanlike manner.

A common mode of shearing, and, perhaps, as convenient as any, is as follows:

Having first well swept the shearing floor, the shearer catches the sheep, and removes all straws and burs from the fleece, and filth from about the tail, with shears, if necessary; he then places the sheep on the floor, and resting upon its rump, with the head upwards, and with its back and neck resting against the legs of the shearer. The shearer first shears the wool from around the head and neck, making short clips, with the shears close to the skin, and bending the neck from side to side, as may be found convenient: he then clips the wool from the fore legs, brisket, and belly, as far down as he can reach while standing in this position; he next lays the sheep down upon its side,

and shears off all the wool upon one side, from the belly to the back; he then turns the sheep over upon the other side, in such a manner as not to tear the fleece, and clips the wool in like manner from the other side; after which, he places the sheep upon its legs, on another part of the floor, and trims off the leg-wool, which is kept by itself.

ROLLING THE FLEECES.

The fleece (without the leg-wool,) should be placed with shorn side downward upon the floor, and then, if any tag-locks remain, they should be carefully removed; the fleece should then be made as compact as possible, by pushing the wool from each side towards the centre; the loose good wool is then thrown upon the fleece; next, the shearer folds each side of the fleece towards the centre, so that (if the wool be fine,) it will not exceed eight or ten inches in width; the head and neck portions of the fleece should then be turned back upon the fleece, as far as the part shorn from the shoulders, and then, beginning at the tail end of the fleece, roll it up as tight as possible.

Next, wind some twine around it, and tie it; crossing the twine in different directions, and passing it only so many times around the fleece as will be sufficient to render it compact. Small, smooth twine should be used for this purpose, and no other. This method presents as good wool as grows upon the sheep, and if all is done right, it will appear desirable. The wool, when shorn, should be removed to a cool, clean, dry, *dark* room, where it will be entirely unexposed to dust or dirt of any kind, until it is sold, or packed in sacks. Exposure to light for a few days will give it a yellow hue.—(A. Agriculturist for 1846, pa. 93.)

After sheep are shorn, they should be housed for two or three successive nights, and at any time for several days afterwards, should cold or stormy weather ensue. The neglect of this precaution frequently causes great sufferings and losses in flocks; and the humane flock-master will not forget this part of his duty.

BALEING OF WOOL.

The kind of linen cloth which is generally used in the United States for baleing wool, is termed *burlaps*, and is generally from 36 to 40 inches in width. Cotton cloth

will not answer for this purpose, unless the wool is very clean, as the yolk of wool soon causes it to decay.

The quantity of burlaps which is necessary for an ordinary sized sack, is five yards. A hoop of wood or iron wire is generally used, around which the edges of the mouth of the sack are folded, and sewed with packing twine. The hoop and sack are then placed on the inside of a square frame, which is just large enough for the hoop to rest upon its four sides, and at an elevation sufficient for the sack to swing clear from anything below. If the wool is fine, five or six fleeces are thrown in for a layer, and are followed by a man or boy, who carefully adjusts and treads each successive layer, till the sack is full. It is well, before the packing begins, to stuff the lower corners of the sacks with wool clippings, and tie them. When the sack is filled, it is then drawn together with twine, and the upper corners are then prepared in the same manner as the lower corners, in order to form handles for moving the bales.

SORTING, MARKING, ETC.

During and after the process of shearing is the most convenient time for the sorting and brand-marking of sheep.—The quality and weight of each fleece may, at this time, be fully ascertained, and the form and every imperfection of carcass may be clearly seen.

At this time, therefore, should be selected out for breeders, all those, of either sex, which are most distinguished for the several purposes for which they are reared, whether for quality or quantity of wool, or the excellence and fair proportions of their forms. Such should receive a lasting mark, and the weight and quality of their fleeces should be duly noted. At this time should be sorted out the wethers and dry ewes, particularly those which are old, or diseased, or inferior in size, and which are designed to be fattened off for the butcher.

Ewes and lambs should be pastured in flocks by themselves, and separate and apart from all other kinds.

Rams and wethers may herd together; and yearling ewes and barren ewes in flocks together.

At this time, each sheep should receive a mark or brand on some part of the body, with a paint brush or brand, of

the initial letters of the owner's name, or some other suitable mark, so that it may be seen at a distance, in case any should stray or get mixed with other sheep.

The materials most suitable for marking, are spirits of turpentine, or linseed oil, or both these articles, mixed with lampblack, or Venetian red, or Spanish brown. The marks may be placed on different parts of the body, so that each kind may be readily known.

Tar is frequently used for brand-marking; but it forms a deep, heavy crust upon the wool which cannot be easily cleansed from it, and, therefore, is injurious in its manufacture.

If the skins of any are found to be in bad condition, the proper remedies may now be conveniently applied. Washing them with salt water will have a good effect upon their skins—will prevent their taking cold, and will cause ticks to drop off.—(Cultivator, 1845.)

At this time, also, attention should be paid to the horns of sheep: if any press too near the bones of the head or face, or endanger the eyes, they should be cut partly or wholly off, as may be necessary. The feet, also, should be examined and pared, if necessary.

Also, the teeth of old sheep should be examined, and if any are found to be loose, or in any wise defective, so as to be useless, they should be extracted with pincers.

OF PASTURAGE.

The natural habits of the sheep attach it to the highest grounds, to the upland slopes where aromatic plants abound. Nature never intended this animal to consume continually the succulent grasses of rich lowlands; and all, who have observed the habits of the sheep, are aware that their natural instinct, after being domesticated for ages, still leads them to the elevated portions of the fields in which they are kept.

For this reason, the highest hills of every farm on which sheep are kept, will always be best adapted for their pasturage, provided the soil be dry, and the quantity and quality of the herbage be suitable for them, and provided, also, that the breed be adapted to the climate.

Either uplands or lowlands, which contain much vegetable matter, and which are, at the same time, so moist as

to be mucky, will be objectionable on account of their producing foot rot.

On the other hand, soils which are composed almost entirely of sand, will not have consistence sufficient to furnish a regular supply of pasture.

The best pasturage lands for sheep, are those which are firm to their feet, and which have such a mixture of ingredients that herbage may flourish, and, at the same time, will suffer least by drought or wet weather.

As the highlands, in which the sheep naturally delights, are generally the thinnest and poorest soils, it becomes necessary for the sheep, in a state of nature, to take a large range of pasturage, in order to obtain the quantity and variety of herbage which is necessary for its welfare. Hence, on prairies and other large unenclosed lands, breeds of sheep which are suitable for such situations, are accommodated with all the variety of food which is necessary for them. But when they are confined by enclosures, it is ever good policy to divide these enclosures into as many convenient sized lots as will be sufficient, in order to gratify their appetites by frequent changes of pasture. A frequent change of pasture, says Blacklock, is the soul of sheep husbandry.

Grass lands, in small divisions, will keep or fatten more sheep than if there are few or no divisions. They can then be fed off at regular intervals, when the grass has attained the proper height. In an enclosed country, sheep generally do best when they are separated into small parcels; they feed more quietly, and they waste less.

Short sweet pasture is most relished by sheep, and is most healthy for them; and a sufficient number should be kept on the grounds on which they are depastured, so that the pasture may be kept at its proper height; and if, at any time, the grasses become too high and rank for sheep, they should be fed off occasionally by horses or cattle.

On the other hand, it is very unprofitable and inhumane policy to overstock lands with sheep, or other animals. By overstocking, all the flock is impoverished and liable to disease, whereby they produce no more wool than a less number with proper rations of food; not to speak of mutton, which, in such case, is entirely out of the question.

Fallow fields and stubble fields are the best of pasture for

sheep, on account of the large quantity of bitter, astringent, and diuretic weeds which spring up in them. But they should never be permitted to run upon new stubble fields of bearded grains, such as bearded wheat, rye, or barley; as the beards of such grains frequently produce braxy and death to them. Hogs or cattle should always precede sheep in such fields, or the sheep should be kept out of such fields until the beards of such grains are rotted enough to make them tender; they will then be harmless. Sheep may be turned into other stubble fields without harm to them, provided there be not so much grain left in them as to injure them by its large quantity.

When convenient, they should be allowed to range occasionally, on dry, open, wood lands, or bushy pastures, so as to browse upon their leaves and shoots, which are much relished by them, and are healthy for them. But after acorns begin to drop freely, on oak lands, they should no longer range on such lands; acorns, in large quantities, being very injurious to them.

They should not be long confined at any one time, to thickly shaded pastures, the herbage of such pastures being much less nutritious and wholesome, that that of open lands.

They should be frequently changed from field to field, unless they have a large range; but, when possible, they should never be changed from very short pasture, to that which is very luxuriant, or the reverse; and, especially, they should not be turned in upon rank clover pastures, when they were wet with dew or rain, lest some be hoven.

They should never be permitted to run very long at one time, on low, moist lands, particularly in summer. But if a farm contains a considerable proportion of such lands, particular care should be used to select a breed which is suitable for it.

Mornings and evenings are the best times for change of pasture. At such time, the flock will generally all be up and feeding, and may readily be discerned.

SHADE TREES.

All domesticated quadrupeds suffer from exposure to the extremes of heat, especially the sheep. Hence, in summer, the sheep is very apt to stand or lie during the warm-

est part of the day, upon the cool ground, in the most airy or shady places. Shade trees contribute greatly to their comfort, and blisters, and permanent injury to the skin, are sometimes produced by undue exposure to the sun, immediately after being shorn.

Hence the considerate farmer will ever encourage the growth of a sufficient nnmber of shade trees in his pastures, and in airy places, and, if possible, where they will least interfere with ploughing. If all trees have been cut from pasture fields, such useful shade trees, as are natural to the soil, may be planted, and will soon form the necessary shades. And if a choice can be made, it will be well to cultivate in plough fields, such kinds as strike their roots deep into the ground, and will least interfere with the plough; such as the oak, &c.

WATER.

Water is not so absolutely necessary to sheep in summer time, as to most other graminivorous animals, as their principal feeding is done mornings and evenings, when the dew is on the grass. But there are times in April, and also in the latter part of summer, when the ground is frequently much parched by the sun, and but little dew falls. At such times, sheep of all kinds, but more especially ewes which suckle lambs, suffer, if water is withheld from them; and, at such times, all should, if possible, be gratified with it. If only a part of the pastures upon a farm are supplied with water, these should be allotted to the ewes and lambs at such times, so that there may be no failure of milk.

WEANING LAMBS.

The time for weaning lambs will depend upon the time of parturition, the breed cultivated, and upon the disposition which is to be afterwards made of the lambs.

The time usually allowed for the lambs of fine wooled sheep to suck, is about four months. In Europe, the time allowed for the lambs of coarse-wooled sheep to suck, is generally about three and a half months; unless it is intended to fatten them off for the butcher; in such case, a longer time is sometimes allowed for them to be suckled by the ewe. Such sheep grow faster, and come to maturi-

ty more rapidly than fine-wooled sheep, and, therefore, their lambs may be sooner weaned.

If lambs are weaned at the usual times, they will generally, after a short period, do better than to run longer with the ewes. After the ewes have given milk three and a half or four months, the quality of their milk becomes inferior, and the lambs are better off without it than with it. They then depend entirely upon grass and feed freely. Consequently, if coarse-wooled lambs have been dropped in the latter part of April, or fore part of May, they should be weaned by the 15th or 20th of August; and fine-wooled lambs, dropped at the same times, should be weaned as early as from the first to the 10th of September. As early as this will be necessary, in order that the ewes may thrive, and be in good condition, for renewed gestation, and the endurance of winter.

When the lambs are first weaned, the ewe lambs should be put by themselves, along with a few old barren ewes, and the ram lambs by themselves, with a few wethers; they will, in such case, be much more quiet, than if apart from any old sheep, and will more readily submit to be driven from field to field, in changes of pasture.

The dams and their offspring should be removed as far apart as is convenient, at any rate, so far that they cannot hear the bleating of each other; otherwise, their inquietude will be prolonged so as to be injurious to both of them.

The lambs should be placed in better pasture than before they were weaned, in order to compensate for the loss of their mother's milk; but not into that which is very luxuriant, as they are more liable to braxy in such pastures than older sheep; and the necessary condiments should be carefully provided for them at this time, lest disease should ensue; and if the farm is apt to produce rot, the driest pastures should be allotted to the lambs.

A contrary course should be adopted with the ewes, as to their pasture, for at least two weeks. For that time, it can hardly be too short: otherwise, it will frequently produce a great extension and inflammation of their udders. And those who wish to save the udders of their ewes, so that all may be fit for breeding, should also take them to their stalls, and thoroughly milk each ewe, on the third

day after the lambs are weaned. In some cases, it will be necessary to repeat this operation twice or three times, at intervals of three or four days, in order to prevent inflammation of the udder with certainty.

As soon as any or all of them are dried up, such ones should be immediately put into first-rate pasture, and should continue in such pastures until winter. If any of them are much thinner in flesh than others, they may be placed by themselves, and a little grain may be fed to them daily until they are recruited, so as to join the rest of the flock.

SECTION XXXIX.

FATTENING.

Whether sheep are to be fattened in summer or in winter, it is ever desirable that they should have been well kept for some considerable time before rapid fattening is attempted. Their digestive organs will then be strong, and able to bear full feeding. Therefore, if any are quite thin in flesh, they should, at first, not be put into too rank pastures in summer, and in winter should not receive too much grain in beginning to feed them, lest they should be cloyed, in some measure, or should become diseased in consequence of excess of nutriment.

With these precautions, if it is intended to fatten them for the butcher, it is always an object to fatten them as fast as possible, if we wish to obtain the greatest quantity of flesh and fat, according to the amount of food consumed; for, regular daily rations of food are necessary to support life, and supply the natural waste of the body; and the sooner the flesh and fat accumulate to the desired quantity, the sooner, also, will this daily waste be brought to a close.

Therefore, in summer, the pasturage should be amply sufficient, so that they may be as quiet as they please, and not be allowed to range over too large a surface, in order to fill themselves. And most special care should be used

that they are frequently moved from field to field, or that a large range be provided for them, and all necessary condiments.

The digestive powers of young animals being weaker than those of animals which have arrived at maturity, such young animals should be fed more cautiously; and it takes a longer time to fatten them, as a portion of their nutriment is appropriated to the development of muscle or flesh.

In summer and fall, sheep may be fattened off most rapidly, and with least expense: good pasture and frequent changes of it, with suitable condiments, being sufficient for that purpose.

But it is sometimes an object to fatten them very rapidly in summer, and, also, to fatten off old sheep which cannot readily be fattened on mere pasture alone. In either case, the feeding of a moderate quantity of grain daily, will generally effect it very advantageously. One bushel of grain fed in summer, will make as much fat as three or four fed in winter.

An experiment was made at Shrewsbury, in England, in fattening three sheep on peas, allowing them, at the same time, to run in pasture. They gained 39 lbs. in 21 days, being an average of nearly 10 ounces each per day.—(A. Agriculturist, 1843.)

If the first quality of mutton is desired, sheep of the smaller breeds, and those which do not soonest come to maturity, should be selected for that purpose, and a large proportion of upland pasture should be provided for them. For though the quality of the mutton depends very much upon the breed of the sheep, the qualities of the food upon which they are fattened have also a powerful influence in determining the qualities of the mutton.

In fattening sheep to the best advantage in winter, it is necessary that they should have good shelters, and that these shelters should be often supplied with fresh litter, so as to make them quiet and comfortable; and, also, that proper allowances of food, water, and condiments should be regularly supplied to them.

The observations of Mr. Spooner will illustrate this subject as follows: "Quietude and warmth contribute greatly to the fattening process. This is a fact which has not only been developed by science, but proved by actual practice,

The manner in which these agents operate, is simple, and easily explained. Motion increases respiration, and the excess of oxygen thus taken, requires an increased quantity of carbon, which would otherwlse be expended in producing fat. So, likewise, *cold robs the system of animal heat;* to supply which, more oxygen and more carbon must be employed in extra combustion, to restore the diminution of temperature. Nature enforces the restoration of warmth, by causing cold to produce both hunger and a disposition for motion, supplying carbon by the gratification of the former, and oxygen by the indulgence of the latter. The above facts are illustrated by Lord Ducie:

"One hundred sheep were placed in a shed, and ate 20 lb. of Swedish turnips each, per day; whilst another hundred, in the open air, ate 25 lb. each, and at the end of a certain period, the former animals weighed each 30 lbs. more than the latter; plainly showing that, to a certain extent, *warmth is a substitute for food.* This was also proved, by the same nobleman, in other experiments, which also illustrated the effect of exercise.

No. 1. Five sheep were fed in the open air, between the 21st of November, and the 1st of December. They consumed 90 lbs. of food per day, the temperature being 44 deg; at the end of this time, they weighed 2 lbs. less, than when first exposed.

No. 2. Five sheep were placed under shelter, and allowed to run at a temperature of 49 deg.; they consumed at first 82 lbs. then 70 lbs. per day, and increased in weight 23 pounds.

No. 3. Five sheep were placed in the same shed, but not allowed any exercise; they ate at first 64 lbs., then 58 lbs., and increased in weight 30 lbs.

No. 4. Five sheep were kept in the dark, quiet and covered; they ate 35 lbs. per day, and increased in weight 8 lbs."

A similar experiment was tried by Mr. Childers, M. P. He states, that 80 Leicester sheep, in the open field, consumed 50 baskets of cut turnips per day, besides oil cake. On putting them in a shed, they were immediately able to consume only 30 baskets, and soon after but 25, being only one-half the quantity required before; and yet they fattened as rapidly, as when eating the largest quantity."

From these experiments, it appears, that the least quantity of food, which is required for fattening, is, when animals are kept closely confined in warm shelters; and the greatest quantity, when running at large exposed to all weather. But, although animals will fatten faster for a certain time, wiithout exercise than with it, if they are closely confined for any considerable time, and are at the same time full fed, they become, in some measure, feverish; the proportion of fat becomes too large, and the meat is not so palateable and healthy, as when they are allowed moderate exercise, in yards or small fields.

As to the kinds of food which may be used most advantageously in fattening, this will generally depend upon what is raised upon the farm, it being preferable, in most cases, to use the produce of the farm. Sheep prefer beans to almost any other grain; but neither beans or peas are so fattening, as some other grains; and are used most advantageously along with them. Beans, peas, oats, barley, rye, buckwheat, &c., may be used along with Indian corn, or oil cake, or succulent food, making various changes and mixtures, in order to furnish the variety of food, which is so much relished by the sheep, and which should ever be attended to by the sheep fattener. This will prevent their being cloyed, and will hasten the fattening process. A variety of food, (says Mr. Spooner) operates like cookery in the human subject, enabling more sustenance to be taken.

The quantity of grain or succulent food, which it will be proper to feed, will depend upon the size, age and condition of the sheep, and judgment must be used, in ascertaining how much they can bear. Mr. Childers states that sheep (New Leicester) fed with the addition of half a pint of barley per sheep, per day; half a pound of linseed oil cake, with hay, and a constant supply of salt, became ready for the butcher in ten weeks; and gain of flesh and tallow, 33 lbs. to 40 lbs. per head. (One sheep gained 55 lbs. in 12 weeks.)

This experiment shows what is about the largest amount of grain which it is necessary or proper to feed to New Leicester sheep, at any time while fattening. The average weight sf 40 New Leicester wethers before fattening, was found by Mr. Childers to be 128½ lbs. each. By weighing an average lot of any other kind of sheep, which are

to be fattened, and by reference to the table of comparative nutriment of the different kinds of food, a calculation may be readily made, as to the largest amount, which will be necessary for them, of any article of food whatever.

When sheep are first put up for fattening, they should be sorted, when convenient, so as to put those of the same age, size, and condition, each by themselves, so that each may have a fair chance to obtain its proportion of food, and may be fed the proper length of time.

They should be fed moderately at first, gradually increasing the quantity to the largest amount, and making the proper changes of food, so as not to cloy them, nor produce acute diseases of the head or intestines, and never feeding so much as to scour them.

Sheep, when fattening, should not be fed oftener than three times a day, viz: morning, noon, and evening. In the intervals between feeding, they may fill themselves well, and will have time sufficient for rumination and digestion; these processes are interrupted by too frequent feeding. But they should be fed with regularity, both as to the quantity of food, and the time when it is given.—When convenient, they should have access to water at all times; otherwise, a full supply of it should be furnished to them immediately after they have consumed each foddering.

When sheep become extremely fat, whether purposely or not, it is generally expedient to slaughter them. Permitting animals to become alternately very fat and lean is injurious to all stock. Therefore, if animals are too strongly inclined to fatten at an age when wanted for breeding, their condition as to flesh should be regulated by the quantity and quality of their food or pasture.

SECTION XL.

CONDIMENTS.

A condiment is defined to be, something which seasons food, or fits it for digestion. Man uses many condiments, such as salt, sugar, vinegar, spices, aromatics, &c. The same course is pursued by other animals; if left to themselves, they range abroad far and near, gathering a variety of herbage, and each of the kinds which they select assists as a condiment, either directly or indirectly, in helping to digest other kinds. And in a state of nature, and where the number of animals is not too large, according to the range which they obtain, the vegetables which they find will contain all the condiments which they need.

For this purpose, the sheep uses the greatest number of plants of any other domesticated quadruped, especially those which are bitter, astringent, and diuretic. Linnæus found, in examining this subject, that by offering fresh plants to such animals, in the ordinary mode of feeding, horses ate 262 species, and refused 212; cattle ate 276, and refused 218; while the sheep took 387 species, and only refused 141.

In England, Ireland, and Scotland, ordinarily no salt is fed to sheep from one year's end to the other, especially where large flocks are kept, and tended by shepherds; though, of late years, more salt is fed to them in those countries than formerly. Dr. Parry, a distinguished wool-grower of England, states, in his essay on sheep, that he never gave his sheep salt but once; and then he mixed it amongst his hay when made into the rick. And in Spain, the transhumantes Merinos are salted only in summer, when on the mountains, in the northern parts of Spain.—Whereas, in the dry climate of New England, salt is considered to be indispensable for them in all seasons. But, doubtless, sheep would do well without salt in ordinary seasons, on such a soil, and in such a climate, provided they could have as large a range as they might choose, on dry and hilly lands. And there are instances where sheep have been kept in Ohio and western Pennsylvania for 20 years, without feeding any salt to them; letting them run in

the roads where there are no salt licks: and these sheep prospered more than those which were kept in fields adjoining, and received plenty of salt, which, when fed freely, in a moist climate, helps to produce the rot.

The truth is, that most, and perhaps all of the various plants which they eat, contain common salt, and a sufficient variety of them will furnish all the condiments which are necessary for sheep, and other graminivorous animals.—But when they are confined to a few acres, they can no longer find this variety, and sink with disease; especially where the soil and climate are not particularly favorable to them. Magendie, a celebrated French physiologist, has shown, by experiment, that it is impossible to keep an animal in a healthy state longer than six weeks on one article of diet; death frequently taking place even before the end of that period.

Now, as the customs of our country require that every person should keep their own animals mostly within their own boundaries, and these are frequently much circumscribed, it will become them to supply to their sheep such condiments as may be deficient in their pasture or fodder, especially bitter articles; for bitterness is essentially necessary in the food of all herbivorous animals. Without it, they sooner or later fall into ill health. It promotes digestion, strengthens the stomach, and through the sympathetic medium of that organ, all other parts of the body. Bitter and diuretic plants or articles are necessary to the proper action of the kidneys of the sheep, on account of the succulence of their food. In Europe, sheep browse freely upon broom and whin plants, both of which are highly diuretic articles.

One of the most useful bitter articles which can be fed to them, will be tar, (or pitch,) which may be mixed with the other condiments which I shall describe. These articles are most excessively bitter, and are also strongly antiseptic, tonic, and diuretic; and should be used in sufficient quantities, especially on wet soils, or wherever their food is very succulent. But as these articles are very powerful, large quantities of them will not be necessary. In winter, boughs of pine will be useful to them. Hop vines may be fed to them for bitters: they are used for this purpose in Sweden. These articles, or a portion of them, along with

the various bitter weeds and plants which are found in pasture fields and in meadows, and which may be saved, along with hay, will be amply sufficient for them.

But the great and essential condiments which are necessary for sheep and other graminivorous animals, are found in the ashes of the various grains and vegetables upon which they feed, of which number, common salt is only one among several others.

By inspection of the appendix, it will be seen that carbon, or the basis of wood, is the principal ingredient in the formation of blood, flesh, and fat; and by the analysis of hay and grain, it will be seen that carbon is also the principal ingredient which goes to form those articles, or is the principal basis of them. Now, these various alkalies, salts, earths, and minerals, which are found in the ashes of these various grasses and grains, are the great natural condiments which are necessary in various proportions in the stomachs of every graminivorous animal which moves upon the face of the earth, along with the gastric juices, in order to dissolve and transform the carbon, which is in their food, into chyle, and out of the combinations which are formed in the stomach, to form blood, flesh, bone, fat, &c. And all the ingredients which are necessary to form animals, are contained in the food which they usually consume. The stomach is, in fact, a kind of laboratory in which whatever food is placed, will be compounded and decompounded, so as to accomplish the transformations which are necessary, in order to nourish the system, and eventually to complete the metamorphosis of tissues which is continually going on in the animal system; and these ashes, or condiments, are the means which the stomach uses, along with the air which is absorbed by the saliva, in the process of rumination,* in order to effect these transformations.

As animals differ somewhat as to their internal functions, and the temperature of their bodies,† the carbon is, in some measure, differently eliminated in them, so as to provide nourishment suitable for each kind.

And in accomplishing this purpose, it will be seen that those articles of food which are natural to graminivorous animals, and which are most nearly assimilated to that

* Liebig's Animal Chemistry, page 39. † See Appendix.

state which is necessary in order to form chyle, and to enter the blood and the system, and which, of course, are most easy of digestion, contain the least amount of ashes or condiments; because the least amount is necessary in order to transform such food. When the carbon enters the blood, it should have the same combinations as when in the blood. And I insert the analysis of the blood, and also of sundry articles of food, in order to show how the carbon must be changed in its combinations with oxygen, hydrogen, and nitrogen, in order to form blood:

	Carbon.	Hydrogen.	Nitrogen.	Oxygen.	Ashes.
Ox blood, dried,	51.96	7.25	15.07	21.30	4.42
Wheat,	45.78	6.79	2.09	44.16	1.18
Oats,	51.97	6.27	1.74	37.43	2.58
Potatoes,	44.01	5.08	1.50	43.51	5.00
Hay,	45.08	5.00	1.05	38.07	9.00

By these analyses, it will be seen that the combinations of the carbon, in hay and in blood, differ very much; and, therefore, a large amount of ashes or condiments is necessary, in order to effect the necessary transformation. The gastric juices alone would be insufficient to dissolve all the nutriment contained in such food.

Therefore, whenever the food of sheep, or other graminivorous animals, is deficient in quality as to its composition, they are strongly inclined to eat clay or dirt, in order to make up the deficiency of natural condiments contained in such food. In such case, it will be necessary that we provide for them those portions of these natural condiments which they require; and these ashes I shall, for brevity's sake, call either natural condiments, or condiments, as may be convenient.

In order, therefore, to ascertaln what should be provided for them, it will be necessary to ascertain and designate the qualities of these ashes; and for the sake of illustration, I shall take the article of white clover, and explain the properties of each article which is contained in the ashes of that plant, or the properties of the compounds formed by those articles; for the acids form compounds with the alkalies and earths, in the various grains, and grasses, and other vegetables. This kind of grass contains

every article which is usually found in the ashes of wholesome grains and grasses, except manganese.

1000 pounds of white clover hay contain 91 32-100 lbs. of ashes, of which the component parts are as follows:

Uncombined.		In combination.		
Potash,	31.05 lbs.	Potash,	31.05	Solvent and relaxing articles.
Soda,	5.79	Soda,	4.09	
Chlorine or muriatic acid,	2.11	Chloride of sodium or common salt	3.81	
Magnesia,	3.05	Magnesia,	3.05	Relaxing earth, Neutralize carbonaceous acids.
Alumina,	1.90	Alumina,	1.90	Absorbent earth,
Lime,	23.48	Lime,	14.84	Astringent earth,
Sulphuric acid,	3.53	Sulphate of lime or gypsum,	6.00	Tonic articles.
Phosphoric acid,	5.05	Phosphate of lime or bone dust,	11.22	
Oxyd of iron,	0.63	Oxyd of iron, or rust of iron,	0.63	
Silica.	14.73	Silica, or sand,	14.73	Neutral earth.
	91.32 lbs.		91.32 lbs.	

1st. *Potash* is a powerful solvent, and is necessary in the formation of milk, says Liebig. When superabundant, it relaxes the stomach and bowels extremely. It abounds in alluvial soils and rich uplands; and the true reason why such lands rot sheep, is, not that they create fluke worms, but that the great quantities of potash, in combination with saccharine matters, in grasses growing on such lands, especially in those which are young and succulent, produce acids, which relax and inflame the bowels.

2d. *Soda*. The appearance and solvent properties of potash and soda are very similar; but they are essentially different substances. Potash, when exposed to the air, attracts moisture, whereas soda parts with its moisture when thus exposed, and becomes a dry powder. Soda is a component part of the bile of animals, and, therefore, is essentially necessary to them, in proper quantities, but more particularly to the sheep, whose saliva contains so large a proportion of carbonate of soda, that it will effervesce with acids.—(Graham's Chemistry.)

3d. *Chlorine, or Muriatic acid.* This article, also, is a powerful solvent, and forms a component part of the gastric juices of the stomach, and, combined with soda, forms chloride of sodium, (Muriate of soda,) or common salt, which is strongly antiseptic and purgative. When used in moderate quantities, it stimulates the digestive organs and the glands; when superabundant, it is very relaxing.

4th. *Magnesia* is a relaxing earth, and neutralizes acids. It is, also, a small component part of bones.

5th. *Alumina* is an absorbent earth, and neutralizes acids.

6th. *Lime.* This is an earth which is never found in its pure state. When combined with carbonic acid, as usually found, it is, in some measure, astringent, and neutralizes all the acids which can be formed in the stomach, and renders them inert and harmless. For this purpose, large quantities of it are necessary in the stomachs of graminivorous animals.

7th. *Sulphuric acid*, in combination with lime, forms sulphate of lime or gypsum, (Plaster of Paris,) which is an astringent and antiseptic condiment. Sulphur is the basis of sulphuric acid; and sulphur is a component part of milk, wool, hair, horns, and hoofs. Gypsnm seems to be the natural astringent for the mucus membranes and the lacteal ducts of the intestines, that nothing improper or impure may pass through them into the animal system, and its antiseptic properties prevent inflammation and decomposition. "Sheep are very subject to infiltrations," says De Aubenton, that is, they readily receive into the system too many acid crudities. Therefore, they should, at all times, receive a sufficient supply of lime and gypsum to neutralize the acids which are formed in the stomach, and to astringe the bowels. And the greater the quantity of potash, soda, or common salt there is in the soil and plants growing upon it, the greater will be the quantity of lime and gypsum which they will need in their condiments; for, in order to perfect digestion, the condiments should be rightly proportioned in the stomach.

8th. *Phosphoric acid*, in combination with lime, forms phosphate of lime; phosphate of lime is the basis of bones, and some portion of it is supposed to be directly assimilated in the stomach for that purpose, and it is tonic and astrin-

gent. A proper supply of phosphate of lime, either in food or as a condiment, is essentially necessary to the full development of bone in growing animals.

9th. *Oxyd of Iron* is a powerful tonic medicine, and is a component part of the blood. In the circulation of the blood through the lungs, the iron becomes oxydized, and carries oxygen to every part of the body.

10th. *Silica* is a neutral earth. It seems to form the bones of plants, as phosphate of lime forms the bones of animals.

11th. *Oxyd of Manganese.* This article is not found in white clover: but it is found in the straw of beans, peas, barley, and oats; all of which articles are healthy for sheep and cattle. It is also found in the grain of rye, and roots of carrots; and it may be the cause why those articles are so healthy for some persons and animals. It operates powerfully and favorably upon the glands: its effects upon the liver, kidneys, and the glands of the throat and skin, have been more particularly noticed.—(Braithwaite's Retrospect.)

The natural condiments are the means which the supreme power has prescribed for the due regulation of the animal system, and are necessary, either for the purpose of digestion, secretion, or action: therefore, a full knowledge of their properties is highly necessary.

The subject may be, in some measure, illustrated by the analysis of the fœces of a cow, by Mr. Dana. By his analysis, it appears that there pass daily through a healthy cow, feeding on 24 lbs. of hay and 12 lbs. of potatoes, as follows:

Humus or geine,	12	lbs.
Phosphate of lime (bone dust),	3	oz.
Gypsum (Plaster of Paris),	$1\frac{1}{2}$	"
Carbonate of lime (chalk),	$1\frac{1}{2}$	"
Common salt,	1	"
Sulphate of potash,	$\frac{2}{3}$	"

By this analysis, we see that the lime and salts of lime, which passed through this animal, were six times as much as the common salt, and all advantageously for this animal; and all this without counting the silica, alumina, and mag-

nesia, which were included in what he calls Humus, or geine, and these articles were equal in quantity, in the hay and potatoes consumed, to at least half as much as the salts of lime. So that, of the whole amount of condiments which passed through this animal daily, not more than one-tenth was common salt.

The solid fœces of a sheep were analyzed by Zierl.—1000 parts of sheep-dung, being burnt, yielded 96 parts of ashes, which were found to consist of—

Carbonate, sulphate, and muriate of soda,	16 parts.
Carbonate and phosphate of lime,	20 do.
Silica,	60 do.

By this analysis, we can hardly estimate the amount of common salt which was voided at as much as one-tenth of the different condiments. So that, with a soil and climate of average moisture, we need not estimate that the common salt should be more than one-tenth of the whole amount of condiments which are necessary or proper for sheep, without including potash.

Now, in order to estimate what condiments will be necessary for sheep on every kind of soil, as the sheep delights in a poor, dry soil, in which there is not much potash, we may compute that there is always potash and soda enough in the grasses which grow on any soil, on which sheep should be kept, so as to form a supply of alkalies, with what soda will be furnished in common salt. Therefore, we have only to furnish common salt, and the other condiments to them.

By the analysis of Sprengel, the ashes of red beach and oak, contain the following ingredients :

	Red Beach.	Oak.
Silica,	5.62	29.95
Alumina,	2.23	
Oxyd of iron,	3.77	8.14
Oxyd of Manganese,	3.85	
Lime,	25.00	17.38
Magnesia,	5.00	1.44
Potash,	22.11	16.20
Soda,	3.32	6.73
Sulphuric acid,	7.64	3.36
Phosphoric acid,	5.64	1.92
Chlorine (or Muriatic acid),	1.84	2.41
Carbonic acid,	14.00	12.37
	100.00	100.00

By these analyses, we see that every essential condiment is present in these ashes; the ashes of trees, grasses, and grains are similar in their composition. But as potash is not wanted, and will be injurious, leached ashes should be used; and as the proportion of gypsum which is contained in oak ashes, and in the ashes of many other kinds of trees, is very small, it will be necessary to add gypsum. And thus, by mixing leached ashes, gypsum, and common salt in their proper proportions, along with bitter articles, we have all the natural condiments which will be necessary for sheep on every soil, and in every climate, season, or weather, so that, with what is contained in the grasses, their digestion may be fully perfected.

Every person may not fully understand these computations: but they will find, that upon a very dry soil, and in a very dry climate and seasons, they may not need any condiment for sheep but common salt; for under such circumstances, the grasses will be fully perfected. But in a moist climate, the grasses will seldom be fully perfected; and in warm wet seasons or weather, or on a moist soil, silica and potash will abound in the grasses, but lime, gypsum, and other earthy condiments will be, in some measure, deficient, so that the acids of the stomach will not be neutralized, nor the bowels properly astringed, and animals will suffer great injury from the want of the condiments

which are necessary for digestion, unless they are supplied to them.

We may, therefore, set it down as a rule, that, the moister the soil, the climate, or the weather, the greater should be the proportion of leached ashes and gypsum with bitter and diuretic articles, and the smaller the proportion of common salt; and with a drier soil, climate or weather, an increased proportion of common salt, and less of the other ingredients.

Alluvial soils may be counted as bad as wet upland soils, for sheep grazing upon them.

Those who spread leached ashes, lime, gypsum, or phosphate of lime, upon their land, will see the benefit of them to their stock in ordinary seasons; * but in very wet seasons or weather, it will be necessary to use the all same condiments, as on wet land.

The most convenient mode of feeding condiments to sheep is, to place them in a box or trough, with a cover over head, so as to exclude the rain. The cover should be raised up by standards, 18 or 20 inches higher than the top of the box, so that they may have free access to them at all times; they will then take so much, as will be necessary for perfect digestion. and will not injure themselves by eating too much. And with them may be placed, and mixed together with a shovel, pitch, tar, or rosin finely pulverized, soot, sulphur, or any other article, which may be useful or necessary for them.

I have used ten parts leached ashes, one part gypsum, and two or three parts common salt, in wet seasons; at other times, one-third salt, and the balance in gypsum and ashes. Others can mix these articles, as they find necessary by experiment. For each one hundred sheep, two to four pounds of pitch pulverized, and mixed with these articles monthly, will be sufficient in most cases, to prevent dropsy, and affections of the lungs. The various condiments should be rightly proportioned. If the alkalies and alkaline salts superabound, they will be injurious by causing too great relaxation; but if the earthy condiments superabound, they will pass through the bowels harmlessly.

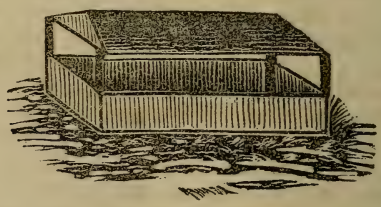
Where ashes cannot be conveniently obtained, two parts

*See A. Agriculturist for 1843, page 93.

slacked lime or chalk, one part gypsum, and one or two parts of common salt, may be mixed together, and used advantageously for the same purpose ; and, if convenient, one part burnt clay may be pulverized, and usefully mixed with these ingredients, along with bitter articles. The quantity which sheep will eat weekly varies ; sometimes a hundred sheep, will eat, in one week, a bushel of salt, ashes and gypsum, mixed in proportion as first mentioned : at other times the same amount will suffice them for three or four weeks. The quantity of ashes and gypsum, which they seem to require, evidently depends upon the quality of the grass or hay.

Perfect digestion is the great source of health to all animals, and, therefore, particular attention should be paid to supply the condiments which may be necessary for them; and when they are supplied, their digestion will generally be very perfect, and a less quantity of food will suffice them, than if they are withheld.

In order to test the properties of gypsum, I fed one part gypsum, and two parts common salt to sheep and cattle. In the softest and rankest pastures, all diarrhœa of sheep was entirely prevented. Its effect upon calves and fatting cattle was particularly excellent. Also gypsum mixed with salt or with provender is very useful to horses afflicted with slavering, or the heaves.



BOX FOR CONDIMENTS.

SECTION XLI.

DISEASES OF SHEEP.

INTRODUCTORY REMARKS.

In order to understand the proper management of sheep, a general knowledge of their diseases will be necessary. It is only by knowing the causes and symptoms of disease, that we can fully understand the correct modes of prevention and treatment.

The animal system is composed of solids and fluids; and these solids and fluids are ordinarily composed of all the different ingredients, which are found in the grain of wheat, except silica and alumina. Upon the proper organization and secretion of these different ingredients, depends the nutrition and preservation of the animal system. The improper organization, secretion or decomposition of these ingredients, produces disease and death. Hence, the treatment of diseases will consist in the restoration of the regular secretions, and the prevention of decomposition.

The food and principles of digestion, of man and other graminivorous animals, are much alike and their diseases and causes of disease, upon a careful comparison of them, will be found to be much more alike than most people imagine. Their digestive organs being stronger than those of man, they need larger doses, in proportion to their size, than man, in order to affect them. But as a general rule, when the disease is evidently similar to that of man, medicines of the same class as for man, may be used advantageously for the sheep.

In their treatment, we should ascertain, as nearly as possible, the nature and symptoms of the disease, with which the animal is afflicted, the qualities of the medicine which we intend to administer, the effects which we intend this medicine shall have, and the quantity which will be necessary in order to produce the desired effect. And in all cases where any of the natural condiments can be used beneficially, they will be the best of medicine, if rightly used.

The natural habitat of the sheep is upon very dry uplands and mountains, where the herbage is fully perfected, and the air is invigorating. Hence, as man places the sheep on various localities, which are unsuitable for it, whereby it is exposed to unnatural relaxation, it is, in such situations, particularly subject to diseases of debility from this cause.

But as the sheep is afflicted with different diseases in different countries and climates, it becomes every flock-master or shepherd to attend more particularly to the nature of those diseases which are most common in his country.—Under these circumstances, it is proper that some account of every variety of diseases should be contained in a shepherd's compendium.

SIGNS OF HEALTH.

Signs of health in sheep are, a skittish brightness, clear azure eye, florid ruddy eye-strings and gums, teeth fast, breath sweet, nose and eyes dry, respiration free and regular, feet cool, dung substantial, wool fast and unbroken, skin of a fine florid red, particularly on the brisket.—(Lawrence on Cattle, page 337.)

SECTION XLII.

DISEASES OF THE BRAIN AND NERVOUS SYSTEM.

Apoplexy, Inflammation of the Brain, Hydrocephalus, Epilepsy, Palsy, Tetanus, and Rheumatism.

APOPLEXY.

This disease consists in a fatal pressure of the blood upon the brain; the base of the brain, whence arise the nerves of sensation and motion, is compressed, benumbed, and its functions are suspended: the animal loses all feeling and power of voluntary action—life is suspended or lost. There is no inflammation, though it sometimes follows apoplexy.

This disease is caused by a redundancy of blood in the system, or by any thing which causes too great a flow

of blood towards the head. Hence, a sudden change from very short to very luxuriant pasture, or over feeding them with grain or succulent food, or worrying or over driving fat sheep, will sometimes produce it. Hence, fat sheep should ever be driven with moderation. The New Leicester sheep, from their greater tendency to fatten and be plethoric, are more liable to apoplexy than most other breeds.

Symptoms. The attack is usually sudden: the sheep moves forward or stands still, unconscious; the eyes are dilated or prominent, and sometimes the animal is almost or quite blind: the membranes of the nostrils and of the conjunctiva of the eye are full of blood, and of a deep red or violet hue; the nostrils are dilated, the pulse hard and full, and the breathing generally sterterous; if not relieved, the sheep will usually stagger and fall, and will often die in less than half an hour; but sometimes will linger for several days, or the disease will terminate in inflammation of the brain. These symptoms are produced by the pressure of the blood upon the brain, and sometimes its vessels are ruptured.

Treatment. If the symptoms are aggravated, a quantity of blood, half a pint or a pint, should be promptly drawn from the neck vein; and two or three ounces of Epsom or Glauber salts should be immediately administered. If necessary, give small doses of the same, half an ounce or less, once in six hours, until the feverish symptoms are fully reduced. For lambs, half the same quantities will be sufficient. The sheep should be fed sparingly for a few days.

INFLAMMATION OF THE BRAIN.

Sometimes the substance of the brain, and, at other times its membranes, and occasionally both of them are subject to inflammation. Inflammation of the substance of the brain often follows an attack of the apoplexy, and is generally produced by nearly the same causes as apopiexy, and occasionally by atmospheric influence.

Symptoms. In an early stage of the disease, the eyes are red and protruded—the animal is dull and heavy, and disinclined to move; but the scene soon changes—the eyes brighten—the flanks begin to heave—the sheep is in

constant motion—he cocks his tail and gallops about the field, and attacks his companions, or the shepherd, or even a post or tree—appears frantic.

Treatment. The animal should be confined, without delay, so as not to injure itself or other things. It should then be bled and purged, as in case of apoplexy, and the purgative medicines should be continued until the animal is fully restored.

In case of apoplexy or inflammation of the brain, as soon as the animal is fully restored to health, it should be slaughtered, or otherwise disposed of; for it will be liable to a return of the complaint from slight causes.

Prevention. In England, sheep are frequently subjected to this disease by being changed from short pasture into a field of fine turnips. This circumstance shows, that in in order to prevent this disease in such cases, the sheep should be dosed with plenty of tar, pitch, rosin, or other diuretic articles; for, besides water, the turnips contain only a small proportion of nutriment, but the excess of water in them causes a plethora, which in such cases can be avoided only by exciting the kidneys into full action.

HYDROCEPHALUS.

Hydrocephalus, or *sturdy*, is a collection of water or serum in the brain. The water is collected, either in hydatids, from the causes hereafter mentioned, or it is collected in some of the natural cavities (the ventricles) of the brain. In the latter case it is owing to a congested state of the spinal marrow, the result of long continued cold upon the back, as appears by the following circumstances, pointed out by the Ettrick shepherd, in the Farmer's Magazine for 1812.

1.—It is always most common after a windy or sleety winter.

2.—It is always most destructive on farms which are ill sheltered, and on which sheep are most exposed to blasts or showers.

3.—It preys only on sheep rising their first year, when the wool separates above, leaving their backs quite exposed to wet and cold.

4.—If a piece of cloth, or hide, is sewed to the wool, so

as to cover the back, such a sheep will not be affected with the disease.

Mr. Spooner says: "This disease is considered to be more prevalent in wet undrained soils, than in high and dry pastures." This circumstance shows that the succulent quality of the food is also a frequent cause of dropsy in the head, as it is of dropsy in other parts of the body; and, therefore, both external and internal influences operate to produce this disease.

When the water is contained in hydatids, these hydatids are unconnected with the brain. They are thin cysts, or bladders, containing serum, and are formed of a variety of shapes, so as to accommodate themselves to the cavity in which they are formed. In either case, the water acts fatally by its pressure upon the brain. This excessive accumulation of fluid within the brain, leads to the dilatation of the skull, and the absorption of its walls, when the bones can no longer be made to yield. For this reason, the skull, towards the termination of the disease, frequently becomes thin and soft in front of the root of the horn, or on the sides of the head. In a head which was presented to A. Blacklock by Mr. Grieve, each temple, exactly beneath the upper extremity of the upright branch of the lower jaw, displayed a circular opening entirely through the bone, wide enough to permit the passage of an ounce bullet.

Symptoms. Very soon after the water begins to collect, either in the brain, or in the hydatids contained in the brain, the animal shows evident and decisive symptoms: these symptoms are, a dull, moping appearance; a wandering and blue appearance of the eye, and sometimes partial or total blindness; the sheep appears giddy and unsteady in its walk—will sometimes stop and suddenly fall down; at other times, will gallop across the field, or separate itself from the flock; and after the disease has existed for some time, will almost constantly move around in a circle. There seems (says Mr. Spooner,) to be an aberration of the intellect of the animal. These symptoms, though rarely all present in the same subject, are yet sufficiently marked to prevent the disease being mistaken for any other.

Treatment. When the existence of a collection of water near the surface of the brain, is denoted by the skull yielding, at some particular spot, to the firm pressure of the

thumb, the disease may sometimes be ended at once, by thrusting an awl or steel wire through the bone, down towards the centre of the brain. This will let out the water, and may end the disease at once. A small syringe may be used to pump out the water, or contents of the hydatid, if necessary. A boy, in England, cured a sheep of sturdy, by boring with a gimblet directly through the skin and bone, on the top of the head. When it was done, the sheep was lying stupid upon the ground: the water streamed out, and the sheep soon jumped up, and went to eating with its fellows, and recovered.—(Amer. Agriculturist.)

Another method, pointed out by Blacklock, is as follows: Make two incisions, so that when completed, they shall be in the form of the letter T, in the skin covering the soft part of the bone, under which the hydatid is supposed to be. Two flaps are in this way marked out, and should be dissected back, so as to expose the skull to view. The yielding portion of the latter should then be pared away, which will bring the sac to view. This will be seen alternately to rise and sink, following, in this respect, the motions of the brain. A moderate sized needle, slightly curved and filled with thread, should be passed through the cyst, and the thread allowed to remain. The fluid is thus permitted slowly to escape, and, at the same time, the sac becomes slowly collapsed: after which it is easily removed by pulling gently at the thread with which it is connected. As good a hold should be taken with the string as possible, and all the water should be allowed to flow out before any attempt is made to extract the remains of the hydatid. To conclude the operation, lay down the flaps of the skin in their original position, covering them with a small piece of folded linen, smeared with lard, and over all apply a cap. Never try to save the bone which you cut in the form of a lid; for, by so doing, you will only endanger the life of the animal, which otherwise will be in little danger.

It will often happen that the hydatid, from being in the interior of the brain, will not be brought into view by the removal of a portion of the skull. In this case, the brain must be punctured, in order to reach the sac, and evactuate its contents.

Either of the above plans appear to be much superior to

that which was devised by Mr. Hogg, the Ettrick Shepherd, of running a knitting-needle, or other wire, up through the nostril into the brain: for, in such a process, there is but a small chance to hit the water or hydatid which is contained in the brain; and there is great danger of injuring the delicate parts within the nose and brain, so as to preclude the possibility of recovery; and, of course, a large proportion of those which are treated in such a manner, must die.

If the animal is very valuable, it may be well to employ a regular surgeon to remove a portion of the skull with a trephine, which is a circular saw, which is used for such purposes. This plan has been employed successfully in many instances; but there is danger of inflammation, and the number of failures has greatly preponderated over the cures.—(W. C. Spooner.)

If the animal is not very valuable, it may be well to butcher it for the pelt and tallow.

Mr. Greaves, of Bakewell, Derbyshire, (in England,) states, in the first volume of the Journal of the Royal Agricultural Society of England, that "the easiest and most effectual way, not only to cure, but to prevent its progress, is, to take some common tar, and place it between the eyes of all the sheep, spreading it down to the nose, and it is astonishing to find how soon they recover; nor will any other of the sheep, having the tar applied in this manner, be liable to have the complaint."

Prevention of Hydrocephalus. The above statement by Mr. Greaves seems to show, that the diuretic properties of the tar, which the sheep lick from their noses, have the same effect in preventing or curing dropsy in the head, that they have with respect to dropsy in other parts of the body; and in summer, when sheep are pastured upon succulent grasses, the use of pulverized pitch, or tar, or rosin, mixed with other condiments, must be depended upon for the prevention of sturdy.

To prevent this disease in winter, it will be necessary, in addition, where the climate is moist, to supply sheep with wholesome dry fodder, and sufficient shelters. Bratting them, that is, covering their backs lengthwise with pieces of cloth or hide, or smearing their backs lengthwise with a mixture of tar and grease, will doubtless be useful,

where suitable shelters cannot be provided. The climate of the United States is much drier than that of Britain or northern France, and sturdy is, consequently, a rare complaint in these States. Even in districts where the rot prevails, sturdy is rarely seen. This circumstance shows that a moist climate or weather is the most frequent cause of this disease. Consequently, good shelters in winter will contribute greatly towards its prevention.

"This disease (says Mr. Spooner,) is principally confined to young sheep, and to their first year: so that, on the continent of Europe, they in some places avoid it, by keeping the sheep in houses or sheds during their first year, which, it is stated, prevents the disease. It is much more common on the continent of Europe, and particularly in France, than in England; and it is supposed, that in the latter country it destroys nearly a million annually, and in Germany, upwards of two per cent."

EPILEPSY.

Epilepsy, in the sheep, is known by the names of Epilepsy, Leaping-ill, Louping-ill, Twarter-ill, or Trembling. The symptoms of this disease are very similar to those of Epilepsy in man, and hence, Epilepsy seems to be the appropriate name for it.

Epilepsy consists in an inordinate action of the nervous system, and of the voluntary muscles connected with it, and strongly resembles tetanus—tetanus in the sheep being little more than an aggravated state of Epilepsy.

Causes of Epilepsy. Epilepsy is usually produced in the sheep by exposure to cold wet weather, and pasturing upon frozen grasses, in a moist climate, and proceeds from their not having been folded, or from their being dismissed from their fold too early in the morning, so that they gather a quantity of congealed water with their food, which chills the rumen, and determines the blood towards the head, and the nervous system is effected through the medium of the nerves of the stomach. Hence, attacks of Epilepsy are most frequent at the beginning of spring, or towards the latter part of autumn, when the hoar frost lies thick upon the ground.

Symptoms. If the animal is in high order, it will, on a sudden, and without any apparent cause, cease to graze—

will stare stupidly in every direction, stagger, run round three or four times, and then fall and struggle violently for several minutes; and these symptoms are often accompanied with gnashing of the teeth, foaming at the mouth, and a spasmodic locking of the jaws. In such cases, the brain is oppressed by congestion of the blood upon it, much in the same manner as in incipient apoplexy, and the animal often dies off within a short period, unless relieved.

These sudden attacks oftenest occur in young sheep which are in good condition, and after a sudden and improvident change of pasture.

If the animal is in rather low condition as to flesh, when first slightly attacked, it exhibits a dull, heavy appearance, with what may be termed a deadness of coat; there is a loss of power in one or more limbs, and sometimes of a whole side, or even of the whole animal—the head and neck are drawn spasmodically towards the shoulder or back with a violent tremor, and a constriction of the œsophagus, so as to endanger suffocation, when a liquid is attempted to be conveyed to the stomach, together with a spasmodic locking of the jaws, and emission of a frothy saliva from the mouth, when the convulsive fits come on, which, in some cases, frequently happens once or twice every five minutes, together with a laborious and quick respiration, which subsides altogether as soon as the fit has terminated.

In this deplorable state the animal will sometimes remain for minutes, hours, or days, according to the severity of the attack; and if it does not rally from it, death sooner or later ensues; or it becomes necessary to use the knife as the only means of putting an end to its sufferings.—Sometimes the animal will rally and recover from this situation, and get entirely well; but, in other cases, one of the hind legs often remains cold and powerless for some time, in spite of the use of friction or stimulants; and sometimes a tumor of the size of a pigeon's egg, or even of a hen's egg, filled with pus or ichor, will appear near one of the joints or arms of the legs, or upon the brisket, or near those parts.

If the sheep is predisposed to Epilepsy, by the quality of the pasture and wet, frosty weather, the disease will some times make its appearance, if the animal is injured

either in its loins by running, jumping, or stretching, or by rough usage in the fold, or if the udder of ewes that are near the time of yeaning, be underlocked, as the fatigue which they thereby undergo, and the cold which thus penetrates to the most tender parts, are often followed by the most fatal consequences.—(See Spooner on Sheep.)

Treatment. When the disease arises from injuries to the back, loins, or other parts of the body, by accidents or by rough usage in the fold, Blacklock advises that the sheep should be slaughtered; as, should a cure be attempted, the treatment, in ordinary hands, will be too tedious and complicated to succeed.

When the disease comes on suddenly and violently, it is owing to oppression of the brain from congestion. In such cases, copious blood-letting and doses of Epsom salts will be found most useful. This kind of Epilepsy is almost certain to end in sturdy, unless combatted by energetic depletion.—(Blacklock.)

When the animal is in low condition, and the disease comes on moderately, or if of long standing, and has every appearance of the true Epilepsy, blood-letting will be injurious. In such cases, warm shelter, with a supply of dry nutritious food, will frequently restore the animal. If this fails, give frequent doses of an infusion of horse castor, made by seetheing it in water. In Epilepsy of man, this has been found to be the most effectual of all remedies; and possibly it may be quite as useful to the sheep as to man.

Prevention of Epilepsy. Exposure to cold wet weather, and feeding upon frozen herbage in a moist climate, appear to be the principal causes of this disease. Hence, in such climates, it may be avoided by providing good shelters, and feeding the sheep with dry hay in the morning, during frosty weather, and not permitting them to feed on grass in the morning until the frost has disappeared.

Epilepsy is a frequent disease in the moist climate of northern Europe. In the dry climate of the United States, it is rarely or never seen; nevertheless, its occurrence in Europe shows the injurious influence which wet, frozen herbage must, in some measure, exert upon the sheep in other climates.

TETANUS.

This disease, which is more usually understood under the term of *Locked Jaw*—this being a principal and common symptom—consists of a violent irritation of the nervous system, occasioning the spasmodic and violent contraction of the voluntary muscles of the body, particularly those of the neck, jaw, and back. It usually commences with a peculiar motion of the head, and sometimes of the limbs, and the jaw becomes fixed, and there is a grinding of the teeth. These appearances, which are involuntary, increase, and the head is bent round, the neck twisted, and one of the limbs fixed. The muscles feel very hard, being in a violent state of action; and sometimes they become less rigid, and convulsions take place. These symptoms are often fatal in the course of twelve hours; but if the sheep survives more than two days, it is likely to recover.

"This disease is more common with lambs than with sheep, and is not unfrequently the effect of castration, particularly when the operation is performed with unusual violence, and by means of twisting. Exposure to cold and wet is also a frequent cause, and deaths oftener arise from this neglect than farmers are generally aware of." It also sometimes arises from wounds or bruises, or a foul state of the bowels.

Treatment. The treatment should consist in removing the animal to a more comfortable, quiet place, where no disturbance can possibly arise. The body should be kept comfortably warm, and a mild purgative should be given, such as linseed oil or castor oil. This should be followed by doses of one-third of a scruple of laudanum, with the same quantity of ginger, in thick gruel three times daily. The animal should be disturbed as little as possible, for it has been found in this disease that quietude is one of the most important agents in establishing a cure. If laudanum fails to give relief, doses of an infusion or decoction of horse castor should be administered freely, with gruel sufficient to preserve the strength of the animal.

PALSY.

This disease consists in a partial suspension of the powers of the nervous system. Sometimes the animal is totally

helpless—every limb being, in some measure affected; at other times, the disease is principally confined to the loins. It differs from apoplexy—apoplexy being a total suspension of the powers of the nervous system.

"The cause of this disease is generally cold combined with moisture; the animal becomes chilled, and is found, perhaps after a snowy night, in the helpless state before mentioned. Though more frequently affecting lambs, it may also attack sheep of all ages, and particularly the ewe that has aborted her lamb with difficulty, and after a tedious labor in cold weather. It often attacks the newly dropped lamb, and sometimes proves fatal during the night.—When less severe, the lamb is found stationary, and with its hind legs powerless; and when this is the case, it rarely becomes otherwise than stunted in its growth, though after a time it may get rid of the paralysis.

"This disease is often confounded with Rheumatism, and is sometimes connected with it; but the former has its origin in the nerves, whilst the latter, (the rheumatism,) though more painful, is an affection of the muscles."—(Spooner.)

"This disease is sometimes produced by an excess of nutriment, or by the quality of the food.

"Mr. Cleve, in the first volume of the Journal of the Royal Agricultural Society of England, relates the following facts: "I had been giving two cart-loads of mangel wurtzel daily to about 150 couples. Finding the pasture get short, I one day ordered an extra load, and the following day I found that thirteen of the ewes had nearly lost the use of their limbs. On another occasion, having some hoggets that would not eat the roots, I enclosed them in a pen, in order to starve them to it; but as soon as they began to feed heartily, they were all similarly effected. If I rightly attribute the complaint to this cause, and, indeed, I have no doubt on the subject, the treatment is, to withhold the mangel wurtzel for a short time, and only return to the use of it gradually, and in small quantities."

Treatment. "In the cases last mentioned, Mr. Cleve bled, and gave each sheep an ounce and a half of Epsom salts, under which treatment they all recovered, with one exception."

In ordinary cases of Palsy, arising in the manner first

mentioned, the treatment should consist in the application of warmth externally, but moderate at first, and gradually increased. A drachm of ginger, or other mild stimulant, mixed with gruel, should then be administered to the sheep; and the dose should be repeated occasionally until the animal is restored.

A lamb thus afflicted should be wrapped in a blanket, and placed in a warm room, but not too near the fire. A little ginger mixed with a little warm milk, may then be given to it; but as soon as it is able to move about, it should be placed with its dam, in a comfortable place, and her care and milk will, in most cases, gradually restore it.

If symptoms of Diarrhœa should appear, the treatment recommended under that head should be employed.

RHEUMATISM.

Rheumatism is an affection of the muscles instead of the nerves, and consists in a peculiar inflammation of those parts, very frequently causing considerable pain, when they are called into action. It is usually caused by exposure to cold wet weather, and sometimes shifts from one part to another, occasionally degenerating into a slow or chronic form, and attacking the sinews, ligaments and joints, as well as muscles. "The neck and loins, (in England) are the parts most frequently attacked, either separately or combined. The former affection causes the head to be carried in a bent position, and the latter produces considerable stiffness and weakness of the loins."

In America, the thighs and legs of sheep appear to be more frequently affected with this complaint, than other parts of the body.

Treatment. As this complaint arises most frequently from exposure to cold wet weather, suitable shelter should be provided for animals so afflicted, and a drachm of ginger, or pimento, should be given to them, in gruel, or in their provender, twice a day. A stimulant, such as hartshorn and oil, or opodeldock, should be well rubbed over the part affected.

Epilepsy and palsy are rare complaints in America; but rheumatism is not uncommon. These complaints will rarely occur in any country where suitable food and shelters are provided.

SECTION XLIII.

DISEASES OF THE DIGESTIVE ORGANS.

OBSTRUCTION OF THE GULLET.

Sheep are liable to this affection, by swallowing or attempting to swallow apples or roots, either whole, or pieces of them, which are imperfectly masticated, or by gorging themselves with large quantities of oats or other grain.

When this affection is caused by apples or roots, "the sheep should have its head elevated, and held firmly between one man's legs, whilst another passes the end of a flexible probang, carefully over the root of the tongue, into the pharynx, and thence down the œsophagus, forcing the obstructing morsel with it. Much care must be exercised in this operation; the probang should be oiled, and forced onward with gentle firmness, so as not to lacerate or inflame the coats of the œsophagus. In the absence of that useful article, a cane or flexible rod having at one end a bulb formed of tow or smooth wood, and being well oiled, may be used as a probang."

If these means should fail, the obstructing morsel should, if possible, by gentle manipulation and pressure upward, be raised up so far in the œsophagus that it may be extracted by the knife. For this purpose, clip off the wool from about the part where it lies, and around the neck, and then with the knife cut down upon the obstructing substance, through the skin and œsophagus, and remove it. Two or three stitches should then be passed through the edges of the wound in the œsophagus, which should be brought neatly together. The same must be done with the external skin, the ends of the threads which closed the œsophagus being brought through the outer wound. The neck should then be bandaged, but not too tightly; and the wool above and below will keep the bandage firm. The sheep must be fed with mashes or gruel for a few days, or until the wound is closed; and the stitches should be removed as soon as the edges of the wound plainly adhere. This is a very simple operation, and will rarely be injurious; but the probang should always be first and fairly tried.—(Youatt.) If the gullet is obstructed by oats or other grain, its pas-

sage downward may be facilitated by gently squeezing the œsophagus.

MECHANICAL DISTENSION OF THE RUMEN.

This disease is more commonly known in the United States, by the name of the *stretches*, which action is only a symptom of the disease. It almost never occurs to sheep, when they feed entirely upon grass, or other succulent food; but when they are confined to hay, or other dry food, and are deprived of water, it frequently happens that a large quantity of food is collected in the stomach, and is packed in a hard, dry mass, so that it cannot pass out of the stomach; this is called by some persons, *the drying of the manifolds*.

Symptoms. The sheep ceases to ruminate, and will alternately lie down and rise up at brief intervals, frequently stretching itself, and refuses food of every kind; sometimes froths a little at the mouth.

Treatment. Frequently a little common salt, a quarter or half an ounce, will relieve the animal in a short time. If this fails, a dose of two table spoonsfuls of castor oil, linseed oil, or hogs lard melted, will sometimes give relief. But the surest and safest medicine is *yeast*. Turn a half a pint of yeast, mixed with an equal quantity of lukewarm water, down the animal's throat, once in two or three hours until relief is obtained. This will produce a fermentation and dissolve the contents of the stomach, which will then pass off, without difficulty or danger.

Prevention. A daily supply of succulent food, such as apples, potatoes or turnips, will prevent this difficulty. Also a plentiful supply of water is the great and most convenient means of prevention; and if this is provided it will almost never occur.

HOVEN.

When sheep are turned in upon wet clover fields, or other indigestible grasses, at a time when their stomachs are empty, they are apt to feed too freely, and, consequently, their stomachs are often inflated with wind, which is produced by the fermentation of these grasses in them. In such case, both the upward and downward orifices of the stomach are closed, so as to prevent the escape of the wind or gas. All ruminating animals are subject to this affec-

tion. Sheep are sometimes, though rarely, hoven, when eating hay in winter. In this disease, the rumen is distended, so as to press upon the diaphraghm, and thus prevents the chest from expanding to admit the the air, and suffocation is produced, so as to cause death.

Treatment. Whether hoven is produced by eating clover, or other indigestible grasses, or by hay, or other food of a bad quality, a quarter or half an ounce of salt fed to a sheep, or dissolved in water, and put down the throat, will frequently give relief. If this fails, give a gill of melted lard, and soon after, another gill: or linseed oil or sweet oil may be used in place of lard.

It is stated in the Dublin Farmers' Gazette, that one or two doses of an egg-shell full of tar, put down the throat of an ox, will surely cure hoven. The same remedy is also useful to sheep. For this purpose, give to the sheep the tenth part of one of the above doses. Tar and common salt are both strongly antiseptic, and will check the fermentation which produces hoven. Repeat the doses, if necessary.

If chemical remedies do not give relief, a hollow flexible probang may be used; or, in lieu of it, a strong flexible wooden rod, with a round knob at the end of it. The knob should be covered with leather, or a piece of bladder, or smooth cloth, and should be oiled or greased. It may then be thrust down the throat, so as to allow the wind to escape. If it collects again, the operation may be repeated. In using the probang, the mouth may be kept open by means of a round stick, having a hole through it, so as to admit the passage of the probang. This operation should be conducted with care, so as not to injure the œsophagus, or meat-pipe.

If the case proves desperate, the last remedy is, to plunge a knife through the skin into the rumen. The knife should be sharp at the point, and dull on the edge, so as not to make too broad a wound. The sheep will swell most on the left side, and a part of the swelling will be very protuberant below the hip-bone. Into this protuberance, plunge the knife. The aperture must be kept open until all the wind is discharged; and if it does not at once freely and rapidly escape, the sides of the belly should be moderately pressed, so as to force it out. After the wind has escaped,

the wound may be drawn together by putting on an adhesive plaster. This is evidently a dangerous remedy, and should be used only in the last resort, as it is evident that the animal must sometimes die in consequence of the wound which is made. If the animal is fat, it may be well to butcher it at once.

Prevention. The usual cause of this complaint is, that clover is a grass which is difficult of digestion, and when it is received into the stomachs of ruminating animals at a time when it is moistened with dew or rain, it goes into a state of fermentation before the gastric juice can operate upon it; whereas, if it is received into the stomach without dew or rain upon it, the gastric juices will readily have their due influence on every part of it. Hence, in order to prevent this complaint, sheep should be turned in upon clover pastures only at such times of the day that the grass will be dry: and should it be necessary to turn them in upon such fields at other times, it will be well to keep them moving about for a little time when first turned in, so that they cannot gorge themselves too suddenly; or they may be turned into them when well filled with other grasses.

THE ROT.

The Rot is a decay of the bowels: it is a complication of diseases, each of which, either directly or indirectly, arises from the same causes. This complication of diseases has never been fully explained by any author; and as, in order to the proper management of sheep on the various soils, and in the various seasons and climates which may occur to them, it will be necessary to have a correct knowledge of these internal diseases of sheep, it will be necessary to use more words than what have generally been used by writers upon this subject.

No one has so graphically described the external causes and symptoms of these diseases, as the poet Virgil. I shall, therefore, insert an accurate translation of part of the 97 last lines of the third book of his Georgies, or poetical works upon Agriculture, which were written about 50 years before the birth of Christ, as follows:

"Not so frequent does the whirlwind, driving winter before it, rush from the Ocean, as the plagues of cattle are numerous. Nor do diseases seize upon single bodies only; but the whole summer's increase, the hope and the flock together, and the whole stock from their origin. If any one can see the aerial Alps, and the Norican Castles upon the hills, and the fields of Iapidian Timavus, and the realms of the shepherds, now, after so long a time deserted, he may then know. Here, formerly, a miserable tempest of the sky, began along with the disease, *and it increased with the whole heat of autumn*, and it put to death the whole race of cattle, and wild beasts; seized upon the lakes; infected the pastures with contagion. Nor was the manner of death simple; but when the fiery thirst, driven into all their veins, had drawn together their miserable limbs, again the fluid liquor abounded, and drew to itself by piece meals, the bones collapsed in the course of the disease.—Oftentimes the victim, standing in the midst of the service to the gods, at the altar, while a woollen fillet, with a snowy label, is put around it, has fallen down about to die, in the midst of the servants waiting. Or if any priest had killed any one with a knife, neither do its fibres placed upon the altars burn, nor can an augur consulted return an answer: and the knives applied are scarce tinged with blood, and the surface of the sand is hardly stained with meagre gore. Hence, the calves frequently die in luxuriant pastures, and yield up their lives at the full cribs. Hence, madness comes upon the gentle dogs; and wheezing cough shakes the diseased swine, and chokes them in their swollen jaws.

Non tam creber agens hiemem ruit æquore turbo,
Quam multæ pecudum pestes. Nec singula morbi,
Corpora corripiunt; sed tota æstiva repente,
Spemque gregemque simul, cunctamque ab origine gentem.
Tum sciat, ærias Alpes, et Norica si quis
Castella in tumulis, et Iapidis arva Timavi
"Nunc quoque post tanto videat, desertaque regna,
Pastorum, et longe saltus lateque vacantes.
Hic quondam morbo cœli miseranda coorta est
Tempestas; totóque autumni incanduit æstu;
Et genus omne neci pecudum dedit. omne ferarum,
Corripuitque lacus; infecit pabnla tabo.
Nec via mortis erat simplex: sed ubi ignea venis,
Omnibus acta sitis miseros adduxerat artus;
Rursus abundabat fluidus liquor; omniaque in se,
Ossa minutatim in morbo collapsa trahebat.
Sæpe in honore Deum medio stans hostia ad aram,"

The miserable horse, though once victorious, falls down, unmindful of his exercise and grass; is averse to water, and frequently strikes the ground with his foot; his ears hang down; an intermitting sweat breaks out, and that cold to those about to die; the skin becomes dry, and hard to the touch, resists the handling.

"Lo, too, the bull, smoking under the oppressive ploughshare, falls down and *vomits from his mouth blood mingled with foam*, and draws his last groans.

"Neither does the wolf search round the sheep-folds for an ambuscade, nor does he prowl about the flocks at night; a sharper care subdues him. The timid does and fugitive stags wander about, among the dogs and around the houses.—The air becomes unfavorable, even to the birds, and they falling give up their lives in the high clouds.

"Nor does it avail any thing that the pastures are changed: the usual arts of healing prove injurious; the masters Chiron and Melampus ceased to prescribe. Pale Tisiphone, sent from Stygian darkness into light, rages, and drives disease and dismay before her. The streams, and dry banks, and sloping hills, resound with the bleating of flocks, and frequent lowings. And now by flocks she deals

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"Lanea dum nivea circumdatur infula vitta,
Inter cunctantes cecidit moribunda ministros.
Aut si quam ferro mactaverat ante sacerdos;
Inde neque impositis ardent altaria fibris;
Nec responsa potest consultus reddere vates;
Ac vix suppositi tinguntur sanguine cultri,
Summaque jejuna sanie infuscatur arena.
Hinc lætis vituli vulgo moriuntur in herbis
Et dulces animas plena ad præsepia reddunt.
Hinc canibus blandis rabies venit; et quatit ægros
Tussis anhela sues, ac faucibus angit obesis.
Labitur infelix studiorum, atique immemor herbæ
Victor equus; fontes avertitur, et pede terram
Crebra ferit; demissæ aures; incertus ibidem
Sudor, et ille quidem moriturns fregidus; arit
Pellis, et ad tactum tractanti dura resistit.
Ecce autem duro fumans sub vomere taurus.
Concidit, et mistum spumis vomit ore cruorem
Extremosque ciet gemitus.
Non lupus insidias explorat ovilia circum
Nec gregibus nocturnus obambulat; acrior illum
Cura domat. Timidi damæ, cervique fugaces,
Nunc interque canes et circum tecta vagantur,
Ipsis est aer avibus non equus; et illæ"

destruction, and in the very stalls heaps up carcasses, overturned by the foul contagion; until they learn to hide them in pits, and cover them with earth.

Neither was there any use for their skins; nor could any person cleanse their viscera with water, or purge them with fire; nor shear their fleeces, eaten through by disease and uncleanliness; nor touch the putrid stuffs. But if any one tried the odious vestments, burning pimples and filthy sweat overspread his noisome limbs. Then, no long time intervening, the cursed fire preyed upon his infected limbs."

Those who remember the summers of 1335, '36 and '37, may recollect, that the influence of the weather upon animals, was much the same as above described. Long continued hot and wet weather combined, ever will produce such pestilences. In such seasons, the grasses grow rapidly, and are deficient in their earthy salts, and the pores of the skins of animals are partly closed by moisture, so that their bowels are oppressed with bad food, and excrementitious matter, and they sink with disease. And much the same thing happens yearly, where flocks are pastured upon wet lands; therefore, a very particular knowledge of this complication of diseases is necessary in all climates.

Symptoms of Rot. The animal pines away, and appears languid and dull; is troubled with fabulence; the white of the eyes, and the eye-lids, if lifted up, are pale and hardly

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Precipites alta vitam sub nube relinqunt.
Preterea, nec jam mutari pabula refert;
Qæsitæque nocent artes: cessere mgistri
Phillyrides Chiron, Amythaoniusque Melampus.
Sævit et in lucem Stygiis emissa tenebris
Pallida Tisiphone; morbos agit ante metumque.
Balatu pecorum, et crebris mugitibus amnes,
Arentesque sonant ripæ, collesque supini:
Jamque catervatim dat stragem, atque aggerat ipsis
In stabulis turpi dilapsa cadavera tabo;
Donec humo tegere, ac foveis abscondere discunt.
Nam neque erat coriis usus; nec viscera quisquam
Aut undis abolere potest, aut vincere flamma;
Nec tondere quidem morbo illuvieque peresa
Vellera, nec telas possunt attingere putres.
Verum etiam, invisos si quis tentarat amictus
Ardentes papulæ, atque immundus olentia sudor
Membra sequebatur; nec longo deinde moranti
Tempore, contactos artus sacer ignis edebat."

show the veins; the caruncle of the eye appears yellowish; the skin loses its carnation color and looks paleish; the tongue becomes livid and furred. In the course of the disease, the wool frequently becomes loose, so as to be easily separated from the pelt; and some part of the skin is often mottled with round reddish or brownish spots, and, in some cases, the whole skin of the back becomes brown; the sheep shrinks, and becomes flaccid about the loins: sometimes it has dropsical swellings, which are most frequent in the peritonæum, or under the jaws; sometimes it has a cough: and diarrhœa is frequently one of the symptoms, but not always: at death, the animal more generally sinks away gradually, and dies off with very little pain.

Causes of the Rot.—These are principally of two distinct kinds. One cause is, the acids, which are produced by the fermentation of grass or food in the stomach.

The other cause is, the mechanical action of sharp-edged grasses, irritating and cutting the mucus membranes of the stomach and intestines.

That kind of rot which is produced in the manner first mentioned, will be first treated of, being that which is more generally known as the rot.

When the digestive powers of the animal are weak, or the food is of such a quality as to be difficult of digestion, fermentation takes place in the bowels, and acids are produced. "Of all the food," says Blacklock, "on which sheep can possibly be kept, none is known to act so deleteriously as grass which has sprouted quickly." This remark is well known to be most perfectly correct, and it affords a key to this complication of diseases called rot.—Such young grasses contain a large proportion of saccharine matter, alkalies, and alkaline salts,* and, at the same time, are deficient as to their earths and earthy salts: they are in a state of rapid preparation for the formation of their grain or seed. Hence, in such a state, they readily ferment and produce acids. Sugar ferments and produces acids in the stomach more readily than any other kind of food. Underneath are inserted the analysis of sugar, and of sundry acids, as follows:

* See analysis of oats, by Mr. Fromberg, in the Appendix.

	Carbon.	Hydrogen.	Oxygen.
Sugar,	42.58	6.37	51.05
Oxalic acid, or acid of sugar,	33.22	0.24	66.53
Acetic acid,	46.83	6.35	46.82
Tartaric,	36.16	3.95	59.88
Citric,	41.36	3.80	54.83
Malic,	41.47	3.51	55.02

By this table, it will be seen that the constituents of sugar, and of each of these acids, are precisely the same; they only vary in the proportions of those ingredients. Of course, the saccharine matter of grasses, may, by indigestion and fermentation, be changed into any of these acids. Ure says, in his dictionary of chemistry, "*From the general phenomena, it may be concluded, that a vegetable substance, heated moderately with potash, gives oxalic acid.**" Now, as potash is ever present in the grasses, whenever it is superabundant, the heat of the stomach will readily form oxalic acid.

The manner in which these acids act, is, that they irritate or erode the mucus membranes, or inner lining of the stomach and intestines: they are also partially absorbed, and pass through the lacteal ducts and mesentery glands, along with the chyle: and abscesses, or cavities, are formed in the lacteal ducts, which sink through the muscles of the intestinal canal; and the mesentery glands are enlarged, and sometimes become schirhus or hard. And when these muscles of the bowels are affected by abscesses, as above mentioned, the tissue of those muscles is so much relaxed that the bowels are no longer able to perform the usual peristaltic or vermicular motion, and sink down into the lower part of the belly, from absolute weakness. In such case, the parts between the hips and the short ribs fall in: the sheep shrinks. And when these ducts and glands are injured in this manner, the chyle will be impurely received, or will utterly cease to be received through the parts which are decayed; and if a very large proportion of these organs is injured, the animal must die, for the very portals of life are closed. I have dissected very many which died with this affection, and never have examined

* This principle is worthy of particular attention.

any one in which the lacteal ducts were not defective. In lambs 6 or 8 months old, the mesentery glands appear most enlarged; in full grown sheep the lacteal ducts appear to be most defective. And the lacteal ducts and mesentery glands are the parts which first fail, and give rise to this complication of diseases called rot. If only the mucus membranes of the stomach and bowels, or if only the liver or lungs are somewhat affected, there will be a chance for restoring the animal; but if the lacteal ducts and mesentery glands are much defective, they can never be restored; the animal must perish for want of nutriment. If only a small portion of these organs are injured, the animal may sometimes be fatted off and killed. And the state of these organs may be nearly known, by the appearance of the parts between the hips and the short ribs; if, with plenty of food before the animal, those parts sink in more than usual, those organs are surely injured.

But in order fully to understand the effect of these acids, it will be necessary to take a view of them. All the four acids last mentioned in the table, may, and doubtless do, pass through sheep and other animals, and cause diarrhœa, which is frequently continued for a considerable time without rotting them. But the oxalic is a powerful acid, and is a strong vegetable poison. If it is formed in the stomach or intestines, in any considerable quantity, it cannot pass through them harmlessly. That it is so formed, is certain. "In the so-called mulberry calculi, or stone in the bladder of the human body, we find oxalat of lime, says Liebig, and always in persons in whom, from want of exercise, or from other causes, the supply of oxygen has been diminished." Such persons are ever subject to indigestion and acidity of the stomach. Under such circumstances, we see that oxalic acid is formed in the human body.

That oxalic acid is formed in the bowels of the sheep, will be apparent by the round reddish or brownish spots which are seen on the skins of sheep affected with rot.

Unfortunately, the oxalic acid has been taken as a medicine by a number of persons in England, in consequence of their mistaking it for Epsom or Glauber salts. And I insert, from Beck's Medical Jurisprudence, an account of the effects which it had upon them, and upon other animals, as it will show its properties, as follows:

1st.—The earliest symptom was, a burning pain in the stomach.

2d.—Vomiting a dark, sanguinolent fluid, which commonly continues till death.

3d.—When life was prolonged for a few hours, pain in the bowels and purging followed, and the fœces were mixed with blood.

4th.—Along with these symptoms, was a sunken countenance, and pulse imperceptible at the wrist.

5th.—In a case in which Dr. Arrowsmith attended, the patient had *a deep red mottled appearance of the skin, in circular patches*, and also leaches, applied to the stomach six hours after the poison was taken, were poisoned; they fastened well to the skin, but on touching one, it fell motionless and dead.

6th.—In Mr. Hebbs' case, the stomach appeared as if scalded, and contained a pint of dark-colored fluid, owing to the blood contained in it.

7th.—In Mr. Fraser's case, the villous coats of the stomach were completely destroyed; though in some parts they appeared entire, on examination it was found to be soft, and easily rubbed off with the finger; and the small intestines exhibited similar appearances.

Experiments were made with this acid, by Messrs. Christison and Coindet, upon animals, and it was found—

1st.—That its effects on the bowels of mankind, and on those of animals, were similar.

2d.—They noticed that a small quanity of acid, when diluted, destroys an animal sooner than when concentrated, [*one-third of an ounce is sufficient to destroy the life of a man—12 grains a rabbit.*]

3d.—The oxalates of potash and ammonia do not corrode, but they produce tetanus, (locked jaw,) and coma, (stupidity,) like the diluted oxalic acid. Messrs. Christison and Coindet found death to ensue to animals in a few minutes from either of these oxalates; and the conclusions drawn from these observations were, that this acid acts through the medium of absorption.

It is impossible not to see the resemblance which such deaths of mankind have to those of cattle dying off with red-water, (called bloody murrain in the United States,) the symptoms of which are before described by Virgil.—

Sheep, drying with braxy, often appear as if affected by oxalat of potash: they often appear to be much affected in the jaws, and grate their teeth; and in cases of rot, the circular red or potash colored spots, which often appear upon their skins, show that both the oxalic acid and the oxalat of potash have helped to destroy them; oxalic acid is formed in the stomach, and potash being always present in the grasses, oxalat of potash is readily formed. It is absorbed along with the chyle, and passes through the lacteal ducts and mesentery glands, into a duct which passes along by the sides of the back bone, and the chyle enters into a large vein, just previous to its arrival at the heart.

Along by the back bone is the place where these circular potash colored spots first appear on the skins of sheep. As the disease advances, these spots gradually become more numerous, and are scattered over the skin of the back and sides; and sometimes the whole skin of the back, on strong sheep, becomes brown from this cause. When cattle are affected with chronic red-water, or merely indigestion, their skins often become dappled or brown, in the same manner. —(See Youatt on Cattle, page 508.)

The effect of the oxalic acid upon animals is similar in one other respect, viz: it salivates them.

In the Massachusetts Ploughman, for 1844, B. F. Wilbur states, "that he purchased a few hundreds of hay and sorrel, nearly equal quantities of each. In a day or two, the horse began to slaver excessively. He before fed him on clear clover, and also on other hay, without any such effect.—Now, in this case, the oxalic acid, which is the acid found in the sorrel, and which gives it such an agreeable taste, is evidently the article which produced the salivation.

But it is well known that horses, feeding on the hay of aftermath clover, or on clover grass, are salivated by either of them. Cattle, also, on such pastures, are frequently affected in the same manner. In braxy, the sheep is frequently salivated: it either froths or drools at the mouth; and even the hog is sometimes salivated by clover.—(See Meases' Archives of Useful Knowledge, Vol. I, page 398.)

The true reason why clover salivates animals seems to be, that it contains a very large proportion of potash, and, consequently, by fermentation in the stomach, it readily produces oxalic acid. And it is evidently of no consequence

whether the oxalic acid is taken into the stomach directly, as in the sorrel, or whether it is formed in the stomach by the fermentation of clover, or other grasses, the effect will be the same. The dog afflicted with rabies is also salivated, and animals afflicted with rabies present the same haggard countenance as the ox afflicted with red-water.

Similar seasons seem to produce these diseases in these different animals; and the part which the oxalic acts in the formation of deadly and contagious diseases, is yet to be ascertained by observation. The oxalic acid inflames and crodes the bowels and produces salivation: the oxalat of potash produces spasmodic action of the jaws, urinary organs, &c., and these two ingredients seem to be the causes of some of the most fatal diseases to which graminivorous animals are liable, such as the red-water and murrain of cattle.

Hence, also, the oxalic acid is to man the probable cause of the water-brash, the cholera, inflammation of the bowels, &c.*

We will now compare the internal appearance of sheep dying with rot or braxy, with those of mankind poisoned by oxalic acid.

1st.—On dissection, wherever the potash colored spots were quite numerous, I have found the mucus membranes, or inner lining of the stomach, pylorus, and duodenum were very highly inflamed, and of a dark red color, and soft and pulpy; and sometimes, in such cases, the inflammation appears to extend the whole length of the bowels. This agrees with what Sir G. S. McKenzie and Blacklock say.

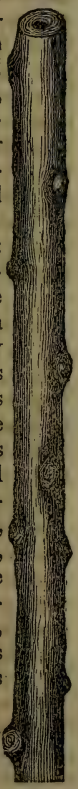
McKenzie says: "A young sheep was observed in the morning not to eat, and seemed remarkably languid—in the afternoon was brought home gasping for breath; pulse very quick; eyes blood-shot; skin remarkably hot. It was bled: but no blood would run. In an hour it died. On opening the body, the fourth stomach was found mortified over all its upper and fore part, which was extended to

* Many symptoms produced by a large dose of oxalic acid are similar to those of Cholera; 1—A burning pain in the stomach; 2—Vomiting and purging; 3—Spasms; 4—A sinking of the pulse, and a sunken countenance; 5—Oiliness of the blood.

where it joins the bowels, which were quite red; the internal coat of them all was loosely attached."

Blacklock says, as to braxy: "Though many parts are commonly implicated, there is every reason for believing the fourth stomach or reid to be primarily affected: inflammatory appearances and mortification are visible on its coats, especially at the pyloric extremity. The inner coat presents a blackish red and gelatinous appearance: the entire bowel being soft and pulpy, and permeable to the finger."

Here we see that the effects of the oxalic acid upon the bowels of man and beast are almost precisely similar: and it may be here observed that the reason why the pylorus and duodenum are more affected with inflammation than the bowels, appears to be, that it is here that the food is first strongly compressed in passing from the stomach to the lower bowels, and, of course, those parts are most exposed to the influence of the acids which are contained in the food.



2d.—As to the appearance of the intestinal canal: The mucus membranes line the whole of the intestinal canal of the animal from the mouth to the rectum. When in a healthy state, they are of a whitish color, with a tint of red, and are not easily croded. The mucus membranes discharge mucus into the bowels to lubricate them, and the lacteal ducts receive chyle into the general circulation; and the mouths of these lacteal ducts and mucus membranes are all pointed towards the interior of the intestinal canal. When abscesses are formed in the intestinal tube, by which the lacteal ducts are injured, most of them are of the size of half a pea or bean, with the bulging side outward; and sometimes the intestinal tube has these abscesses bulging out, variously scattered over it, through its whole length, in cases of the rot. The annexed figure represents a section of the intestinal tube, showing how it is affected by abscesses, in cases of the rot.

3d.—The mesentery glands, in a healthy state, are very nearly of the same color as the kidney;

when enlarged or diseased, upon being cut open, they are generally of a pale reddish brown color near the outside; at other times, when very badly diseased, they are of a whitish color, are much distended, and are indurated with calcareous salts, like tubercles.

4th.—The affections of the other parts of the bowels appear to be, generally speaking, merely consequent upon an impure state of the blood.

As to the lungs, it may be remarked that so far as my observation extends, not more than one in four or five of those whose bowels were decayed, had any cough, or any appearance of diseased lungs upon dissection: and I have taken particular notice as to this point. It is not strange that, in Britain, the lungs of sheep or other animals should be much affected; for their misty atmosphere is very oppressive to the lungs. Neither is it strange that lambs should be dropped which are diseased in the lungs; for the blood of the mother nourishes the lamb; and if the blood of the mother is bad, it may create diseases of the lungs in both dam and progeny precisely alike; and Sir G. S. McKenzie observes, that lambs are sometimes dropped with tubercles upon their lungs.

5th.—The livers of sheep are generally more affected by tubercles and inflammation than the lungs; and the reason seems to be, that after the transformation of tissues is completed, by the blood passing through them, the blood is conveyed by the veins to the liver, in its most impure or highly carbonated state: and as, in our very warm seasons, the lungs do not, in all cases, fully oxygenize the blood, the liver suffers from the imperfect action of the lungs.* In order to illustrate this principle, I shall state the case of a Merino ewe dying aged 16 years. On dissection, there was no inflammation of the mucus membranes; the lungs, kidneys, and liver were sound; the liver, upon being cut, was sound like that of a middle-aged sheep; the molar teeth were good: and this animal was never known to be sick with coryza or cough, and died off without the least apparent pain; and the only parts which were found defective, were, the lacteal ducts and mesentery glands. The true reason why this animal attained such an age, seems to

* See Liebig's Animal Chemistry, page 17.

be, that it had a large, broad, and deep chest, which contained lungs which were so large as to be able to impart a full supply of oxygen to the blood which passed through them, and thereby to save the liver, which is a very important organ in the digestive process.

6th.—The kidneys are sometimes a little enlarged, though seldom; but are frequently flabby, and decayed in substance, so as to cause dropsical effusions from want of their full action.

7th.—Dropsical effusions and hydatids are common symptoms in the last stages of the rot—especially under the jaws, in the peritonæum, and near the kidneys.

I shall now state what properly constitutes the rot, and the treatment.

In the *rot* or *gradual decay of the bowels*, there is a chronic inflammation of the mucus membranes of some part or parts of the intestinal tube, which is frequently not very severe; the tongue, though furred, may show little or no sign of inflammation, and, at the same time, the lacteal ducts and mesentery glands are gradually decaying, in consequence of this inflammation; nutriment cannot pass into the lacteal ducts through the inflamed parts, nor through those parts which are injured by abscesses, and, consequently, the sheep pines away by degrees. This is, properly speaking, the rot; it is very similar to the dyspepsia of man, and the complication of diseases which ensues, is the result of this indigestion.

The same effect is produced when man is affected with inflammation of the mucus membranes. Dr. John Mackintosh, of Edinburgh, says: "Sometimes the mesenteric glands are affected, (i. e., with tubercles,) but I have never seen them so, without finding the corresponding part of the mucus membrane inflamed, more generally extensively ulcerated."

Treatment of the Rot.—When man is afflicted with chronic inflammation of the mucus membranes of the bowels in this manner, it has been found that mineral water, which is strongly impregnated with gypsum, (Plaster of Paris,) is one of the best remedies for this complaint; and mankind are seldom afflicted with dysentery in those districts where the waters are made hard by gypsum; and most hard waters are of this description: and dysentery is an

acute inflammation of the mucus membranes of the lower parts of the bowels; and it is only when lime and gypsum are deficient in upland grasses, that graminivorous animals, feeding upon them, are afflicted with inflammations of the mucus membranes of the bowels. The reason for this effect appears to be, that inflammation is the beginning of decomposition; gypsum is the natural astringent of the bowels both to man and beast, and its powerful antiseptic qualities arrest the decomposition which begins in the parts inflamed, and nature restores them to a healthy action.

Therefore, when the bowels of sheep are more or less decayed, nothing better can be done for them than to give them a full proportion of gypsum and lime in their condiments, and a suitable proportion of tar or pitch along with them; and if any one does not incline to eat ashes and gypsum, a cleaner mixture may be made with one part slacked lime or chalk, two parts gypsum, and two or three parts common salt: such a mixture will not be refused.

In winter, sheep, whose bowels are in any wise decayed, should be kept warm and dry, and should be provided with a supply of well-cured hay, and a moderate supply of grain: but special care should be used not to feed them so much as to scour them.

This course will, in most cases, arrest the disease, and prevent any farther decay of the lacteal ducts and mesentery glands, and will take away all diseased action, so that such animals may, with propriety, be fattened and eaten, in all cases where they can be made fat: but it is seldom that medicine can restore them to their original sound state, when their bowels are much decayed. If any such animals fully recover, as they sometimes will, the round potash colored spots on their skins, will, in many cases, disappear. But where the bowels of such animals have been much injured, these spots are very apt to remain: and it is only in summer that such animals can be fattened, by allowing them good pasture and a little grain daily, with a full supply of condiments.

ROT PRODUCED BY ACORNS.

There is another species of rot, which is produced by their eating acorns. In ordinary rot, the disease arises from inflammation and relaxation; but in this kind of rot,

the disease proceeds from their too great astringency; the tannin, or tannic acid, or gallic acid, astringes the bowels, so that portions of them can no longer receive the chyle through the lacteal ducts, into the system; and consequently, animals, thus afflicted, pine away and die, much in the same manner as in the kind of rot last mentioned. Considerable numbers of sheep and cattle, in Mahoning county, Ohio, have been injured in this manner. Sheep drovers frequently have their flocks injured by acorns. Also, hogs, when butchered, frequently show that their bowels are injured by them. Tusser, an old British writer upon husbandry, speaking of acorns, says:

"Some left among bushes shall pleasure thy swine,
For fear of a mischief *keep acorns from Kine.*"

Small quantities of acorns may be useful and wholesome food for sheep or cattle. But special care should be used, that sheep be not allowed to range upon oak wood-lands, where they can have a full supply of acorns; for it is not probable, that anything can restore the bowels, when they are astringed or tanned in this manner.

ROT PRODUCED BY ASTRINGENT WATERS.

In New Holland, it has been found that astringent waters produce rot.

The following is substantially what was communicated by Mr. Cheatham, to the *Veterinarian*, (a paper printed in London.) "In New Holland, where water in summer is frequently scarce, the water holes are usually surrounded with trees, which, during a continued drought, shed their leaves into the water. Now, while any large body of water remains in the holes, the effects upon the animal, arising from the infusion, will not be perceptible; but when during the excessive heats of summer, the quantity of water becomes reduced, its powerful astringent effects will be discovered, in the disease, and consequent death of many of the flock."

ROT PRODUCED BY ALUM WATER.

Mr. Cheatham also says, "There is another disease, not unlike the above, to which sheep are liable, arising from a somewhat similar cause; this is the drinking of water impregnated with alum. I was informed by a gentleman,

that, on one occasion, a very large proportion of a flock died off; a circumstance for which he could in no wise account. There was no external sign of illness, and yet they died. This induced him to subject the carcass of one of them to a regular anatomical process, which pointed out the stomach as the seat of disease. And from other circumstances, he came to the conclusion that the evil was caused by the water. He accordingly tested the water from holes on the run, and discovered one strongly impregnated with alum. The mystery was elucidated; the flock was removed, and the mortality ceased.

In the above cases of alum water and other astringent waters, it seems that their bowels must have been operated upon, much in the same manner as by their eating acorns. And the principle by which we should be governed, is, to deprive them of any access to such causes of disease.

ROT PRODUCED BY SHARP-EDGED GRASSES.

The second principal cause of rot is, the pasturage of sheep upon a kind of grass called scour-grass, or horse-tailed grass, (equisetum hyemale). There are seven species of this grass; they usually grow on marshy lands. In America they grow more commonly in bunches from 12 to 24 inches high; their leaves rise up, and, near the top, bend over like a horse's tail; and, from this circumstance, they take their name. Their edges are sharp like a sickle. When sheep feed upon such grasses, their sharp edges irritate, and cut the mucus membranes and lacteal ducts of their intestines mechanically, so as to cause inflammation and decay of those parts; so that, eventually, the animal dies off precisely in the same manner, as if the inflammation had been caused by acids. Cattle and horses are frequently injured and destroyed by these grasses, in the same manner, and on examination their stomachs are found cut and lacerated.—(Farmer's Encyclopedia.)

Any other kind of sharp-edged grasses will, of course, produce the same effects.

Blacklock treats of this kind of rot, under the name of *pining*. He says: "The name has arisen, from the rapid wasting, which is a prominent symptom of this complaint. A farm can hardly be subject to a more ruinous

distemper, as the same sheep will be affected by it, year after year, and if a ewe be attacked during autumn, it is ten to one she will not have a lamb in the ensuing season. Pining only seizes on thriving sheep, preferring young ones, those, more especially, of the larger breeds, and is confined to farms where the land is principally micaceous, and covered with occasional stripes of *benty grasses*. A whole flock sickens at once, their usual alacrity seems to have deserted them, their eyes are dull, and the whole flock seems weary and languid. At a more advanced stage, the wool acquires a bluish tinge, the blood becomes thick, diminishing in quantity, and the muscles assume a bloodless appearance. The bowels are constipated, and to this the feverish symptoms apparently owe their origin. If the disease progresses, death will ensue in about a month."

Mr. Spooner says: "The farms most liable to this disnare are those dry grassy farms, abounding in flats and ridges of white and flying bent; these are the bane of the flocks. On the genuine pining farms, the disease is more fatal in dry, than in wet seasons: and most so at that season when, by the influence of the sun, the plants are less juicy, or in autumn, when the gaasses which have pushed to seed become less succulent: consequently, June and September are the most deadly months."

The true reason why these grasses are so injurious at this time is, that when they are ripened and dried, their edges become very hard and sharp; they then more readily cut and irritate the mucus membranes of the stomach and intestines, and produce inflammation in them; and the feverish symptoms are produced by this inflammation.

From the description given by Blacklock, it is evident that sheep thus afflicted, pine away, precisely in the same manner, as if afflicted by rot, which is produced by the grasses having too much saccharine matter in them. It is the inflammation of the mucus membranes, which causes the decay of the other parts of the bowels: it is the beginning of the decay; and the effect produced is the same, whether the inflammation is produced by acids, or by the mechanical action of sharp-edged grasses.

Treatment. If the bowels of the animal appear to be

constipated, the first object should be, to obtain a free discharge from them, by means of purgatives and injections, if necessary. For this purpose, oils will be the best medicines, as they will, in some measure, sheath the bowels from the edges of the grass; one or two ounces of linseed oil, hog's lard melted, or castor oil, may be given to each animal; or the same quantity of Epsom or Glauber salts, or common salt instead of oils.

Animals afflicted in this manner should be removed to pastures of a better quality, and the same medicines and condiments should be given to them, as for the kind of rot first treated of. And these will be sufficient for them: that is, no better treatment can be used for them.

I fed a mixture of one part gypsum, and two parts common salt, to calves whose bowels were injured by horse tail grasses, with good effect.

BRAXY.

This disease is also sometimes called red water, in England, from the appearance of their urine. It is an acute inflammation of the mucus membranes, (or inner lining) of the stomach, pylorus, duodenum, and a portion of the intestinal canal next immediately adjoining; but the stomach and the duodenum are generally most affected. This disease is produced, either by acids or by sharp edged grasses.

BRAXY PRODUCED BY ACIDS.

Symptoms. In the commencement of this disease, the animal will appear uneasy, lying down and rising up frequently, loathing food and drinking often; or will stand with its head down and its back raised; sometimes, when fever sets in, will stand with its head stretched out, and its mouth open and panting; at other times will froth or drool at the mouth; the pulse will be quick and strong; the respiration rapid and laborious; the belly sometimes is much swollen; the urine is sometimes totally stopped by strangury, or is small in quantity, and is high colored and sometimes bloody. Sometimes the animal groans and grates its teeth, as if much affected in the jaws and pained in the bowels; and often its back is dappled with red or brown spots, as in cases of the rot. If the disease is

not arrested, the feverish symptoms will increase, until the animal dies; and death will generally ensue within a week, unless a recovery is obtained.

When the appearances are as above stated, if the animal's mouth be opened, the tip of the tongue, and the edges of it will be found to be considerably redder than the middle of it; and this is a very sure way of judging as to the extent of the inflammation of the mucus membranes, either in this disease or in dysentery.

On dissection, the mucus membranes of the parts affected are found highly inflamed, and of a dark reddish color, and doubtless the oxalic acid is the principal agent, which acts so powerfully upon them; as in such cases, they frequently drool or froth at the mouth, especially lambs or yearlings.

Either young grasses which have sprouted quickly, or old frost-bitten grass, most readily produce the disease: such grasses readily ferment and produce acids in the stomach.

Treatment of Braxy. As soon as the diseased state of the animal is noticed, medicine should be promptly administered; give one or two ounces of Epsom or Glauber salts, (or common salt, when neither of the other kinds are on hand,) combined with one-tenth of an ounce of chalk, in order to neutralize the acids which are ever present in such cases. If the animal is very feverish, bleed a half pint or pint from the fore leg. If the medicine does not operate within two or three hours, repeat the dose of salt and chalk; and, if necessary, make use of injections, in order to produce an evacuation of the bowels. As soon as this is effected, mix common salt, gypsum, and chalk, an equal proportion of each, and give to the animal one-third or one-fourth of an ounce of this mixture two or three times daily, mixed in with gruel of wheaten shorts, or other finely ground provender. If the weather is unfavorable, place the animal under shelter, and furnish the necessary hay or grass. Pursue this course until the animal is recovered so as to join the flock—enlarging the doses, if necessary.

A single case of severe braxy was cured by giving a mixture of equal quantities of gypsum and common salt, in portions of one-third of an ounce once in four hours, during day-

light, for two successive days, without the use of any other medicine: its effects were excellent.

If the lacteal ducts and mesentery glands are sound, the animal may generally be restored, especially if the disease is early discovered.

As the appearance of animals afflicted with braxy is not always precisely alike, I shall state cases which will show the nature of the disease. In the Cultivator, printed at Albany, for the year 1844, are cases stated by Mr. Pierre V. Miller, of Shawanyunk, N. Y. June 9th, 1836, he turned a flock of one hundred ewes, with their lambs, into a field of red clover, which was in full bloom. They remained in the field 11 days, during which time 25 were taken sick, and 19 died.

"The first symptom of disease was, that they reeled and staggered back for a while; after which, they lay insensible until death, which generally happened in an hour or two.

"On searching the field, he found nothing poisonous but two small stools of elder, which should not be there. He found, however, that the strips of grass on the old sward, along the fences, and elsewhere, which had not been ploughed and stocked with clover, were gnawed close to the earth; and the sheep showed their dislike to the clover, by their twice breaking out of the field over a good fence.

A *post-mortem* examination was made of two carcasses, and no unusual appearance was found, except that *the paunch was very red, and much inflamed;* there was no distension, as in bloat." In these cases, the inflammation of the stomach shows the effect of the oxalic acid, and their stupidity, the effect of the oxalat of potash. And it should be observed, that in those cases, braxy was produced by the clover when in full bloom; the very time at which it contains the largest proportion of saccharine matter, and, of course, most readily produces oxalic acid.

Other cases are mentioned by J. C., in the Genesee Farmer for 1838. He says: "The first symptoms of the disease are, a *dumpishness*—not inclined to eat—not even to lick salt—*froth a little at the mouth*, and run at the nose; remain in this state a few hours, when death ensues. On dissection, the animals appeared full of clotted blood, so much so, that we should suppose that the whole of the

blood had left the veins, and found its way to the interior of the body."* In these cases, the frothing at the mouth shows the influence of the oxalic acid, and their dumpishness that of the oxalat of potash.

BRAXY PRODUCED BY SHARP-EDGED GRASSES.

When such grasses are freely devoured by sheep, the irritation is frequently so great, that the animal often dies off, in the course of a few hours, in consequence of the inflammation produced.

Symptoms. When distressed by eating these grasses, they throw up, and shake their heads about, showing thereby the irritation and pain which afflicts them within, and the difficulty of raising their cuds, in consequence of the sharp edges of the grasses. In such cases, the fever will be intense. and will soon carry them off, unless they are relieved; and, therefore, medicine should be promptly administered.

Treatment. In such cases, a dose of two ounces of linseed oil, castor oil, or hog's lard melted, and turned down their throats, will doubtless be the best purgatives which can be given them; the oils will help to sheath the bowels, and the grasses will pass off with less injury to them than if Epsom or other salts are used. But, in such cases, delay will be dangerous, and the best purgatives on hand should be used. After which, feed them with wheat flour porridge, or wheaten shorts, along with hay or grass, until they are restored; giving them occasionally a little salt and chalk or gypsum, with their porridge or provender; and repeating the doses of oil, if necessary.

Cases of this kind of braxy happened in Washington Co., Pa., a few years since. A drover turned a drove of 1200 sheep into a pasture, in which was marshy ground on one side of the pasture, on which was an abundance of horse-tail grasses. As the sheep had been driven during the day, and were hungry, they fed upon these grasses freely, and in the course of the night, one-half of them were affected with braxy, and 150 died. Instead of giving purgative medicines, the drover gave them pepper and whiskey,

* These cases of braxy are similar to to red-water (bloody murrain) cattle.

which doubtless increased the malady. Information as to this calamity was furnished by a creditable drover, who was an eye-witness of it. Drovers, therefore, should use special care as to placing their flocks in swampy pastures. Sheep, when very hungry, devour rough-edged grasses very freely; whereas, at other times, they will seldom eat much of them, if there is a supply of other good grasses.

Cases of braxy, produced by new wheat, are related by Mr. John Hawes, in the "Veterinarian," for 1840. He says: "In the month of September, in the last year, a flock of sheep, more than 200 in number, strayed into a field where there was a quantity of wheat, which had not been carried in, in consequence of the unfavorable state of the weather. They fed rather bountifully upon it before they were discovered by the shepherd; when they were immediately removed to the pasture on which they had previously been grazing; and no farther notice was taken of them until the following day, when four of them were found dead, and several others were evidently ill. To all that evinced any symptoms of disease, Epsom salts and castor oil were immediately given. But on the following morning, finding that twenty-eight had already died, and nearly as many more were almost dead, the owner sent for me, as it is too frequently the case, when it was too late to be of much service. The first thing that I did, was, to examine some of those that had died, and I found the rumen, in every instance, filled with wheat, barley, and straw: the abomasum highly inflamed, as well as the bowels: the spleen had the appearance of a mass of coagulated blood—its structure being entirely destroyed: the lungs, in most of the cases, presented a healthy appearance, as alo did the liver. Fifty-eight died in the course of five days after eating the wheat; the others were bled, and half a pint of linseed oil was given to each, and they recovered: but many of them have since thrown their lambs."

In the above case, it is very evident that the beards of wheat and barley caused an inflammation of the internal coats of the stomach, similar to that caused by horse-tail grasses; the berries of these grains being the very best of feed for sheep.

Prevention of Braxy and Rot. A review of the causes which produce braxy and rot, will show us that low,

moist lands are unfavorable to sheep, either from the chemical composition, or from the shape of the leaves of grasses, which frequently grow on such lands; and upland hay, in winter, is as much better for them than lowland hay, as upland pasture is better than lowland pasture.

Hence, sheep should not be confined to pastures where sharp-edged grasses abound; and whenever their food is deficient in quality, from the moisture of the soil, climate, or weather, a suitable supply of pitch or tar, with salt, ashes, and gypsum, should be carefully supplied for them at all times, as prescribed under the head of condiments. These are the means of prevention of braxy and rot which can ever be depended upon.

But as every thing which weakens, relaxes, or injures the bowels, has a tendency to produce these diseases, the deficiency of nutriment of hay, straw, or pasture in winter, should be made up in grain or roots. If, notwithstanding these precautions, some are inclined to these diseases, they (especially lambs) should be confined to fields, where the pasture is very short, and should receive a full supply of hay, with a suitable amount of grain: they will thus obtain the exercise which is necessary for them, without being injured by frost-bitten grasses, which have a strong tendency to produce diarrhœa and braxy. In summer, a sufficient supply of pasture should be provided, so that all may begin the winter in good condition: they will then be less liable to braxy during winter.

Hence, also, mouldy or musty hay, being partially decomposed, will be extremely injurious to sheep: and as it is much disliked by them, much of it will be wasted. Hay should always be sufficiently dried by the sun or air, so as not to become mouldy or musty in the barn or stack.

The pasturage of sheep, in the neighborhood of stagnant waters, should be avoided: such waters produce bowel diseases as effectually for sheep as for mankind.—(McKenzie.)

The rot cannot be considered a contagious disease: but as ewes, which are much effected with it, cannot produce strong, healthy lambs, and, therefore, should not be used for breeding, I shall insert Mr. Beattie's rule for judging them, as follows: "The first thing to be observed, is, in the spring time, when they are dropping their lambs.

A sound ewe, in good order, drops a lamb covered with a thick and yellow slime, which the ewe licks off it: and the rule is, the sounder and higher the condition the ewe is in, the darker and thicker will be the slime; but when they observe a ewe drop a lamb covered with thin watery bubbles, and very white, they note her down as unsound."—(Blacklock.)

If the bowels of a sheep are much decayed, and it has plenty of good food within its reach, the parts between the hips and the short ribs, will surely fall in more than they should in a healthy animal, and thereby show the state of the bowels.

As perfection of form is a great preservative against these bowel complaints, sheep should be selected for breeding, which have a large, deep, broad, and round chest. It frequently happens that when one-half, or three-fourths of a flock of lambs are destroyed by the rot, few will be saved but such as have a large, well-formed chest. Hence, the New Leicester, and other improved long-wooled breeds of mutton sheep, are admirably adapted to rich, level lands, which are unfavorable to most other breeds.

Much has been written to show that salt was a preventive against the rot; but this is a great mistake. So much salt as will be necessary for the purpose of digestion, will be useful: all over and above what is strictly necessary for them, will be injurious to them—will help to create the disease, it being a very relaxing article.

Potash is very abundant in rich beach lands. Hence, such lands generally are not so favorable for sheep as oak lands, which contain less potash but more soda.

As the bowels of sheep, when afflicted with these internal diseases, are very tender and sensitive to injury, the use of poisonous medicines, such as digitalis, copperas, calomel, and salt-petre, should be carefully avoided: for under such circumstances, even a moderate use of grain will often be injurious, causing them to scour too much; and any thing poisonous will be highly injurious.

DIARRHŒA.

By this term, is meant a constant purging, which affects sheep occasionally at all times of the year; but is most common in spring. In simple diarrhœa, there is no in-

flammation of the mucus membranes of the bowels, and, consequently, there is no fever, and the appetite is unimpaired, unless in the last stages of the disease. Diarrhœa is generally an effort of nature to expel from the intestinal canal something which is offensive, and is the natural result of the crude, acid, undigested, or irritating state of the food which passes through them. And it is only in the last stages of the disease, that inflammation of the mucus membranes and fever frequently supervene.

The causes of diarrhœa are—

First,—Eating young or rank grasses of rapid growth. Therefore, when the foddering season is about to expire, they should have a little hay daily, for a week or two; and if they do not incline to eat it, it may be sprinkled with a little very weak brine: they will then eat it freely; after which, grass alone, with the necessary condiments, will be sufficient for them.

Second,—Change from short pasture to full feeding.

Third,—Exposure to sudden transitions of weather, or to wet weather, closing the pores of the skin. Hence, shelter will be an useful preventive.

Fourth,—Weakness of the bowels, from poverty, or other causes.

Fifth,—Salting too freely early in the spring, when the grass is very young and flashy.

Sixth,—Feeding upon irritating weeds or grasses.—Sharp-edged grasses will sometimes make cattle scour excessively; and will doubtless affect sheep in the same manner. In such case, their pastures should be changed without delay. If such grasses are to be used as hay for animals of any kind, they should be cut as soon as they have attained their full height, and before they have become hard and wiry.

Seventh,—Feeding upon aftermath hay, or hay which was made from any grasses which were not sufficiently ripened before they were cut. Such grasses abound in saccharine matter, and readily create acids by fermentation in the stomach; and, consequently, the hay which is made from them, will have the same effect, only in a less degree. Upland grasses should be cut while the stalks are yet green, but after the blossom has fallen, and before the seed begins to shell; for then, a large proportion of the saccharine mat-

ter will have been converted into starch—which does not so readily become acid in the stomach as sugar. Such hay is most relished both by sheep and cattle.

Eighth,—Giving grain in too large quantities, when first beginning to feed it. It should be fed moderately at first, and the quantity gradually increased.

Treatment of Diarrhœa. In many cases, an allowance of good hay, or confinement to good, well-cured hay, without much water, and with suitable shelter, will gradually stop the disease. Feeding a proportion of oat straw will frequently be very beneficial. If these means are ineffectual, mix equal parts of pulverized chalk and common salt, and give doses of one-eight or one-fourth of an ounce of the mixture once or twice daily.—(Dr. Parry.)

Or what is better, mix equal proportions of gypsum and common salt, and give doses of one-eight of an ounce. If necessary, cleanse the bowels with one, two or three drachms of rhubarb, and then give doses of the aforesaid mixtures, adding a fourth of a drachm of ginger to each dose.

Sometimes diarrhœa proceeds, principally, from a want of action in the kidneys, and, in consequence, the animal system contains so much water, that the lacteal ducts do not readily receive water into the animal system; hence, that which is in the intestinal canal, instead of being absorbed by the lacteal ducts, is carried off by diarrhœa.

In such cases, put tar or pitch into the sheep's mouth once in a day or two, so as to compel it to swallow the tar; this will excite the kidneys into full action, and will frequently be a sufficient remedy for the complaint.

Diarrhœa is generally an easily managed disease. But it is sometimes only a symptom of some other disease, or an effort of the constitution to ward off some more serious evils. In such case it will be be necessary to proceed with caution, and not stop the disease too suddenly. When it is only a symptom of rot, it will be difficult to cure it; and, in such case, should be stopped only by such medicines as are proper for rot.

Prevention of Diarrhœa. With a suitable proportion of lime and gypsum, in their condiments, sheep will seldom be troubled with this complaint. The acids which are generated in the stomach, are the principal cause of

this disease: lime will neutralize these acids, and gypsum will strengthen the bowels, so as to prevent the complaint, unless their food is of a very bad quality, or the bowels are extremely weak. When ewes have free access to a supply of salt, ashes and gypsum mixed, their lambs are almost never troubled with diarrhœa.

At those times of the year when sheep are more particularly subjected to diarrhœa, a little more than the usual proportion of gypsum, should be mixed with their condiments, together with an increased proportion of pitch, as the grasses at such times are too succulent.

Lambs, after being weaned, are much more subject to diarrhœa, than full grown sheep, and therefore they should be placed upon the driest pastures, and in winter should be provided, with the best quality of hay, and other food, together with the necessary condiments.

DYSENTERY.

The dysentery is an acute inflammation of the mucus membranes or inner lining of the hinder part of the bowels, or large intestines. Fever is a constant attendant upon it, in its early stages, and wasting and debility rapidly follow.

Causes of Dysentery. These appear to be, principally, a bad quality of the grasses, or a sultry state of the atmosphere, or some peculiar changes of weather. These causes produce a weakness of the bowels; the fœces become injurious to them, and inflammation sets in.

Symptoms of Dysentery. In this disease, the pulse is quick, and the respirations hurried, giving evidence of fever; the eyes are red and languid, and the ears droop; the mouth is dry, and the tip and edges of the tongue will be redder than the middle portions of it; the animal eats sparingly, and rumination is stopped: the discharges from the bowels are frequently slimy, sometimes green, and at a more advanced stage of the disease, are mixed with blood, or become black and fetid; flatulence is frequently attendant upon this disease; and the bowels are sometimes knotted and lumpy to the touch.

Dysentery is distinguished from diarrhœa, in several particulars, as pointed out by Dr. Duncan, of Scotland, as follows:

1.—Diarrhœa is more frequent in spring, and late in autumn; whereas, dysentery is most common in July, August and September.

2.—In diarrhœa there is little or no fever, or tenesmus, or pain before the stools, as in dysentery.

3.—In diarrhœa the fœces are loose and, in other respects, natural; whereas, in dysentery the fœces consist of hard lumps, passed occasionally; the rest being blood and slime.

4.—In diarrhœa, the appetite is not lessened; whereas, in dysentery, the animal will have no appetite for food.

5.—In dysentery the animal wastes rapidly; but in diarrhœa, only a temperary stop is put to its thriving; after which, it makes rapid progress in convalescence.

7.—Dysentery is frequently fatal; diarrhœa is rarely fatal, unless the animal has been previously much debilitated.

Treatment of Dysentery. The following treatment is related by Mr. Sayer, in a useful essay on this disease, read to the Veterinary Medical Association:—"Two ounces of linseed oil and two grains of powdered opium were given to each sheep, in an infusion of linseed, the gruel being repeated several times; and on the following day the opium was again administered, with half a drachm of powdered ginger, and the same quantity of gentian, which was given several times, and sometimes combined with linseed oil.

"This treatment proved successful, and, indeed, is as good as can be advised; the food being also attended to, and proper care bestowed."—(W. C. Spooner.) *For merinos, smaller doses.*

For this purpose, feed the animal, at intervals, with small quantities of well boiled porridge, made of wheaten flour or shorts, combined with a small proportion of linseed gruel; and a moderate allowance of hay or grass, when its appetite returns.

A solution of mutton tallow has been found very beneficial in dysentery of man, and, doubtless, would be as useful, and perhaps better than linseed oil, in that of the sheep.

Possibly a mixture of common salt and gypsum may be as useful in dysentery as it is in braxy.

When the appetite returns, and the fœces begin to acquire a proper color and consistency, a speedy recovery may be expected.

During recovery, a part of the wool always falls of.—(Blacklock.)

Prevention of Dysentery. Dysentery cannot be considered a contagious disease, unless to animals which are particularly predisposed to the complaint, from having been injured by the same causes; and then only when confined to the same stall or shed. It cannot be considered more contagious among sheep than among mankind. And, therefore, when sheep are pastured in open fields, a free air will prevent any contagious influence; and no particular precaution will be necessary, in order to prevent it, more than proper changes of pasture, and a supply of the necessary condiments and good water.

JAUNDICE.

This disease consists in a superabundant discharge of bile, or an obstruction of the biliary ducts of the liver, in consequence of the undue thickness and viscidity of the bile, or by hardened bile, or gall stones, or by inflammation or tubercles upon the liver. In either case, too great a quantity of bile is re-absorbed, and enters the circulation, and thus tinges the eyes and skin.

Symptoms of Jaundice. The principal symptoms to be depended upon, are, a yellowness of the eyes, or caruncle of the eye, and a sluggishness of the animal almost amounting to sleep.—(Blacklock.)

In rot, the liver is frequently affected with inflammations and tubercles, and, of course, some symptoms of jaundice are frequently apparent in such cases.

Treatment of Jaundice. Barley is an old and useful remedy for liver complaints. In Ellis' remedy* for the rot, a decoction of barley was the principal ingredient among several others, and was undoubtedly used on account of its supposed efficacy upon the liver. In fattening hogs in Ohio, upon corn, or other such articles as are usually fed to them, a large proportion of their livers, when they are killed, are found to be diseased with tubercles in them;

* Ellis, the ancient author of "The Shepherd's Sure Guide."

whereas, those which are fed mostly with barley, have, when killed, good sound livers. This has been ascertained by repeated experiments. "The husk of barley contains a bitter principle which is tasted in the decoction of the entire barley;*" and hence, doubtless, its medical properties are contained principally in its husk.

We may, therefore, rest assured, that no better or more convenient remedy can be used for these liver complaints, than barley.

For this purpose, feed a gill or more to each sheep once or twice daily. But as it is a very relaxing and deobstruent article, care should be used that they do not get so much as to scour them. Barley, in its raw state, is best for this purpose: cooking it in water, or any other way by heating it, lessens its medicinal properties. If the liver is the only part diseased, barley may be used more freely: remembering that any article, which is powerful enough to do good, may also produce injury, if improperly used.

Prevention of Jaundice. Liver complaints prevail most where the soil and climate are moist and relaxing, or where there are stagnant waters. The last mentioned is, probably, the most frequent cause of jaundice. Therefore, in order to prevent it, care should be used not to pasture them in the neighborhood of such waters or marshes.

Where the soil and climate are very dry, as in New England, the lower viscera, and particularly the liver, are generally very sound.

DROPSY.

Dropsy is an effusion of serum in different parts of the body; and is a complaint which frequently accompanies the rot. Dropsical deposits are frequently found under the jaws: in such case, it is sometimes called the Poke; also about the kidneys, and between the muscles in various parts of the body; also in the peritonæum.

Ordinarily, dropsy comes on slowly. In such cases, the serum is of a whitish or yellowish color. But dropsy sometimes comes on with rapidity, particularly in the peritonæum; which is a membrane which lines the abdominal cavity. In such cases, it is accompanied with inflamma-

*Farmers' Encyclopedia.

tion, and the serum is of a reddish color. This acute kind of dropsy is sometimes called the red-water.

"It is the natural office of this membrane, the peritonæum, to secrete a watery fluid, in order that the bowels should glide readily on each other. But when diseased action is set up in this membrane, its secretion becomes excessive, and the serous portion of the blood, mingled with some of the red portion, becomes effused in this cavity, where it cannot escape.

"This acute dropsy in the peritonæum is (in England,) very common to lambs, both during the time they are with their dams, and after they are weaned, and in them, as well as in the sheep, it is very fatal, destroying the sheep in twenty-four hours, and the lambs in less time."—(W. C. Spooner.)

In America, dropsy is generally chronic; it is seldom acute. It is a disease very common among old sheep.

Causes of Dropsy. Dropsy is produced by exposure to cold, damp weather in autumn, winter, or spring, or immepiately after they are shorn, when it is more particularly injurious to them; or by eating wet, frost-bitten grasses, or succulent grasses, or lowland pasture; also, by feeding too freely on turnips, or other succulent roots. In England, feeding on turnips is a common cause of dropsy, particularly where there is a hoar frost, and the sheep are folded on them during the night.

Symptoms of Dropsy. The sheep appears dull and disinclined to move; has a staring eye; loses flesh, strength, and spirits; is generally, but not always, constipated; dropsical swellings appear under the jaws or belly, or upon the legs; acute pain is seldom manifested.

Appearances on Dissection. In every dissection, when the sheep is afflicted with dropsy under the jaws, or in the abdomen or parts adjacent, the kidneys are invariably found to be defective; they are either enlarged in size, and flabby, or are injured in substance, and turned of a yellowish brown color on the outer edges, like the color of the mesentery glands when injured in rot; and the true reason why dropsical affections arise in sheep, appears to be, that there is either an improper action, or a want of full action of the kidneys; and for that reason, too large an amount of water remains in the animal system.

When man is afflicted with dropsy, the kidneys are generally defective in the same manner.—(Dr. McIntosh.)

Treatment of Dropsy. In the treatment of this disease, place the animal in a dry and comforable situation, especially when the weather is cold and wet. If succulent grass or food has been the cause of the disease, the sheep should be put upon drier food, either hay or dry pasture. If it is costive, a gentle purgative of linseed oil or rhubarb, should be administered to it; otherwise, a purgative will be unnecessary: bleeding will be improper. Medicine should then be given which will strengthen the kidneys, and excite them into action, such as gum guiac, tar, pitch, or spirits of turpentine, in small doses. And for this purpose, tar or pitch is one of the most convenient and powerful medicines which can be used: it is tonic, diuretic, and antiseptic. It will frequently lessen, or take entirely away, a dropsical swelling under the jaws, even in the last stages of the rot; and a perfect cure may sometimes be effected, when there is a large swelling under the jaws, by applying tar to the lips or mouth of the sheep, a few times, once in two days. But it is seldom that a perfect cure can be effected, either for man or beast, when the kidneys are much affected; and, therefore, a large proportion of the sheep which are afflicted with dropsy, die, as a matter of course; but the means of recovery should be used, and some may be saved.

Prevention of Dropsy. In summer, pasture them as much as possible on dry lands. Fallow fields and stubble fields will be particularly useful to them, on account of the large quantities of bitter and diuretic weeds, which are sure to spring up and grow in them. In winter, be careful not to feed too large quantities of turnips, cabbage, or other succulent food, especially to ewes which are with lamb. Shelter from wet and cold should be provided for them in winter, and also in summer, for a few days after they are shorn; and in order fully to prevent dropsy, a small quantity of tar or pitch should be mixed with their condiments, or tar should be applied to their noses, once in two or three weeks.

In confirmation of my experience, as to the benefit of tar, in preventing and curing dropsy, I shall insert the remarks of Mr. Greaves, of Derbyshire, in England, upon this subject. He says: "This disease (acute dropsy) is

very prevalent in this part of Derbyshire, and a friend of mine, Mr. Cooper, of Ashford, for many years, lost one fifth of his hoggets from red water. Three or four years ago, he was advised to bring them into a yard, and give each hogget a table spoonful of common tar, every fortnight; and the consequence has been, that, although they are kept in every respect, in the same way as before, and on the same ground, he has not lost one sheep since the adoption of this treatment."—(W. C. Spooner.)

From a full view of the causes of dropsy, it seems very evident that, the more succulent their food, the greater will be their need for bitter and diuretic articles.

HYDROPHOBIA.

Sheep are liable to be bitten by rabid dogs, and, therefore, it will be proper to take notice of this disease, in this place.

This disease is primarily produced only in carnivorous animals, such as dogs, cats, &c., and there is no satisfactory evidence on record, that it is ever originally produced, in purely graminivorous animals; yet when propagated among them, by the bites of rabid animals, the symptoms produced in them are very similar to those produced in the animals first affected; and the disease is communicated by means of the saliva of the rabid animal.

This disease appears to be produced by the joint influence of the oxalic acid and the oxalat of potash, formed in the stomach of dogs, &c.; the stomach is the part first affected, and the symptoms produced, arise from the inflammation of the stomach, and the qualities of the oxalic acid and oxalat of potash.

As like causes produce like effects, a comparison of the symptoms produced in man, by a dose of oxalic acid, with the symptoms of hydrophobia in man, and also a comparison of the effects of the oxalic acid and oxalat of potash, upon the sheep, in cases of braxy, with the symptoms of hydrophobia in the sheep, will show that it originates from the same causes as braxy.

In man, the following symptoms are similar, both in cases of hydrophobia, and upon taking a dose of oxalic acid.

1.—Nausea and vomiting, attended with a burning heat at the pit of the stomach.

2.—Inflammation of the stomach and upper part of the intestinal tube.

3.—A weak and frequent pulse, and a sunken countenance.

4.—The blood of persons afflicted with hydrophobia, has, on dissection, an oily appearance, like that which has been found in the stomachs of those who have died by taking oxalic acid.—(M. Troillet.)

5.—The skins of some of those persons, who have died by taking oxalic acid, were dappled with red circular patches; but in cases of hydrophobia, the whole skin of the person afflicted, usually becomes of a livid red color, after death.—(See Eberle's Practice of Medicine.)

In the sheep. the following symptoms are often present, both in hydrophobia, and also in in that kind of braxy, which is produced by the oxalic acid, and oxalat of potash.

1.—A frothing at the mouth, or salivation.

2.—Inflammation of the stomach and intestinal tube next adjoining.

3.—A spasmodic action of the jaws, urinary organs, &c.

4.—Coma, or stupidity.

The observations of Mr. Spooner will illustrate these facts. He says: "In the sheep an indefinite period may elapse between the time of the inoculation, and the first exhibition of the symptoms, ranging from two to six weeks; and this is a shorter period, than usually supervenes, both in the dog and in the human being."

"The first symptoms of rabies in the sheep, which are observed, are, a diminished appetite, and a disposition to ride each other; to which succeed a propensity to mischief. The sheep will often butt each other furiously, but will not bite, although they will nibble at a stick, if presented to them. There is considerable nervous irritability developed, spasmodic twitchings of the muscles and quickened respiration. They become drowsy, lose their appetite, and take no notice of surrounding objects; saliva flows from the mouth; thirst is exhibited without ability to swallow. There is no dread of water at any period of the disease, which, in some cases, proves fatal in a couple of days, and in others continues upwards of a week."

"The *post-mortem* appearances are not always alike,

but it is very rare, that some of the following appearances are not found, and generally they are mostly present together: Much inflammation is found at the back of the tongue, and entrance of the windpipe and gullet; and the course of the windpipe often shows similar inflammation. Sometimes the first stomach will appear greatly inflamed, and partially filled with heterogeneous indigestible contents; but more frequently the disease will be found most extensively *in the fourth stomach, which contains a dark frothy fluid.** Sometimes the brain and spinal cord will exhibit the tokens of much inflammation, but in others will appear pretty free from disease.

"In the dog, these appearances are present in a more marked degree. The stomach is either full of a dark, chocolate colored fluid, or distended with a mass of indigestible substances, such as hay, straw, wood, &c. The back of the tongue and entrance to the windpipe also exhibit a highly inflammatory appearance, and the brain likewise is often affected."

In hydrophobia, the nerves of the pylorus are, doubtless, much affected. The pylorus is a very sensitive part of the bowels, and when its nerves are much affected, by anything which is contained in the stomach, as by the oxalic acid, which is very irritating, a tremor is often communicated to the whole system; and this tremor is a common symptom in hydrophobia.

Treatment. "If a sheep, which has been bitten by a rabid dog, is in any wise fit for the butcher, it will be proper, by all means, to kill it, if it has been recently bitten; and by carefully removing any part suspected to have been bitten, no danger whatever will be incurred."—(W. C. Spooner.)

"The poison of hydrophobia is confined to the saliva, and the flesh of a rabid animal, which has not been in contact with the teeth or the saliva, may be eaten with impunity. The livers of hundreds of rabid dogs have been eaten, in days of ignorance, dressed in all manner of ways,

* Dr. Thatcher has recorded a case of inflammation of the stomach in man, attended with spontaneous hydrophobia.—[See N. York Medical and Physical Journal, Vol. 2.]

but usually fried as nicely as possible, as a preventive against madness."—(Youatt.)

Otherwise, if a sheep is suspected or known to have been bitten by a rabid dog, it will be necessary to examine it with the greatest care, and to clip off the wool closely from every place which has received a flesh or skin wound, or even the smallest scratch. The edges of the wound should then be cut off with a knife, and lunar caustic (nitrate of silver,) or a hot iron, should be applied to every part which has received the slightest scratch; and, if necessary, the wound should be enlarged, so that the lunar caustic or hot iron may penetrate as far as the teeth of the rabid animal have reached. If this operation is performed soon after the animal is first bitten, and is thoroughly done, the beast will be safe.

If the beast becomes rabid, mix equal parts of leached ashes, gypsum, and magnesia, with half a part of tar, or spirits of turpentine, or both, and administer to the sheep a half an ounce or an ounce of this mixture, stirred in with gruel, once in two or three hours. This mixture is designed to neutralize the acids of the stomach, and to arrest the rapid decomposition which goes on in the animal system, and to strengthen the kidneys, and to excite them into action.

In order to quiet the pylorus and the nervous system, peal from the fore legs of one or more horses, an ounce of horse castor, which grows on the skin a little above the knee-joint, and cut it up in fine pieces, and steep it in water, and give half a gill or more of the infusion to the sheep, once in an hour or two, or as much oftener as may appear necessary, in order to effect the desired purpose.

This horse castor is one of the most powerful antispasmodic medicines which can be used; and its formation and existence in the blood of the horse, is probably the cause why the horse is able to withstand, in a great measure, the spasmodic influence of the oxalat of potash, which most other graminivorous animals cannot do. The principal injurious effect which the horse receives from the oxalat of potash is, in the production of the heaves. As the mastication of the horse is much less perfect than that of ruminating animals, its digestion, also, is often less perfect, and, consequently, its stomach is more subject to the formation

of the oxalic and other acids, than those of ruminating animals: and the elimination of this substance, in the system of the horse, may have been intended as a defence against the influence of such acids, and after it is formed and used in the system, it is secreted upon the sides of the fore legs; for the qualities of every thing which exists, were created with reference to other things.

If by these means the animal can be kept alive six or seven days, the disease will run its course; the poison will be carried off in the saliva, and the animal may live.

Special care should be used that the saliva of the rabid animal does not come in contact with any wound or scratch upon the hand or other part of the body, or with the lips of the person attending such animals.

Mr. Spooner remarks that, "the rabid dog invariably dies within a week, generally about four days from the first exhibition of the symptoms. This fact, therefore, affords a reason why the suspected dog should not be destroyed, but should be tied up securely, so as to test by its death, as well as by the symptoms manifested, the existence of the disease. The symptoms that he will probably exhibit, are, a disposition for mischief; a peculiar glassy expression of the eye; twitching of the muscles; an unceasing restlessness; a peculiar and unnatural howl; a copious flow of viscid saliva from the mouth; a want of appetite, but a disposition to gnaw and tear and swallow wood, hay, straw, or any foreign substance that may be near. These are the leading symptoms; there are no fits, no running round, no turning or falling over. The animal possesses consciousness throughout, and the presence of fits will be almost sufficient to decide at once that the animal is not rabid. It should, also, be distinctly observed that, in the dog, there is no dread of water, though often an inability to swallow. The dog will often thrust his nose in, and lap the water, though unable to swallow a drop.

"The time between the bite of one dog by another rabid dog, and the manifestation of the disease, is uncertain, varying from six weeks to six months, but usually about two or three months."

SECTION XLIV.

DISEASES OF THE CHEST AND AIR PASSAGES.

CORYZA.

Coryza is a running of mucus from the nose. It arises from a slight inflammation of the membranes lining the air passages of the nose, head, and throat, and is an effort of the system to expel excrementitious matters which should pass off through the skin and kidneys.

The sheep is more incommoded by coryza than most other animals, owing to the naturally small calibre of its nostrils; and it is from this peculiarly small formation of the nostrils that the sheep is so easily blown, when made to exert itself in running.

When the inflammation extends far down the air tubes of the throat, the symptoms often assume a severer type, and death sometimes occurs from suffocation. It then becomes bronchitis, in its worst form, and, in such cases, is generally accompanied with a cough and feverish symptoms.

Treatment of Coryza. In all mucus or dropsical affections of the head, throat, or jaws, the kidneys seem not to act sufficiently for the time being, or else they act improperly; and, therefore, in such affections, the use of tar, or pitch, administered to the sheep, has an excellent effect; it stimulates and strengthens the kidneys, and helps digestion, and is one of the best remedies for coryza. It should be applied to the mouth and lips of the sheep, once in a day or two, so that the animal cannot avoid the use of it. Tar is a very effectual remedy.

Or, feed a drachm of ginger, or pimento, daily to each sheep, in provender or gruel, for a few days.

If the feverish symptoms are severe, it will be well to give a mild purgative, and, in some cases, to bleed; but bleeding will seldom be necessary in this disease.

If any one is badly afflicted, so as to breathe with great difficulty, a little snuff may be placed in its nose; this will compel it to dislodge the mucus, and give relief, until other medicines can have effect.

Prevention of Coryza. Exposure to cold and wet wea-

ther are among the most prominent causes of this complaint: and, therefore, in winter, good shelters and wholesome food are the best means of prevention; in summer, a proper supply of tar or pitch, especially where the grasses are very succulent.

If any are particulary subject to this disease, they should be sorted out and fattened off, if possible.

CONSUMPTION OF THE LUNGS.

Symptoms. A cough and coryza are the principal apparent symptoms of consumption of the lungs.

Causes. Mr. Youatt says: "This disease is especially prevalent in low and moist pastures, and it is of most frequent occurrence in spring and autumn, and when the weather at those seasons is unusually cold and changeable."

Appearances on Dissection. Blacklock informs us that, "when the lungs are much affected, tubercles are formed in them. These tubercles are hard, white bodies, which vary in size from that of a mustard seed to that of a pea. They are sprinkled through all parts of the lungs, and will, in every dissection, be found in a variety of stages, from the firm condition in which they were deposited, to the soft state which denotes their speedy expectoration. Each tubercle, however small, usually holds *a particle of calcarious matter* in its centre. The lungs in the advanced stages of rot, (in Scotland,) will be full of cells or caverns, owing to the destruction of its texture by suppuration in those parts where tubercles existed. The cells or sacs are of all sizes, from that of a bean to that of a goose egg. These sacs contain purulent matter of all shades and odors, and identical with that which the animal coughed up. Tubercles, and all their concomitants, as above detailed, are also met with in the liver, though not so frequently as in the lungs. They constantly occur in the clyers, (mesenteric or lacteal glands,) which, on this account, are much above their usual size, and are occasionally found in other parts."

According to the chemical analysis of M. T. Boudet, the principal elements of tubercles of the human lungs, (which are, doubtless, similar in substance to those of graminivorous animals,) are chlorate of sodium and sulphate of soda, with salts of lime in small quantity.

Now, the true reason why these tubercles are formed, seems to be, that there is in the blood an excess of the above mentioned salts of soda and lime, which are not fully carried out of the circulation through the kidneys, as they should be, and, consequently, deposits of them are formed in the lungs and other glands, which are the basis of these tubercles.

By chemical analysis, the urine of the sheep consists of the following ingredients :

Water,	96.00
Urea, along with some albumen, and coloring matter,	2.80
Salts of potash, soda, lime, and magnesia, with traces of silica, alumina, iron, and manganese,	1.20

By this analysis, it appears that a proportion of the salts of the urine is, doubtless, composed of the very same ingredients which compose tubercles. Whenever, therefore, the kidneys become inactive, these salts superabound, and the lungs, liver, and other glands receive deposits of them ; and eventually, the kidneys become so weak that they do not carry water enough out of the system, and dropsy sets in. Hence, in rot, these affections of the lungs are frequently accompanied with dropsy in some part of the body.

Treatment. The above theory shows why tar and other resinous articles are so useful to the sheep, in affections of the lungs, and dropsy. These resinous articles strengthen and excite into action the kidneys, so as to carry off the various salts of lime, soda, &c., which they should do, and prevent the formation of tubercles ; and, possibly, sometimes discuss those which are already formed ; for tar is strongly diuretic and detergent. But as barley will discuss tubercles of the liver, it may, with propriety, be used for the same purpose in tubercles of the lungs.

Hence, the treatment which promises to be most advantageous for tubercles (or consumption) of the lungs, will consist in feeding a half gill or gill of barley daily, to each sheep thus affected, and in the frequent application of tar to the sheep's mouth, together with all necessary condiments ; indigestion being ever present in such cases.

Fortunately, the lungs of sheep are much less affected

with disease in America than in Britain; even in the cold, severe climate of New England, consumption of the lungs, as an original, primary complaint in the sheep, is seldom seen. And, therefore, if the lungs are much effected, we may be assured that some part of the other viscera are unsound, or very deficient in their action, especially the kidneys.

INFLAMMATION OF THE LUNGS.

"This disease consists in an inflammation of the substance of the lungs; and thus differs from two other diseases, for either of which it may be mistaken, and with which it may or may not co-exist, that is *pleurisy* and *bronchitis;* pleurisy being an inflammation of the membrane covering the lungs and lining the chest, and bronchitis being an inflammation of the membrane lining the bronchial or air tubes of the throat."

The causes of this complaint are, an undue exposure to wet and cold: hence, washing or shearing when the weather is too cold; exposure after being shorn, or chills after hard driving, may cause this complaint; also, over-feeding, or feeding too largely in beginning to feed grain, or other stimulating food to sheep which have previously had short feed.

"High bred animals, particularly the Leicester breed, are more disposed to this complaint, and also to pleurisy, than some other breeds of sheep."

Symptoms. The symptoms of this disease, as given by M. Seron, a French Veterinary Surgeon, are as follows:—"The whites of the eyes are red and injected; the mouth hot; accelerated pulse and laborious breathing; the mouth of the sheep rests on one side, and the animal makes frequent attempts to get rid of a yellow mucus with which the nostrils are clogged. One symptom is remarkable, and always present, namely, great tenderness of the loins; if the animal is pressed on that part, he will often fall suddenly to the ground."

Other symptoms are, ceasing to ruminate: an unwillingness to move; slight heaving of the flanks; a frequent and painful cough.

Treatment. Bleed a pint from the neck or leg. After this, give a dose of two ounces of Epsom or Glauber salts,

and place the animal under a comfortable shelter. When the bowels are cleansed, give half a drachm of nitre in gruel once in six hours—oftener, if the fever appears to increase, together with cooling drinks, such as cream of tartar dissolved in water, with small quantities of gruel, until the inflammation is subdued. After which, feed moderately, until the animal is restored.

"The duration of the malady is from twenty-four to thirty hours, and its termination is always fatal, unless medical aid is rendered without delay."

PLEURISY.

"This disease is an inflammation of the pleura, or membrane lining the chest. It is produced by the same causes as inflammation of the lungs, with which it may be accompanied; particularly by sudden changes, which chill the whole system. It is not unusual, on examining the bodies of sheep, to find the lungs adhering to the sides of the chest; and the animal thus affected generally loses flesh. This adhesion is the effect of pleurisy."

Symptoms. "The symptoms of this disease are, in many respects, like those of inflammation of the lungs; but it is attended occasionally by severe pain, and by a harder and more defined pulse, and more warmth of the body, than inflammation of the lungs."

Treatment. "This must consist of active bleeding, in the first instance; and, in this disease, the sheep can bear blood-letting to a greater extent than in most other diseases. The bleeding may be repeated, if necessary; setons may be inserted in the brisket; the bowels should be kept moderately relaxed, and, in other respects, the same treatment observed as in inflammation of the lungs."—(W. C. Spooner.)

Sheep are seldom afflicted with pleurisy, or inflammation of the lungs, in the United States.

SECTION XLV.

DISEASES OF THE URINARY ORGANS.

INFLAMMATION OF THE BLADDER, (CYSTICIS).

"Inflammation of the bladder, sometimes called *watery braxy*, is rather a rare disease with sheep, and is chiefly confined to such as are kept on artificial food, such as oil-cake, beans, &c.; though it is said that clover, which has been mown, will produce it. It is mostly confined to the male sex, and principally to rams, and such as are highly fed.

"The state of the bladder appears to be that of fulness, which shows that its neck is involved in inflammation, and thus becomes contracted, and closes the cavity, producing strangury."—(Spooner.)

Symptoms. These are, uneasiness, frequently shifting the hind legs, and straining, as if to void urine, without the capability of doing it; stiffness, and unwillingness to move about, with feverish symptoms.

Treatment. Bleed a pint from the neck or leg: after which, administer one or two ounces of linseed or castor oil, with ten grains of powdered opium: if necessary, repeat the purgative dose during the day, or any succeeding day: feed the animal with wheat flour gruel, mixing with it small portions of cream of tartar, together with hay or grass; feeding moderately until the feverish symptoms are reduced.

CALCULI IN THE URINARY ORGANS.

Urinary calculi, or gravel of graminivorous animals, is generally composed of phosphat of lime or oxalat of lime, united with small portions of carbonat of lime, carbonat of magnesia and mucus. They result from a peculiar indigestion, whereby too large a proportion of these salts is received into the animal system, or from a want of due action in the kidneys. They may be produced by confinement to dry fodder, which is made from unripe grasses, whereby oxalat of lime may be produced, or by the constant feeding, or over-feeding of oil-cake or other highly nutritious relaxing food, whereby the lacteal ducts are too

much relaxed, and phosphat of lime is too freely absorbed. The bad effects of bad food is increased in such cases, by a want of sufficient exercise. Sheep are also sometimes afflicted with this complaint when confined to woody pastures, the herbage of which is of inferior quality. These calculi are generally found in the uretha of rams or wethers, and are apt to lodge near the end of the penis, in pieces of the size of a wheat kernel. They produce excessive pain, and sometimes destroy the animal by stopping the passage of the urine.

Symptoms. If the animal is very uneasy, and tries to void urine frequently, and without much effect, it may be suspected that he is troubled with gravel. Mr. Stevens, of New Market, in England, in a communication in the 13th volume of the "Veterinarian," observes, that in every case which had occurred to him, concretions were found adhering to the hairs of the prepuse, like beads, of the same character as the calculi taken from the uretha.

Treatment. In such cases, the penis should be drawn out and examined, and if a calculus is found to be in it, a cut should be made into the penis, down upon the gravel, which may then be removed. One or two sutures should then be passed through the edges of the wound, which will speedily adhere. If the animal is very valuable, it may be well to employ a skilful surgeon to perform the operation. After which, means should be used for the prevention of calculi.

Prevention of Calculi. It has been found that astringent and diuretic medicines were most useful for this purpose. With this view, feed to animals thus afflicted, a large proportion of gypsum with tar, rosin, or pitch. If these articles fail to give relief, make a decoction of one ounce of juniper berries, one-fourth of an ounce of boxwood leaves, and one-fourth of an ounce pearlash, in one gallon of water, and give doses of one gill twice or three times daily.—(See American Agriculturist, 1844.) If the animal is constipated, give a dose of linseed or castor oil; and if the animal is kept upon dry food, succulent food should be provided for it.—In place of oil-cake, &c., oats, buckwheat, and other farinaceous articles should be fed alternately. At the same time, a full share of exercise should be allowed to animals thus affected; exercise being very essential to the proper action

of the kidneys; and, in summer, frequent changes of pasture should be provided for them. If this complaint is fully seated upon an animal, so that it has become constitutional, it is very difficult to cure it. Hence, if possible, such animals should be fattened off and slaughtered without delay.

SECTION XLVI.

DISEASES OF THE MOUTH.

APTHÆ OR THRUSH.

This disease is an inflammation of the mucus membranes of some part of the mouth or tongue.

Causes of Thrush. General relaxation, exposure to cold combined with moisture, or an acrimony of the humors produced by unwholesome herbage, are the probable causes.

This disease is of two kinds—acute and chronic.

ACUTE THRUSH.

This kind of thrush is commonly called Blain, or Gloss Anthrax, in England. It is thus described by Mr. Spooner: "In this complaint, the tongue, or rather its connexions, are mostly affected; a number of vesicles or bladders appear on its side, attended with inability to feed, and a discharge of saliva from the mouth, which sometimes becomes bloody and offensive. These bladders burst, and leave behind large sores, which sometimes become troublesome ulcers; and these symptoms are occasionally attended with swellings of the head and throat. There is little doubt but that the disease is infectious, whether it appears as epidemic or not; and, therefore, the affected sheep should be immediately separated from the rest of the flock."

Treatment. The vesicles in the mouth, and also any tumors upon the head or neck, which evidently contain a fluid, should be freely lanced. These vesicles or tumors should be bathed with warm water, until the matter is mostly evacuated—then with cold water, in each pint of which, a drachm of chloride of lime, or alum, or borax,

has been dissolved. Aperients must be administered very cautiously, and not at all, unless there is considerable constipation. The strength of the animal should be supported with mashes of bran, linseed, or other farinaceous meal, and the best of succulent vegetables; plenty of good thick gruel, if necessary, being horned down, and two drachms of powdered gentian and one of ginger being given morning, noon, and night, along with the gruel.

CHRONIC THRUSH.

This disease is less severe than acute thrush. It is attended with vesicles, but of a slighter description, and the sheep is often unable to feed.

The following cases are related by Mr. Rawlins, of Bristol, in the tenth volume of the "Veterinarian." He says: "In the month of May, 1836, I was requested to examine the flock of Mr. Charles Marshal, of Snowhill, near Broadway, Worcestershire, who had lost several ewes and lambs previous to my seeing them. I found seventy lambs in a most emaciated state, scarcely able to move, their mouth being a mass of disease, being one complete ulcer. On examination, I found a large fungus issuing from all around the lower gum, enveloping the teeth, and protruding from the lip to a very considerable extent. There were about thirty still more or less affected. The disease clearly orinated in the lower gum, and when it was matured to any extent, the ewes refused to allow the lambs to suck, and it gradually pined away. At this stage of the disease, the lamb communicates it to the ewe's udder. As soon as the ewe is effected, she begins to lose flesh rapidly: the udder becomes tumefied. In some of the extreme cases, the udder suppurated, and parts of it, with one or both teats, sloughed, and the cure was rendered useless as a stock ewe."

Treatment. First, separate the diseased lambs with their dams, from the rest of the flock, as the disease is contagious. The object desired, is, to destroy the fungus flesh and heal the parts affected. For this purpose, mix two ounces of alum with a gill of molasses, and the same quantity of vinegar; apply the mixture two or three times daily to the parts affected. If the udder of the ewe is affected, wash it off, and apply the same ingredients to it

with a syringe. Give to the dams or other sheep thus afflicted each an ounce or two of Epsom salts or linseed oil. If the dam is purged, the sucking lamb will not need a purgative.

Prevention of Thrush. With good shelter and food, the sheep will seldom be afflicted with this disease. It is almost or quite unknown, in the dry climate of the United States.

SECTION XLVII.

DISEASES OF THE SKIN.

PELT ROT.

This affection arises from exposure to cold, wet weather, and hard keeping, or poverty. The skin becomes so weak, as neither to be able to secrete the wool, or perfectly formed yolk; the wool falls off from the parts affected, and the yolk presents the appearance of a mere scurf.

Treatment. If much wool becomes loose, the skin should be well cleansed with soap and water, so as to dislodge the scurf, and then an ointment, made of one part tar, and three or four parts oil or grease, should be applied to the parts affected. Sometimes it will be necessary to apply a flannel covering, to the parts from which the wool has fallen. Full feeding and a warm stall will generally complete the cure.

ERYSIPELAS.

This disease consists in an inflammation of the skin, which raises the outer or scarf skin into blisters, which contain a thin, reddish, watery fluid; on which account it is sometimes called the red-water. These blisters continue for a short time, break, discharge their matter, and are followed by a blackish scab. Generally, it first appears about the breast and belly; though at other times, it begins on other parts of the body, and spreads over it. It attacks most generally, sheep which are in the best condition, and has sometimes proved very fatal, when not attended to in

season. In such cases, the fever increases, and soon destroys the animal.

This disease makes its appearance more generally, about the beginning or end of winter. In such cases, it probably arises from the exposure of the animal to cold and wet weather, which affects the animal internally, thus producing a slight fever, which throws out these vesicles, similar to the scabby eruptions, which appear about the face, and, more particularly, the mouth of persons affected by a cold. This disease also sometimes attacks sheep in the summer months. In such cases, it probably arises from the animal's being in high condition and, at the same time, feeding on too succulent pasture; for, on dissection, in such cases, there appears to be an inflammation of some part of the bowels.

Treatment. The sheep should be placed in a fold by itself; if the disease is violent, a little blood should be taken; otherwise it will be sufficient to use cooling purgative medicines internally, and lotions or ointments externally.

For this purpose, give the animal an ounce of Epsom or Glauber salts—repeating the dose, if necessary, at the end of 12 or 24 hours—or give one-third of an ounce of flour of sulphur and one ounce of molasses, mixed with water or gruel, sufficient to wash it down; repeating the dose for a few days. At the same time, a weak decoction of tobacco, or a weak solution of sugar of lead in vinegar, should be applied to the parts affected: or, lard or oil, with which has been mixed one-tenth of its weight of tar, may be used for the same purpose.

When the disease appears in summer, flies will be troublesome; and, therefore, in such case, some small portion of tar, sulphur, or tobacco, should be contained in the ointment or lotion, which is applied externally.

Prevention of Erysipelas. Occasionally this complaint is very severe, and, in some countries, assumes the appearance of an epidemic; and, in some cases, it may be contagious. It will be proper, therefore, in all cases, to separate the animals affected from the rest of the flock, until they are restored.

BLACK MUZZLE.

"There is a disease known as the "black muzzle," a pimpled or scabby eruption about the nose of the sheep, sometimes extending up to the eyes and ears, encircling the former and covering the latter."—(Youatt.) This disease, also, sometimes begins at the corner of the mouth and the lips become swollen. It probably arises from some constitutional derangement; and hence ears which are continually scabby or scurvy, are indicative of some defect in the constitution. A correspondent of the Albany Cultivator (vol. 7, pa. 48) thus speaks concerning it. "It generally commenced in one corner of the mouth and spread over the lips, and the lips swelled to the thickness of a man's hand. My flock consisted of about 300, and in the space of about three weeks, about forty died of the distemper, and not one had recovered. By this time, at least one half of the remainder of the flock were attacked. It occurred to me, that tar would be as likely as anything to give relief. I accordingly had my sheep brought together, and filled their mouths, and daubed on their lips, all that could be made to stick, and, to my surprise, it affected an immediate cure. I lost but two or three afterwards, and these were nearly dead when I made the application. In a few days every sheep was well."

An ointment of hog's lard and sulphur, applied to the parts affected will also affect a cure; but tar is the most convenient remedy.

Prevention. From the above description of this complaint, and its progress, it appears to be quite contagious. Consequently, those which are affected with it, should be separated from the rest of the flock, until they are restored.

SCAB OR ITCH.

This disease is of two distinct kinds. One kind is, that which arises from some irritating quality of food, or from constitutional derangement. Mr. Youatt says, "a sheep is observed to scratch himself in the most furious manner, and with scarcely a moment's intermission. He rubs himself against every projecting part of the hedge, and every post, and the wool comes off in considerable flakes. When he is caught, *there is no appearance whatever* of cutaneous disease." Mr. Young says that, "the sheep rub themselves

in all attitudes—they have clear skins without the least sign of scab—never observed that it was catching—and the better the food the worse they become."

Treatment. In such cases, if the disease arises from a bad quality of food, a change of pasture or food will be apt to relieve the animal. If this does not give relief, there will probably be some constitutional derangement. Therefore, administer a purgative of one ounce of Epsom or Gluuber salts; and, if necessary, repeat the dose at intervals of two or three days. If the weather is warm, the sheep should be thoroughly washed with soap and water, or with brine of common salt. But if the weather is cold, it will be necessary to depend upon purgatives, and proper changes of food, together with the necessary condiments combined with a small proportion of sulphur.

The other kind of *itch*, which is more generally known by the name of the *scab*, is similar to the itch in man, and to the mange in cattle, horses, &c., and is caused by parasitic insects belonging to the Acari, or mite tribe, exceedingly minute in size, and living in the skin of the animals with which they are brought in contact.

The origin and economy of this class of insects have attracted much attention from naturalists. It is well known that their origin is sometimes owing to the peculiar state of the animal system of the animal in which they are found; yet, when brought into existence, they have the same difference of sex, and in their propagation are governed by the same laws as animals of higher orders.

The most rational conjecture as to the formation of the itch insect, and that of some other parasitic animals, is, that they arise from the want of some ingredient which is necessary in the animal system; though as to how they are formed, we are entirely in the dark.

And it would seem, that the itch insect arises from a want of a proper supply of sulphur in the animal system. In support of this theory, the experience of Mr. E. C. Genet will be in point. In the tenth volume of the old series of the Cultivator, printed at Albany, page 170, it is stated that Mr. Genet fed some weak but valuable sheep with milk. Their restoration was complete, and while the rest of the flock suffered with scab, these sheep (which it would seem would be most apt to have it,) were entirely exempt from it.

And the true reason why milk had this effect, is, that it contains in itself every element which is necessary to sustain life; and among other things, a full proportion of sulphur, which is necessary to all graminivorous animals. That sulphur was the ingredient which produced this effect, will more fully appear from the experience of Mr. Edward Wait, of Orange county, N. Y. (Am. Agriculturist, vol. ii, pa. 277.) He repeatedly cured the scab in sheep, merely by placing flour of sulphur mixed with salt, in troughs where they could come and eat it at pleasure. These different experiments show, that the itch insect of the sheep cannot exist, and, of course, cannot be formed, where there is proper supply of sulphur in the animal system.

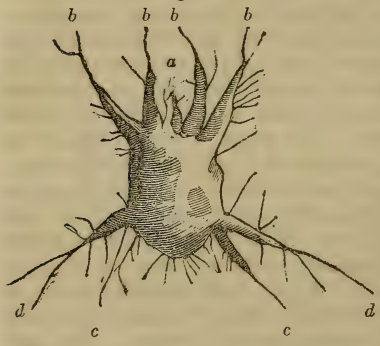
These insects are no larger than the hole formed by a pin or needle of a medium size. They burrow under the skin, producing great irritation, and when the pustule dries, they leave it for another part, and thus propagate it by contact with another animal. The mode in which this is accomplished, has been pointed out by M. Waltz, a German, as follows: "If one or more female acari are placed on the wool of a sound sheep, they quickly travel to the root of it, and bury themselves in the skin; the place at which they penetrated being scarcely visible, or only distinguished by a minute red point. On the tenth or twelvth day, a little swelling may be detected with the finger, and the skin changes its color, and has a greenish blue tint. The pustule is now rapidly formed, and about the sixteenth day breaks, and the mothers again appear with their little ones attached to their feet, and covered by a portion of the shell of the egg, from which they have just escaped. These little ones immediately set to work, and penetrate the neighboring skin, and bury themselves beneath it, and find their proper nourishment, and propagate, until the poor animal has myriads of them to prey on him, and to torment him; and it is not wonderful that he should speedily sink. Some of the male acari were placed on the sound skin of a sheep, and they, too, burrowed their way, and disappeared for a while, and the pustule, in due time, arose; but the itching and scab soon disappeared without the employment of any remedy.

"It, therefore, appears necesary, that both sexes of the acari should be present, in order to propagate the disease

to any extent, and then such are the prolific qualities of the female, (from eight to fifteen being produced at a litter) that we cannot wonder that the disease should spread so extensively."

"Mr. Waltz found that the young acari, kept in a dry place, dried and crumbled to dust; but when old, that it would retain its life through the winter; thus proving the necessity of not relying on the season for its destruction, but on preparations of active medicine, when the disease shows itself."

Fig. 1. Fig 2..



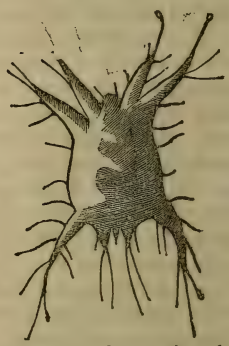


Fig. 1. The female, of 366 times the natural size, larger than the male, of an oval form. and provided with eight feet, four before and four behind.

a. The sucker.

b. b. b. b. The four anterior feet, with their trumpet-like appendices.

c. c. The two interior hind-feet.

d. d. The two outward feet, the extremities of which are provided with some long hairs, and on other parts of the legs are shorter hairs. To these the young ones adhere when they first appear from the pustule.

Fig 2. The male on his back, and seen by the same magnifying power.

The *external causes* of scab are, filth and the poverty, which arises from exposure to cold and wet weather, or bad food, or contagion, which is the most usual cause. It spreads both by direct contact, and also by means of the rubbing places. For it has happened, that when a farmer has got rid of his tainted flock, and covered his pastures with a new one, the disease has broken out again. And this has arisen from contact of the sheep, with the old

scratching places of fences, trees, &c. As this disease is very contagious, if any sheep is observed to be infected, it should be immediately removed from the flock; otherwise, the whole flock will shortly be infected.

Symptoms. The first symptom is, that the sheep is restless, rubbing itself against any object, nibbling itself, or tearing off the wool with its teeth. If closely examined, the skin will be found to be red and rough; and it is ascertained that the sheep begins to rub about twelve days after having received the infection. Pustules will next be visible, and in a few days these pustules are broken by rubbing, and a fluid escapes, which soon becomes dry, and forms the scab, which gives designation to the disease. The shoulders and back are generally soonest affected by these pustules. On the infected part, the color of the wool becomes changed, and is readily noticed. The general health of the animal is affected, according to the extent and virulence of the eruption: sometimes it pines away and dies, exhausted by continued irritation and suffering.

Treatment. The sheep acarus is very different in form, size, and color, from the human acarus. But any application which will destroy one, will prove fatal to the other. The remedy is, the destruction of the insects.

In the treatment of this, as well as most other complaints, those modes are preferable which are most convenient, provided they are effectual, and can be depended upon, and can be used without injury to the animal. The mode of treatment which has been used by Mr. Edward Wait, of mixing sulphur with their salt, is certainly the most convenient, and is also the safest; sulphur, being natural to the animal system, if used in moderation, cannot be injurious, like mineral poisons, which may destroy the itch insect, but will also frequently injure or destroy the sheep to which they are applied.

For this purpose, sulphur may be mixed with salt alone, or with salt and other condiments, and fed to them until a cure is effected.

If this remedy alone fails to effect a cure, shear off the wool about the pustules, and remove the scab with a knife or probe; after which, the diseased parts should be washed with soap and water; then anoint the parts affected with

an ointment made of the following ingredients, well mixed, viz:

Lard, - - - -	4 lbs.
Tar, - - - -	¼ "
Sulphur, - - - -	1 "
Spirits of turpentine, - -	1 gill.

repeating the operation, if necessary.

Or, wash the parts affected with a decoction made by thoroughly boiling one ponnd of plug tobacco in four gallons of water; to which add the same quantity of lime water, and one pint of spirits of turpentine.

Or, dissolve five quarts of common salt in four gallons of a strong decoction of tobacco, made as above mentioned, and apply it to the parts affected.—(Cultivator, 1845—page 336.)

Mercurial ointments, of various kinds, are frequently used for curing scab; but mercury is injurious to sheep in the same manner as to man.

1st—If a sheep gets wet, while under its influence, it will be very apt to be salivated or die.

2d—If a sheep is once anointed with it, such sheep will never regain its constitution; and will not keep or fatten as easily afterwards; and is liable, every spring after, to peel off its wool from those parts that were touched with the mercury.—(Cultivator, 1845.)

Prevention of Scab. This disease is most prevalent in cool, moist climates, or weather, and, therefore, dry and warm shelters, with plenty of wholesome and nutritious food, will be the best means of prevention. A poor sheep will be the first to suffer from this disease. In Scotland, sheep are smeared with tar and grease, in the months of October or November, as a defence against the weather and the scab, and with the best results. Where good shelters are provided, this operation will be unnecessary.

SHEEP POX.

This disease is unknown in the United States, but is not uncommon in France, Spain, and some other European countries. It consists in a pustular eruption upon the inside of the thighs and arms, but extending to all parts where the skin is thinnest, and when severe to every part of it:

and is accompanied with febrile and other symptoms which run through a regular course, much like the small pox of man, and is highly contagious to other sheep by contact.

"The *treatment* of this disease (in France) consists in separating the sound sheep from the diseased, being careful that, having been thus separated, they are not subjected to the influence of cold, or wet, or insufficient food. The diseased sheep are supplied with wholesome food. During the febrile stage, aperients of Epsom salts are administered. The state of fever having passed, mild tonics, as gentian and ginger, are administered—the Epsom salts being still retained, but in smaller doses. Common salt is a favorite, and a very useful medicine, on account of its antiseptic and tonic properties.

"The practice of inoculation, so as to produce the disease in a milder form, was introduced about the middle of the last century, and was so far attended with success, that, whereas, when the disease appeared naturally, one-half of a flock or upwards fell victims to its attack, in the artificial disease, this mortality was limited to about one in a hundred. The practice has been, in consequence, pretty generally adopted; and it is considered the duty of flock-masters on the continent, when the disease appears in the neighborhood, to submit their sheep immediately to inoculation."—(W. C. Spooner.) This disease is rarely produced except in cool, moist climates.

SECTION XLVIII.

DISEASES OF THE FOOT.

FOOT ROT.

A SECTION OF THE SHEEP'S FOOT.

Showing the interdigital gland. *g*. The gland. *d*. The duct leading from it.

There are two varieties of this disease; or rather there is a disease of the foot, properly speaking, and another disease of the fetlock and pastern joints. In the skin, immediately over the forks of the pasterns, and between the pasterns is placed, in the sheep, a small glandular sac and a tube, running from it, with an orifice to it, in the skin. This sac and tube lie nearly in a circular form, between the pasterns. The orifice of this tube is marked by a little tuft of hair, and should be always open. It is, however, frequently glued together by the strong-smelling, oily fluid which is secreted from this sac, and which should at all times have a free passage out. When this orifice is stopped up, pull out the hairs which are around it, and then put one finger under the foot, between the claws, and the thumb or finger of the other hand above the orifice, and press out this oily fluid, which is stopped up, and the sheep will soon be well, ordinarily.

If the pressure with the thumb and finger is found insufficient to open the orifice, it may be opened with a probe, and all glutinous matter or sand, or other foreign substance, should be extracted. And if probing alone is insufficient, this tube may be opened by cutting as far as may be necessary for this purpose. It should then be dressed at intervals, with an ointment of lard and tar, or other healing

ointment, and, if necessary, a bandage should be applied. But the orifice, above mentioned, should be kept open.—Astringent remedies, in some cases, may be necessary. In such case, dip a bandage into an infusion of oak bark or alum water, and bind it on the parts affected. If any fungus flesh arises, apply a solution of burnt alum and sugar of lead, with a syringe, to the parts affected, when necessary.

This gland and tube should never be cut out, if a cure can be effected without proceeding to that extremity; for the oily secretion from them is designed to lubricate and sheath from friction the parts between the claws.

The real foot rot, is an ulcer upon the foot, near, or within the horn of the hoof. This affection is caused by the irritation, which is occasioned by long hoofs, or by manure, peat or muck, or other vegetable substances, lodged between the hoofs, or by the skin or flesh near or between the hoofs being cut by sharp-edged grasses, sand or stones, or in consequence of the sac and tube, above mentioned, being stopped up.

The cause of the inveteracy of this complaint is, that an extra quantity of ammonia is secreted from the feet of the sheep, more than from the feet of other animals, and more than from other parts of the body. Ammonia helps to decompose animal and vegetable substances, and to communicate such decomposition to the flesh, wherever it is wounded, or irritated. Hence, if sheep are pastured on firm lands, and with hoofs well pared, they will seldom be troubled with this complaint. But if they are kept in filthy stalls, and without a suitable quantity of straw to rest upon, or if pastured on mucky or peaty soils, they will be very apt to contract the disease; for on such soils an abundance of sharp-edged grasses usually grow, which will wound the flesh or skin; the decomposition of peat or muck, by the ammonia, will be communicated to the wounded parts, and inveterate ulcers will be formed. For the same reason the disease is readily communicated from the feet of one sheep to those of another, by means of the matter of suppuration.

Symptoms and treatment. If a sheep is observed to be lame in the feet, it should be examined; and if foot rot has begun on, or in any part of the foot, the foot will gen-

erally be considerably hotter, than the other feet; which fact may be ascertained by comparing the lame foot with the other feet. It should then be ascertained what part of the foot is affected; whether between the hoofs, or upon the external parts, or internally. Where the complaint begins between the hoofs, it sometimes arises from the stoppage of the sac and duct above mentioned. In such case its orifice should be opened without delay. But whatever may be the cause, in the first stages of the disease, the skin between the hoofs frequently appears red and inflamed, and sometimes has the appearance of a scald, and will often form a blister, which will break. In such cases, the application of tar to the parts affected will generally affect a cure.

If an ulcer is formed between the hoofs, or near the hoofs, and above them, it should be first cleansed with soap and water; and pulverized burnt alum or blue vitriol should be sprinkled upon it, and then it should be covered with tar, or with tar and grease; repeating the dressings, until the ulcer is firmly healed.

Or apply, with a syringe, one part burnt alum and two parts sugar of lead dissolved in vinegar, to the parts affected, twice daily;

Or, spirits of turpentine alone until cured;

Or, apply muriate of antimony, (butter of antimony) and a few minutes after, apply white lead, and bandages, if necessary;

Or, wash the ulcer, and dress with equal parts of alum, copperas and charcoal;

Or, alum, gypsum, and charcoal;

Or, blue vitriol, white lead and charcoal;

Or, if a considerable portion of a flock is affected with this complaint, dissolve two, three or four pounds of blue vitriol in each gallon of water, more or less according to the violence of the complaint, and put a sufficient quantity of the solution into a flat-bottomed trough, which is 8 or 10 feet long, so that the water may be about two inches deep in the trough, and with suitable fixtures, cause the flock to pass lengthwise through this trough, two or three times weekly, as may be found necessary, until all are restored.

In cases where the hoof is quite hot, and no external

affection is visible, it may be ascertained what parts are affected, by pressing the foot slightly with the thumb, around the junction of the horn and skin, and also the sole of the foot. The seat of the abscess will be made known, by the wincing motion of the foot. If the abscess is within the horn of the hoof, the horn of the hoof should be pared away, so as to bring the diseased parts to view ; for in such cases, the horn will shortly be reproduced. If the abscess is found to be above the horn of the hoof, it will then be necessary to cut into the part diseased, with a keen knife, so as to occasion a discharge of the matter. In either of these cases, if the diseased parts are brought to view so that medicines can be conveniently applied, the ulcer may be treated as before mentioned. But if the ulcer is deep seated, as it will sometimes be, and will even penetrate to, and among the bones of the foot, it should be washed out, by injecting water or soap suds into it, with a syringe ; a solution of one part burnt alum, or blue vtriol, and two or three parts sugar of lead (acetite of lead) in water, should then be syringed into the parts diseased. This treatment should be continued once or twice daily, until the parts affected are fully healed ; washing the foot from time to time, so as to keep it as clean as circumstancess will permit.

If, by paring away the horn of the hoof, the parts underneath are left bare, so as to be irritated or injured by treading upon the ground, it will be necessary to apply bandages to the foot, and tie them on, after the dressings are completed. Each claw of the foot which is pared away in this manner, should have a separate bandage upon it, in order to prevent friction of the parts diseased, and so as to keep them more cool, than if both claws are enclosed by one bandage. For this purpose, bandages of linen or cotton cloth will be most suitable ; and these must be kept on until horn is reproduced, so as to protect the parts affected.

When the disease has been very severe, so as to penetrate to the bones or joints, it will be very difficult to effect a perfect cure ; the malady, in such cases, will be subject to frequent returns ; frequently, at the end of six months or a year, the same feet will be again affected. In such cases, unless the animal is very valuable, it may be well

to butcher it. No animal afflicted with foot rot, should be permitted to rejoin the flock until perfectly restored.

Prevention of Foot Rot. Sheep which are affected with foot rot, should be kept by themselves; they can then be examined more conveniently, and the contagious influence of the complaint may be avoided. In some soils and climates, this complaint does not seem to be particularly contagious, and is an easily managed disease; but in others, it is extremely contagious; even on high mountains and dry pastures, the complaint is sometimes very prevalent.

Sometimes the disease is contracted merely by sheep passing along in the same road, or by being pastured in a pasture where sheep, diseased with foot rot, had been pastured, and removed a month previous to the well sheep's being turned into it; or by their being put into the same yard or pen, where sheep, diseased with foot rot, were penned or stabled several weeks before the well ones were introduced. And it is said that the space of time, between the sheep's being exposed, and the symptoms becoming visible, varies from nine to fourteen days.

That it is contagious, has been proved by the experiments of M. Farre, of Geneva, (in Switzerland). Out of 32 cases, inoculated with the matter of foot rot, 20 became infected. In the cases where the disease was produced by inoculation, it was sufficiently marked to leave no room for doubt. The inference drawn from his experiments has been confirmed by those of others. Ordinarily, the matter of contagion is taken up by the absorbents of the feet with which it comes in contact.

Wherever the circumstances are such that sheep are any wise predisposed to this disease, their feet should, at all times, be kept well pared, so that the feet may stand in a natural position. If the hoof is too long at the end, or on the sides, the upper part of the hoof will bear too heavily upon some of the fleshy parts above, and will cause great irritation, so as, without any other cause, to produce an ulcer, in some cases.

When sheep are pastured upon grounds which are apt to produce the disease, their feet should be pared at least four times a year. But, generally, it will be sufficient to pare them twice a year: once in April or May, and once in November; at which times of the year, their hoofs will gener-

ally be softer than in midsummer or midwinter. For this purpose, a strong knife or a hoof-cutter will be necessary; or, instead of a hoof-cutter, a fine pannel saw will be found convenient; it should be oiled often. One person may hold the claws upon a block with both hands, while another saws off the toe; or a chissel and mallet may be used for this purpose. After which, they should be pared, so that they may stand in a natural position.

Ewes, far advanced in pregnancy, should not be set up on end in order to pare off their hoofs; placing them in such a position, when they are weak, will sometimes cause abortion.

In order to prevent foot rot in winter, spread straw in their sheds or stalls, so that their feet may be kept dry, and free from manure.

In summer, pasture them on lands which are free from mucky or peaty deposits; hilly lands, which are merely moistened by running water, do not produce the disease. And keep them from fields on which infected sheep have run, until after the frosts or rains have destroyed the contagion.

If pasturage lands appear to produce the disease, a quantity of lime, or gypsum, or charcoal pulverized, and deposited about their box of condiments, will be very useful in preventing the disease, by neutralizing the ammonia, which is continually produced, and excreted from their feet. In such case, their box of condiments, and, also, the lime, gypsum, or charcoal, should all be under shelter, so that the rain cannot fall upon them. If the disease is among the flock, when they are brought to their stalls, gypsum or charcoal may be sprinkled in their stalls, for the same purpose. And for this purpose, charcoal is one of the best and least expensive articles which can be used. Dried charcoal will absorb 90 times its bulk of ammonial gas; which is a greater quantity than any other substance has been found capable of absorbing. Charcoal is an article to which sheep seem to be partial. If there is a pile of half-burnt and half-charred logs in a field, they will be sure to make a resting place by the side of them. Pasturing sheep in newly burnt fallow fields, has been found very beneficial in foot rot.—(See Genesee Farmer, 1838, pa. 95.)

The constitutions of short-wooled breeds of sheep,

whether their wool be coarse or fine, are adapted to dry uplands, on which foot rot seldom prevails to any great extent, except by means of contagion; and hence, when placed upon rich level or lowlands, they are far more liable to this disease than long coarse-wooled breeds, whose feet and qualities are far better adapted to such lands.

SECTION XLIX.

DISEASES OF THE EYE.

The eyes of sheep, like those of other animals, are liable to inflammation from various causes; from the pollen of flowers, or other minute substances lodged in them; from an undue determination of blood towards the head, by over-driving, or over-worrying, or over-feeding; or from some constitutional derangement.

If the eye appears to be affected, it should be examined, and all foreign substances which are between the eyes and the eye-lids, should be carefully removed with a probe, or with a piece of fine silk cloth, or by washing the eyes with water. After which, a drop or two of laudanum, or laudanum diluted with four times its weight of water, may be dropped into the eye twice or thrice daily, until the inflammation is subdued.

If the eye is inflamed by over-driving, worrying, or over-feeding, administer a dose of Epsom or Glauber salts, and wash the eye three or four times daily with cold water. If necessary, repeat the dose of Epsom salts, and feed moderately, until the inflammation is subdued.

Sometimes a considerable portion of a flock is afflicted with sore and inflamed eyes, particularly at the latter end of the year, or in spring, when the weather has been cold and moist for a long time.

In such cases, the inflammation is moderate, but the eyes are weak, and a white film gradually spreads over the eyes, which the animal sometimes keep closed. At first a watery fluid, and afterwards, a thicker mucus matter is

discharged from them, and the film increases, until the whole of the eye is of a pearly whiteness, is blind.

In such cases, the inflammation will sometimes abate, even if nothing is done, and the eye begins to clear, usually commencing at the upper part of the eye, and gradually proceeding downward, until the whole of the organ is once more transparent.

In such cases, when a film is perceived to be growing upon the eye, or obscuring the eye-sight, drop a little finely pulverized burnt alum upon the parts most affected, once or twice daily. This will remove the film without injury to the eye. Or, drop a few drops of molasses into the eye once or twice daily; the oxalic acid, which is in the molasses, will remove the film without pain to the animal.

SECTION L.

OF WORMS.

Worms are frequently generated within the sheep. They probably arise from a want of a sufficient supply of common salt, (chloride of sodium), in the animal system. This will appear from the treatment and mode of prevention, which are necessary.

WORMS IN THE TRACHEA, OR WINDPIPE.

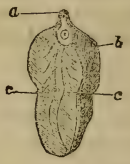
"Worms in the windpipe cause great irritation, and produce a species of bronchitis, with a discharge of mucus from the nose, and a cough which is frequent and distressing. This disease is more common with young cattle, from their being more exposed to wet and woody pastures; and when sheep are thus afflicted, it is confined to young animals."

Treatment. "The same means should be resorted to, as are employed with success in young cattle; and for which we are indebted to Mr. Mayor, of New-Castle-under-Lyne. Lime water, half a pint for a sheep, and a quarter for a lamb, should be given in the morning;

and in the evening one or two large teaspoonfuls of salt, dissolved in a quarter to half a pint of water. This treatment should be continued for a week, or until the improvement becomes very decided."—(W. C. Spooner.)

Prevention. It is very evident, that if lime water and salt will destroy worms, under such circumstances, a suitable supply of salt and lime, as condiments to the sheep, will prevent their formation. In the above prescription, salt is the principal efficient remedy.

FLUKE WORMS.



The Fluke Worm—*a*, the mouth ; *b*, the reproductive apparatus; *c*, *c*, vessels for the distribution of the blood.

The Fluke—the Fasciola of Linnæus—the Distoma hepaticum of Rhodolphi, is found in the billiary ducts of the sheep, the goat, the deer, the ox, the horse, the ass, the hog, the dog, the rabbit and various other animals, and even in the human being. It is flat and oval, and of a brownish yellow color. It is from three quarters of an inch, to an inch and a quarter in length, and from one-third to half an inch in greatest breadth. The head is of a pointed form, round above, and flat beneath ; and the mouth opens laterally, instead of vertically. There are no barbs or tenacula, as described by some authors. Mr. Morton was unable to discover any eyes ; and it is not probable that these residents of a locality never penetrated by light, actually possess any.

Origin of Flukes. "The fluke worm has been found by Frommen, in the fœtus of the sheep, into which it could not have been conveyed by transmission from the mother, as there is no direct vascular communication, between the fœtus and the mother."—(Blacklock.)

This circumstance shows that the fluke worm is formed

within the animal. How they are formed we can no more determine, than how the itch insect is formed. "Each worm is bisexual, or hermaphrodite; on which account they multiply with great rapidity. They produce eggs to be hatched while floating in the bile. They are found only in the gall bladder, and the ducts which lead to it. In these they are often found in such numbers, as to cause great distension, and, in some instances, the irritation produced by them leads to the thickening of the walls of the gall bladder, and to deposition of calcarious matter between its coats; frequently also to complete obliteration of portions of the ducts. Hence the crackling sound sometimes perceived, when handling the liver of a rotten sheep."

These last observations are by Blacklock. In America, such quantities of fluke worms are a circumstance entirely unknown. I have examined great numbers of sheep, which had died of rot, and which always had plenty of salt, without finding a solitary fluke worm. But as a proper supply of salt is not generally afforded to sheep in Europe, and as fluke worms have usually been there found an attendant upon rot, they have been more noticed than they deserved. They are only an attendant upon rot; they may exist with or without it.

Treatment. It is not probable that we can know, to any certainty, whether fluke worms exist in the liver of a sheep. But if it is suspected that a sheep is troubled with them, give one and a half ounces of common salt, in three quarters of a pint of water, to a sheep, on an empty stomach, for three or four mornings. The sheep should be kept from eating during the night preceding each dose. This is said to be an effectual remedy.—(Cultivator.)

Prevention of Fluke Worms. A regular supply of common salt.

SECTION LI.

FLIES AND TICKS.

During the summer months, sheep are much annoyed by the various species of maggot flies, and the *Oestrus Ovis*. These flies are most abundant in woody localities. These maggot flies deposit their eggs upon the sheep, selecting for that purpose a wound, or sore, or filthy parts about the tail, or about the horns, or even in the wool, when it is moistened by warm damp weather, especially on breeds which have not much yolk. The maggots being hatched, burrow in the skin or flesh, causing severe irritation, and frequently produce extensive and troublesome wounds, which sometimes destroy the sheep, by the irritation and fever which they produce, in the course of a short time; and, therefore, when struck by the fly, they should be attended to without delay.

Treatment. The wool should be cut off around the parts, where the maggots are deposited; then dislodge them with a knife or probe; or apply spirits of turpentine to the parts affected; the maggots will soon crawl out and perish. Apply tar and grease, or white lead and oil to the corroded parts from which they have been removed.

Maggots may be dislodged by applying honey to them, when spirits of turpentine would be ineffectual.—(J. S. Skinner.)

"As a local application, imediately after the sheep has been struck, white lead is one of the best, and it will also act as a preventive. In using it, while one person, holds the sheep by the head, let another open the wool, and having ready a pepper box, containing pulverized white lead, scatter it among the wool, wherever there is any appearance of maggots or slight wounds made by them."

Prevention. Clip off all tag locks, and apply to any parts, which are particularly liable to wet or filth, portions of a mixture of five parts lard, and one part tar, or sulphur or white lead. Flies are very apt to deposit their eggs about the roots of the horns of rams, whether the skin is abraded by fighting or not. Many valuable rams are destroyed by maggots thus produced. Therefore, imme-

diately after shearing, tar should be daubed around the roots of their horns, and between them.

THE GAD FLY, (ŒSTRIS OVIS.)

These flies somewhat exceed half an inch in length, and are nearly a quarter of an inch in breadth, when full grown. The figures in the above cut are taken from Mr. Youatt's treatise. Fig. No. 1 shows the larva or bot of the Œstris ovis half grown; 2, the same at its full growth; 3, the Œstris ovis in the pupa state; 4, the Œstris in its perfect state, giving a full length view of it.

These flies deposit their eggs on the inside of the nostrils, which the sheep endeavor to prevent by holding down their heads, and flocking together. If a fly of this kind appears near, they strike violently with their fore feet, and, at the same time, plunge their noses into the dust. When the fly succeeds, the sheep exhibits the greatest uneasiness, shakes it head, snorts, stamps with its feet, and runs off furiously to some dusty spot or protected corner. The attacks of this fly continue from May to October. Sometimes a dozen maggots are placed in one sheep's nose; but not often more than three or four in one season.

The eggs thus deposited are soon hatched, and the young maggots crawl up the nostrils, in doing which, they produce great irritation, which causes the sheep to sneeze and shake its head. They enter the frontal and other sinuses connected with it, where they remain, increasing in size until the following spring, feeding on the mucus which is

secreted by the membranes which line those cavities. At some time between the middle of April and the end of July, the larvæ attain their full growth, and then make their exit from these sinuses, and crawl down the nostrils; in doing which, they prove a source of great irritation, causing the sheep to sneeze and shake their heads.

The maggot then burrows in the ground or rubbish of the sheep-yard; its skin gradually shrinks and hardens, and it is soon formed into the chrysalis. In from forty to sixty-three days, according to the experiments of Valasnieri, the perfect transformation takes place, and the fly comes out. Though most of the worms leave the head of the sheep to undergo transformation, it is certain that all do not: for shells of the chrysalis are sometimes found in the sheep's head, showing that some reach the fly state before leaving. The fly will live two months after it is produced, but like a butterfly, it is supposed that it takes no nourishment of any kind. After the two sexes have copulated, the male dies after a few hours or days; sometimes, however, having impregnated a second or third female; but the female lingers until she has found a proper receptacle for her ova, when she also expires.

In most cases, the worm leaves the sheep's nostrils without producing serious injury; but sometimes they are very injurious. They destroy the sheep by the long continued irritation and inflammation which they create in the nasal sinuses.

Symptoms of Worms in the Head. The eyes sink in and look glassy, the ears lop, the head droops, the nostrils discharge more than usual, and, in the last stages, bloody, watery matter frequently runs from the nose: the animal becomes poor, with a good appetite, and the best of keeping, and, in the last stages, is generally troubled with diarrhœa.

Treatment.—To destroy worms in the head, mix a pound of scotch snuff with eight quarts of water—a half gill of this mixture will be sufficient for each nostril, if the operation is performed in the fall season, when the worms are young. Throw it up each nostril by means of a syringe. This operation is most conveniently performed by thrusting the nose of the sheep into a hole made through a board, which is fastened to a post, and made sufficiently large to

receive the nose of the sheep two-thirds of its length from the eyes to the nose. The board keeps the head steady, so that there is no difficulty in performing the operation. A decoction of tobacco is used by some persons for the same purpose; and others blow tobacco smoke into each nostril, with good effect in such cases.

Another remedy is—mix equal proportions of spirits of turpentine and oil (sweet oil or linseed oil), and inject a table spoonful or less of the mixture into each nostril. These processes will disable the worms, and cause the sheep to sneeze so as to expel them.

Sulphur is offensive to some other parasitic insects of the sheep; and hence, the feeding of it, in moderate quantities, to sheep thus affected, may destroy or dislodge the worms from the nasal sinuses, when other means fail.

Prevention of Worms in the Head. With a wooden spatula, smear a streak of tar from the end of the sheep's nose up to the wool between the eyes. This operation should be repeated upon each sheep, once in two or three weeks, from May till frosts appear in autumn. This is the best mode of prevention; but it should be thoroughly done, and regularly attended to. As soon as the lambs are weaned, tar should be smeared upon their noses also, in the same manner. If sheep are kept in first rate condition as to flesh, they will the more readily avoid this fly by their activity, and if the worms are deposited in their nostrils, they will be the better able to endure the irritation caused by them.

TICKS AND LICE.

The sheep louse is of a brownish red color, with a flat body, and three legs on either side. The tick has also three legs on each side; but it has a large round body, with a small chest and head, which it buries deep in the skin, and by which he holds so fast as to be with difficulty torn off. The lice are propagated by means of eggs or nits. The origin of the tick is not so well understood. They are both injurious to the wool and to the health of the animal, on account of the constant irritation which they produce.

The louse is more injurious than the tick. The tick only buries its head in the skin; but the lice burrow and form their nest in or under it; they collect together, and a scab

soon rises, whence a glutinous matter proceeds. The scab continues to increase until it is of the size of a sixpence, and undermines and destroys the wool, and portions of the fleece come off in patches. The itching then becomes intolerable; the sheep rub themselves against everything within their reach, and tear out locks of wool with their mouths.

Lice and ticks infest sheep of all ages, but are most troublesome to lambs.

Treatment. The most convenient mode of destroying ticks, is, to feed sulphur to animals thus afflicted. For this purpose, feed to each hundred sheep, weekly, 10 or 12 ounces of flour of sulphur mixed with their condiments; or, feed the same amount of sulphur to them weekly in small doses, mixed with their provender, until the ticks are destroyed, which will generally be effected within three or four weeks. The sheep should be examined, and as soon as the desired effect is obtained, the sulphur should be withheld from them. Sulphur is a relaxing article, and while they are using it, they will be more subject to take colds than at other times, and, consequently, the most proper time for killing ticks in this manner, is in cold, dry weather in winter, or in warm, dry weather in summer, when the sheep is well covered with wool; but not immediately after they are shorn. This method has been used successfully.

Another method of destroying them when the wool is long, is, by fumigation with tobacco. Take a canister of copper, sheet-iron, or tin, made at one end to fit the nose of a bellows, and having at the other end a small pipe, for the escape of the smoke. Fill the canister with tobacco, put in a coal of fire, and fasten the canister to the bellows' pipe, around which there should be wrapped some damp tow or cloth, to make it fit tight. One person should hold the sheep and open the wool, and another should blow the smoke with the bellows. The wool should be opened in lines or furrows around the body, from six to eight inches apart. As the wool is opened, the pipe of the canister should be applied close to the skin, the wool closed around, and slightly compressed at the surface with the hands; and, at the same time, a puff given with the bellows. This will

keep the smoke close to the animal's body, and nearly every tick will be killed.—(Cultivator.)

Or, open the wool in lines or furrows, and sprinkle snuff or flour of sulphur among the wool.

Or, in a few days after the sheep are sheared, the ticks, being deprived of protection on the sheep, will resort to the lambs, whose wool will then be sufficiently grown to afford them a covering; if, at this time, the lambs are dipped in a decoction of tobacco, the ticks may be exterminated at once.

For this purpose, make use of one pound of tobacco for every six gallons of water—five pounds of tobacco will be sufficient for one hundred lambs. Chop the tobacco fine, and boil it in the water uutil its strength is fully extracted. After which, put the decoction into a large tub or kettle; on the side of which, fasten a board on which the lambs may rest after their immersion, in order that the liquor may drain from them into the kettle or tub. The lambs should be held by the head with both hands, and then dipped into the decoction up to the ears, using special care that none of the decoction passes into the eyes or mouth.

Or, if the lambs are dipped in a strong solution of common salt in water, the ticks will mostly die, or will drop off. The salt will also have a good effect upon their skins. —(See Cultivator, 1845.)

Good keeping during the summer months, is a great preventive against the influence of flies and ticks.

SECTION LII.

DISEASES OF PARTURITION.

ABORTION.

Abortion occurs at all periods of pregnancy, but is most frequent, when the ewe is about half gone. When sheep are in some measure afflicted with the rot, it also frequently occurs a short time previous to the full period for their lambing.

Causes of Abortion. These are, sudden fright; jumping over hedges or ditches; being worried by dogs; blows, or strains of the back or abdomen; the too free use of common salt; also, the unlimited use of turnips, or other succulent food; confinement to wet pastures during fall or winter; or anything which more than usually relaxes the system. Hence, sheep affected with rot, are very liable to abortion; and abortion is more common after a wet fall and winter.

Symptoms of Abortion. The symptoms first manifested are, dullness, and refusal to feed; the ewe will be seen moping at a corner of a fold or field, and will be heard to bleat more than usual. To these symptoms succeed restlessness, and often trembling with slight labor pains, and in the course of twelve hours, abortion will have taken place. Sometimes the parts will be so relaxed, that the uterus, or vagina, will become inverted, and the expulsion of the placcuta will precede that of the fœtus. Aborted lambs are generally dead when dropped.

Treatment af the Ewe. If the ewe is apparently much injured, she should be placed in a sheltered situation, but should be allowed plenty of fresh air; and the following medicines, with some nourishing gruel:

Epsom salts,	-	-	-	¼ ounce.
Tincture of Opium,	-	-		1 drachm.
Powdered Camphor,	-	-		½ do.

The two latter medicines may be repeated for one or more following days, as may be found necessary; but not the salts, unless the bowels are constipated. The immediate cause of death, in fatal cases, is inflammation of the uterus, or womb.—(W. C. Spooner.)

Prevention of Abortion. When many cases of abortion occur, it frequently arises from some quality of their food or pasture. In such cases, the ewes should be confined to a full supply of good hay and water, or dry pasture fields, with a moderate allowance of grain. Ewes which have suffered abortion, should be removed from the rest of the flock, and the aborted lambs should be buried.

INVERSION OF THE UTERUS.

Though this occasionally takes place in the ewe at any

period, from sudden severe exertion or straining hard, yet it is most frequent immediately or very shortly after parturition. In this case, it arises from the violent spasmodic action of the womb, which turns inside out, and protrudes from the sheep. The womb is also sometimes forced out of the orifice, when great force has been used in extracting the lamb. No time should be lost in replacing it. If necessary, the womb should be cleansed with warm water. The ewe should then be placed on her back, with her hind feet elevated, and the hands being well lubricated with oil, the uterus should be gently forced back into its natural place by a person having a small hand. Gentle and continued pressure will effect this much sooner than the application of the greatest force. When it is returned to its natural place, the lips of the orifice should be secured by passing through them a piece of fine wire, and twisting it, so as to keep them together until the animal is fully restored; otherwise, it may again protrude. Twenty or thirty drops of laudanum should then be given to the ewe in a pint of gruel, and the ewe should be kept perfectly quiet, till fully restored; repeat the dose of laudanum, if necessary. If the uterus is thus returned before it has been much bruised or inflamed by hanging out, there will be little danger to the mother, and she may suckle her lamb as usual. When she has accomplished that, she should be fattened; for the same accident would almost certainly happen to her at her next parturition.

HEAVING, OR AFTER-PAINS.

The ewe is occasionally subject to after-pains, especially if she is in high condition, or if much force has been used in extracting the lamb. The spasmodic pains arise from the violent contraction of the womb, and the effort of nature to restore it to its natural size; and though, to a certain extent, it is a healthy operation of nature, it often passes beyond the bounds of health, and becomes disease, and exhausts and destroys the animal.

Symptoms. The first symptom is, generally, a frequent and painful disposition to expel her urine, which is highly colored and bloody; she breathes quick, lies down, and appears to have spasmodic pains; her ears droop, and she takes no notice of her lamb; on pressing her hind parts she

yields and almost sinks to the ground; and if she moves, it is with much pain and difficulty. The hind parts often swell, and mortification follows, when the pain, in a great measure, ceases, but is soon followed by death.

Treatment. When the pains are not inordinate, it is better not to interfere with nature; but when otherwise, twenty or thirty drops of laudanum, mixed with gruel, should be given, and repeated once in two or three hours, until the pains abate; increasing or diminishing the dose, as may appear necessary, according to the size and condition of the ewe.

GARGET.

This is an inflammatory affection of the udder. It is generally produced by the death of a lamb, and the milk of the ewe becoming coagulated. But it may also be produced by some constitutional derangement, or by cold and wet lair, or by the ewes taking cold in any manner. Hence, pulling or shearing off too much of the wool which grows about the udder, will have a tendency to produce garget, if the weather be frosty.

Garget will be first denoted by disinclination or refusal to suckle the lamb; and one or more of the teats will be found wholly or partially enlarged, and knots or tumors will be felt.

Treatment. If garget arises from the death of one of the lambs, the other lamb should be made to suck both teats, and this will generally afford relief. If it arises from other causes, the udder should be well washed with strong brine of common salt; or, apply to the udder a mixture of opodeldock and a small proportion of laudanum; or ointment of lard and bittersweet. If the inflammation runs high, an ounce of Epsom salts or common salt, and one drachm of ginger, mixed with water or gruel, should be given to the ewe. At the same time, the lamb should suck her, or the milk should be drawn from her by hand. If the swelling continues, and matter forms, the abscess should be opened by a free incision, and the escape of the pus should be assisted by pressure. If the wound becomes foul, it should be washed out with water, applied with a syringe, and a solution of one part burnt alum and three parts sugar of lead should then be applied to it, in the same manner, twice

daily; and, if necessary, apply some healing ointment in addition.

When some portion of the udder becomes schirhus, hard, from the effects of garget, so that the ewe cannot give a full supply of milk, she should no longer be used for breeding.

SECTION LIII.

DISEASES OF YOUNG LAMBS.

COAGULATION OF THE MILK.

All the milk which is swallowed by the young lamb, is first coagulated in the stomach by the power of the gastric juices, as by rennet in making cheese; after which, it is digested by means of the same gastric juices. Therefore, whenever the quantity of milk taken by the lamb, is so great that the gastric juices are only able to coagulate it, without digesting it, the whey is separated from the curd, as in the process of making cheese, and passes off through the bowels by a light colored diarrhœa; and, at the same time, the curd remains in the stomach, and sometimes accumulates to the amount of two or three pounds, thus producing a dangerous constipation. Hence, this disease can arise only when the ewe furnishes for the lamb more milk than it can digest, or milk of a bad quality.

Symptoms. When a thriving lamb, with a healthy dam, having a full udder, begins to be dull, and stands panting and distressed, with a hard and distended abdomen, and can scarcely be induced to move, and the fœces appear white, as before mentioned, or nothing passes its bowels, its illness probably arises from coagulation of the milk.

Treatment. The first thing to be done, is, to administer a purgative of two or three drachms of magnesia, combined with one or two drachms of Epsom salts, or common salt, and a little ginger, dissolved in water, in order to dissolve the coagulated mass, and evacuate the stomach. The above dose should be repeated, in less quantities, twice or three

times, at intervals of three or four hours, combined with plenty of warm water, in order to carry off the dissolved curd.

At the same time, the ewe should be supplied with less succulent food, or be turned upon shorter pasture. Also, it may be necessary to draw from the ewe's udder a portion of her milk daily, for a short time, until it is reduced in quantity, so as not to injure the lamb.

DIARRHŒA.

This generally arises from exposure to cold wet weather, or from some bad quality of the mother's milk. When it arises from such causes, the fœces are generally of a greenish color.

If the diarrhœa arises from the quality of the mother's milk, which is naturally aperient, and, in some cases, may be too much so, especially if she has an abundance of it, the ewe should be put upon drier feed or pasture; or she should be dosed with the same medicines or condiments, as if she herself was afflicted with diarrhœa; and this will generally relieve the lamb. If this fails, give to the lamb small quantities of chalk and ginger once or twice daily, mixed with a little warm cow's milk, or boiled milk. The stomachs of young lambs are weak, and, consequently, small doses, at proper intervals, will have the best effect.

Or a pinch of leached ashes, gypsum and salt, prepared as for full grown sheep, may be placed in the lamb's mouth once or twice daily, and, in most cases, this will be a very effectual remedy. Indeed, young lambs will often take to eating this mixture before they are two weeks old. As soon as the diarrhœa abates, the medicine should be immediately suspended, lest costiveness should ensue.

SECTION LIV.

INJURIES AND OPERATIONS,

Sheep are liable to external injuries in the form of wounds, fractures, bruises and strains.

WOUNDS.

All the wounds which can be inflicted may be classed under the heads of *incised*, *punctured* and *lacerated*.

An *incised wound* is one which is made by a cutting instrument, such as a knife or a piece of glass.

Punctured wounds are those produced by sharp-pointed bodies, as pins or thorns.

Lacerated wounds are those which are produced by blunt bodies, as the teeth of the dog, tearing rather than cutting the flesh.

When a sheep has received any of these injuries, the following rules ought to be attended to, and in the order here recommended.

1.—Arrest the bleeding, if profuse and likely to endanger life.

2.—Clip away the wool, for a few inches around the parts injured.

3.—Remove dirt or other foreign body from the wound.

4.—Bring the separated parts as nearly together, as circumstances will at the moment permit, and retain them there by a suitable apparatus.

TO STOP BLEEDING.

Bleeding will, if no large arteries are divided, cease, on the free exposure of the surface for a few minutes to the air, but when a large vessel has been cut, more determined means must be used. Pressure on the bleeding surface, and its neighborhood, will, in many cases, succeed. But this or any similar method, is far inferior to that of securing the open vessel by a thread. To accomplish this, the mouth of the vein or artery must be slightly drawn out from the contiguous surface, by means of a small hook, called by surgeons a tenaculum, and easily procured form

any blacksmith. While the mouth of the vessel is thus held exposed, an assistant must surround it with a noose of thread, which, on being secured with a double knot, will effectually close it. The thread ought to be of white silk, though any undyed thread, which is firm, round and capable of standing a pull, will answer the purpose. Care must be taken to place the thread, before tying it, fairly behind the point of the tenaculum, so as to avoid including the instrument within the ligature, a circumstance which would lead to the slipping of the noose, and failure of the operation. The hook is now to be withdrawn, and one end of the ligature cut off by scissors, within a little of the noose. The remaining threads are allowed to hang out of the wound, so as to admit of their removal, when they become loose, which does not, however, take place till the termination of the first four days, and they are frequently retained for a much longer period. At each time the wound is dressed, after the fourth day, the ligatures should be gently pulled, or, which is preferable, twisted to disengage them, if at all loose, so that the wound may be speedily closed. Before proceeding to any operation where bleeding is expected, the operator should provide himself with a few well waxed threads, each twelve inches long, so that no delay may ensue, on a division of large vessels.

REMOVAL OF EXTRANEOUS MATTER.

Dirt is best removed by washing with a sponge, or old linen rag, and warm water: Other foreign bodies may in general be extracted by the finger and thumb, or by a probe. In some cases, however, it may be necessary to enlarge the wound, with a fine-edged knife, in order to facilitate the removal of substances, which from their shape or situation, cannot be otherwise displaced.

CLOSURE OF A WOUND.

The last thing to be done, is, to bring the edges of the wound into as accurate contact as the state of the parts will at the moment permit, without, however, using any force. This, with a little care, is readily accomplished; the only difficulty being to retain them in the desired position. They may be held in contact, either by stitches,

plasters, or bandages, or by an union of the three. Stitches are only required, when the wound gapes to a considerable degree, as it always will do, when it runs across a muscle. They may be applied in the following manner: Transfix one side of the wound with a curved needle, (armed with a well waxed thread,) forcing the needle *from without*, obliquely towards the bottom of the wound; then carry it through the opposite side, *from within*, taking care to bring it out, about the same distance from the edge, as that at which it entered on the other margin. The needle must now be removed, by cutting the threads close to the eye, and while the ends are allowed to hang loose, the same operation should be repeated at the distance of an inch or an inch and a half from the other stitch, as often as the length of the wound may render it necessary. Your assistant will now bring the sides of the wound together, as accurately as possible, and retain them there till you have tied the corresponding ends of the threads in a double knot.

BANDAGING.

Adhesive plaster is, in some instances of service, but, upon the whole, ought rather to be disposed with, being of difficult application, and, moreover, tending to the accumulation of filth, and the discomfort of the animal. Nothing will be found to serve the purpose of supporting the parts so well, as a properly adjusted bandage, which is useful in every instance, and serve to stay on, if sewed here and there to the fleece. The bandage should never be omitted, where the wound has any tendency to gape, as too great a strain upon the stitches cannot but lead to delay, in the healing process.

In bandaging a limb, or part of a limb, commence *always at the foot*, and proceed upwards. On other parts of the body, begin where you find it most convenient. Before applying a bandage to an injured surface, a couple of pieces of old linen or cotton cloth should be folded into pads or compresses, and laid one on each side of the cut, and over these the bandage should be rolled evenly, and with moderate and uniform firmness. By this plan, the separated surfaces are supported, and preserved in close juxtaposition,

especially at the wound, a thing of some importance where the wound is deep.

Transverse cuts of the limbs of sheep require more careful and more complicated treatment than cuts in other parts, as there is a constant tendency of the edges to retract. The retraction of the edges may be, in some degree, obviated, by the application of a splint, which may be made of a slip of stiff leather, (such as is used for saddle-flaps,) well wetted, so as to be easily adapted to the form of the limb. It is intended to impede the motion of the leg, which occasions the gaping of the wound, and must, therefore, be made to pass over one or more joints, as circumstances may require. Tow must be laid along the surface (a sound one, if possible,) on which the leather is to be placed, and a bandage then rolled over it, so as to make all secure.

CLEAN CUTS.

Clean cuts, as every one knows, heal readily in a healthy animal, seldom demanding above three dressings. Simple incised wounds should, if possible, be united by the first intention. The edges of the skin should be brought together, and joined, by means of stitches, over which a bandage may be placed, and by this means, a cure is frequently effected in a short time.

LACERATED WOUNDS.

Lacerations require a longer period for their reparation than clean cuts; inasmuch as the process which nature goes through, is more complicated. In clean cuts, the parts are speedily glued together so soon almost as in contact, and the union is generally complete within the first thirty-six hours. Not so, however, with lacerations. Here the parts are bruised, torn, and, perhaps, to a considerable degree, wanting. Some of the diseased portions may die, and are, of course, to be renewed. This is a process requiring great effort on the part of the vital powers, which are often inadequate to the task. And on this account, when the injury is severe, we ought to sacrifice the animal, rather than run the risk of its dying during the process of the attempted cure.

When the wound has been cleaned and freed from all extraneous substances, such parts as are almost completely

torn or squeezed off, should be removed. To replace the lost part, suppuration, or the formation of matter commences; while under cover of this, a crop of fleshy particles (granulations,) rises to fill the vacancy. Granulations are best promoted by warm emollient applications, such as poultices of oatmeal, linseed meal, barley flour, or wheat bread, which ought to be frequently renewed, to prevent their becoming cold or dry. Whenever the granulations become too luxuriant and rise, as they are apt to do, above the level of the skin, (i. e.) whenever it is evident, by their appearance, that fungus flesh is formed in the wound, the poultices must be laid aside; and in order to remove the fungus flesh, burnt alum should be applied to it, or it may be washed once or twice daily, with a solution of sulphat of copper, made by dissolving two or three drachms of blue vitriol, in an English pint of soft water; after which, the sore should be covered carefully over with a pledget of fine tow, spread with lard, or any simple healing ointment, by which means a cure will easily be accomplished.

The wounded animal should be allowed to move about as little as possible, and food should be rather sparingly given.

In the cure of a mere wound of the skin, tar, or, with more propriety, a mixture of tar and grease, may be applied, which will speedily heal the parts affected; but to a deep wound of any kind, pure tar should never be applied. It prevents the suppuration which is necessary to the proper growth of flesh.

PUNCTURED WOUNDS.

The orifice being small in these, and the depth considerable, the sides are apt to adhere irregularly, and prevent the free escape of matter, which is certain to collect at the bottom. To avoid such occurrences, it is, in many cases, proper to convert a punctured into an incised wound. When, from neglecting this, the matter is denied an outlet, an incision must be made to allow it to escape; otherwise, much harm will ensue from its burrowing between the different textures. Fomentations will also here be serviceable, and should be preferred to poultices. To apply them, make a decoction of meadow hay, or hop vines; dip a piece of flannel into the decoction when it is very hot,

then wring it, and double it one or more times, and apply it to the parts affected; dipping the flannel again when the heat is gone, and continuing this application until suppuration takes place freely. After which, apply healing ointments.

WOUNDS OF JOINTS.

Such wounds are highly dangerous, and apt to baffle the most experienced. *The grand object in every case, however, where a cure is attempted, is to produce a speedy union of the wound, by closure and bandaging, as before directed.*

If the injury be very extensive, the best thing a farmer can do, is to slaughter the animal.

FRACTURES.

The mending of a broken bone, though somewhat tedious, is by no means difficult, when the skin covering the fracture has not been torn. Let the limb be stretched, and the ends of the broken bone be placed very accurately in contact with each other. A piece of stiff leather, or of pasteboard, or thin wood, wrapped in a soft rag, is then to be laid along the limb, so that it may extend an inch or two beyond the contiguous joint. Whichever of these substances is employed, it should be carefully secured in its situation by a bandage of linen, cotton, or flannel cloth, an inch and a half broad, and two yards long, or more, if necessary. After having been firmly rolled up, it should be passed spirally around the leg, beginning at the foot, and carrying it up above the end of the splint. When any considerable swelling appears, the bandage should be carefully slackened, and tightened again, when the swelling abates. When the swelling is considerable, and fever present, you cannot do better than to open a vein of the head or neck, allowing a quantity of blood to escape, proportioned to the size and condition of the animal, and the urgency of the symptoms. The exhibition of purgatives should never be neglected. Epsom salts, in ounce doses, given either with gruel, or as a drench, will be found to answer the purpose well. If the broken bones be kept steady, the cure will be complete in from three to four weeks; the process of reunion always proceeding faster in a young than in an old sheep.

Should the soft parts be injured to any extent, or the ends of the bone protrude, recovery is very uncertain, and it will be a question whether it would not be better to convert the animal into mutton without delay.

BRUISES AND STRAINS.

Bruises and strains, unless very severe, need not be interfered with. The fetlock joint is most frequently injured by strains. When a severe strain or bruise happens, to that or other part of the limbs or body, if the weather be warm, no better application can be made than to apply cold water or cold strong brine of common salt, frequently to the parts affected. If the weather be cold and wintry, opodeldock or astringent remedies may be applied. At the same time, the animal should be placed where it may obtain food, without being compelled to move much about.

ULCERS, ABSCESSES AND TUMORS.

These are produced by some constitutional derangement or by bruises. In either case, there is a collection of pus or matter under the skin; and whilst this is collecting, the surface of the skin is usually very tender, and sometimes there is also much constitutional irritation present. A collection of matter may be known by the heat, swelling and pain of the part. On pressing it, the contained fluid is felt to fluctuate, and the pressure being removed, the part immediately assumes its former shape; whilst a watery or dropsical swelling, on being pressed, leaves for some time the marks of the fingers. After some time, the abscess points; that is, the matter can be more distinctly felt at one particular point, at which, if permitted, the abscess would burst. This, however, should not be permitted; but at this stage, a large opening should be made with a knife or lancet, at the lower part, or at that part which will admit most readily of its discharging itself.

If the abscess is languid and slow in forming, a stimulant, such as ammonia and oil, rubbed in occasionally, will be useful; or a plaster of rosin and tallow may be applied to it, until it it comes to a head, so that it may be lanced as above mentioned.

After the pus is discharged, apply portions of lard, with which a small proportion of tar is mixed, together

with caustics, if fungus flesh arises. The tar and lard will keep off flies and heal the parts affected.

If a fistula or pipe forms in an ulcer it may be discussed by injecting common salt into it a few times; after which it may be healed as in other cases.

Tumors may sometimes be discussed, driven away, by washing them with brine of common salt.

BLOOD LETTING.

In describing this operation, too much stress is always laid on the importance of opening particular veins, or divisions of a vein, in certain diseases. Such directions are altogether unnecessary, as *it matters not from what part of the animal the blood be drawn, provided it be taken quickly.* Nothing tends so much to the recovery of an animal from a disease in which bleeding is required, as the rapid flow of the blood, from a large orifice. Little impression can be made, on an acute disease, by the slow removal of even a large quantity of blood, as the organs have time to accommodate themselves to the loss, which might, for any good it will do, as will be dispensed with. Either bleed rapidly, or not at all. The nearer the commencement of an ailment, in which you employ bleeding, the operation is resorted to, the greater the chance of its doing good. No time, therefore, ought to be lost in using the lancet, when once it is known to be required. Bleeding, by nicking the under surface of the tail, does very well, when no great deal of blood is required; but it is not to be thought of, if the veins of the face or neck can possibly be opened.—These are to be taken, in preference to a vein on the leg, as they are much more readily got at.

The facial vein commences by small branches on the side of the face, and runs downwards and backwards to the base of the jaw, when it may be felt, within two inches of the angle, or opposite the middle grinding tooth. It is here that the orifice must be made; the thumb of the left hand being held against the vein, so as to prevent the flow of blood towards the heart, will make it rise. Some prefer opening the jugular vein, which commences behind the eye, and runs down the side of the neck. This vessel is, however, more difficult to open than the former, being better covered with wool, and not so easily exposed or made

to swell. *Stringing* is the mode commonly resorted to, for this end; that is to say, a cord is drawn tightly round the neck, close to the shoulder, so as to stop the circulation through the vein, and render it perceptible to the finfier. A lancet is the instrument generally used in bleeding, though a well pointed knife will do at a pinch. The opening must always be made obliquely; but before attempting this, the animal must be secured, by placing it between the operator's legs, with it croup against a wall. The selected vein is then fixed, by the fingers of the operator's left hand, so as to prevent its rolling or slipping before the lancet. Having fairly entered the vein, the point of the instrument must be elevated, at the same time that it is pushed a little forward, by which motion it will be lifted from, or cut its way out of the vein. *A prescribed quantity of blood should never be drawn*, for the simple reason, that this can never be precisely stated. If the symptoms are urgent, your best plan is, not to stop the flow of blood till the animal falls or is about to fall. When this occurs, run a pin through the edges of the orifice, and finish, by twisting round it a lock of wool.—(Blacklock.)

Bleeding is almost never practised in the United States, and with good reason: for sheep are little subject in this country to those kinds of inflammatory complaints in which bleeding is necessary.

CASTRATION, DOCKING AND MARKING OF LAMBS.

The most suitable age for castrating young lambs is, between the tenth and thirtieth day after they are dropped.* The testicles will then be large enough, so that they can be got hold of, and yet not so large, that profuse bleeding will follow, in extracting them.

Cool and dry weather should be chosen for performing these operations. In such weather, the wounded parts will generally soon stop bleeding; whereas, if the weather is warm and moist, profuse bleeding sometimes takes place, which results in the injury or death of the lamb.

The flock should be brought to their stalls, without hurrying, so that the lambs may not be overheated.

* In Hungary, Merino ram lambs, are usually castrated and docked in their eighth week, if the weather be favorable.—[C. L. Fleischman.]

After a lamb is caught, it should be held for a little time, until the agitation is over. It is then to be held at a convenient height for the operator. The assistant should be in a sitting position, and placing the back of the lamb upon his knees, should draw the hind legs of the lamb towards him, so that the scrotum may be fully exposed for the operator. The operator should then cut off about one-third or one-fourth part of the scrotum; that is, only so much of the end of it should be cut off, that each testicle may pass out. He should then start the testicle, by means of his thumb and fore fingers, pressing on the abdomen with his other fingers.

Next, cut a slit through the film which envelopes the testicle, and slit off the side ligament from it; then draw the testicle slightly, and cut off the blood vessels and spermatic cord, about half an inch above the testicle. The generative organs of young lambs are not active, and no danger from bleeding will ensue, by cutting off the blood vessels. Cutting them off will be less painful to the lamb than pulling them out; and it should be remembered, that lock jaw is sometimes produced, by performing this operation with unusual violence, and by means of twisting. A little experience will show how much of the scrotum it will be necessary to cut off; and care should be used not to cut too much of it off; for when too large a portion of it is taken off, the inflammation sometimes extends into the bowels, and causes the death of the lamb.

After the testicles are removed, the necessary ear marks should be put upon the lamb, and the tail should be cut off. For this purpose, lay the tail upon a block of wood, and cut it off with a chisel and mallet, or with an axe, which is a very convenient tool for this purpose. It should be cut off, so as to leave it only one or two inches long. The blood which flows, by marking the ears, and cutting the tail, undoubtedly contributes to prevent too violent inflammation in the scrotum; and, for that reason, docking and ear marking should be deferred until castration is performed. Docking promotes cleanness of the wool, and ewes, which have been docked, are not liable to lose their lambs, by their being entangled by the tail; an accident which happens to long tailed ewes, oftener than most persons are aware of.

At the conclusion of the castration and docking, an ointment, made of one part tar or spirits of turpentine, and four or five parts of lard or oil, well mixed, should be applied to the mutilations of the scrotum and tail. This ointment will promote healing of the parts mutilated, and will effectually keep off flies. Pure tar, (without grease,) should not be used for this purpose.

The lambs should be put out of the enclosure as fast as each has passed the operations; and should be kept quiet for an hour or two, until the blood has stopped flowing, and becomes concreted on the parts affected. After which they may be moved off slowly to their pasture, if it is not far distant. But, if convenient, they should not be moved far within a day or two after castration. If the weather be cold and wet, the lambs should have the benefit of shelters, till they are perfectly well.

CASTRATION OF OLD RAMS.

The following is a very safe and convenient mode of castration: Apply iron clams firmly to the scrotum, near the testicles; then sear off or cut off the scrotum, with the same iron; and sear the cords and blood vessels with the same iron; after which spread over the wound a quantity of tar made hot with the same iron. The searing with the hot iron prevents any flow of blood, and the tar heals the wound, and keeps off flies.

The following is also a safe mode of castration, but not so convenient as the foregoing:

On each side of the scrotum, cut a slit for each testicle through the film which envelopes each testicle, cutting from the lower end of the scrotum upward just so far as will be sufficient, in order to extract the testicle, and no farther; then slip the testicle out of its envelope, and carefully slit from it the ligament which adheres to it on its side, cutting close to the testicle as far as this ligament extends; after which, pull out the blood vessels and spermatic cord, together with the testicle. If the blood vessels are pulled out, there will be no danger of the animal's bleeding too much—the internal wounds, made by lacerating the blood vessels, will heal by the first intention, and the scrotum will be healed in the course of two or three weeks. But the blood vessels should not be cut off with a knife;

for in such case, there will be danger of excessive bleeding.

Castrated rams should be examined from time to time. In four or five days after castration, if the scrotum appears inflamed, and suppuration does not appear to progress, as it should do, it should be washed out, and the finger should be passed into it, and all clotted blood or other foul matter, should be extracted by the finger; a little fine salt should then be sprinkled into each of the wounds. This will cause suppuration to progress, and healing will take place in due time.

If flies are troublesome, a little finely pulverized charcoal or sulphur should be sprinkled into the wounds, or an ointment composed of one part spirits of turpentine or tar, and ten parts lard, may be applied round the edges of them; either mode will keep off flies. If maggots get into the scrotum, they should be probed out, or extracted by the finger; otherwise the irritation and inflammation, which they will create, will extend up into the bowels, so as to cause the death of the animal.

Tar, in its pure state, should never be applied to the edges of the wounds of the scrotum of rams, which are castrated in this manner; it prevents the suppuration, which is necessary to the proper closure of the wound.

CUTTING OFF HORNS.

The most suitable time for this operation is, in spring or fall, when the weather is neither very warm nor very cold, and when flies are least troublesome.

They may be sawed off most conveniently with an ordinary fine-toothed hand-saw, at the distance of two or more inches from the skull. After they are sawed off, and after the blood has, in some measure, ceased to flow, tar and grease, or tar alone, should be applied to the stumps of the horns, and bandages of linen or cotton cloth should be put over each of them, and tied on, so as to keep off the flies, and keep out the air. The tar will generally heal them, without any other application. But they should be examined from time to time, and if the marrow does not heal, and fungus flesh arises within the pith of the horn, which may be known by a thin glairy running from it, equal parts of sugar of lead and burnt alum, dissolved in water, should be syringed into the hollow of the horn: after which, drop

a little pulverized white lead into it. This operation should be repeated twice or three times daily, until the horn appears to be dried up and healed.

Some persons, after cutting off the horn, plug up the hole, in the end of the stump of the horn, with a smooth wooden plug. This excludes the air, until the internal parts are healed. This plan has been used successfully.

SECTION LV.

OF POISONS.

ANIMAL POISONS.

"Not unfrequently sheep are bitten by snakes. As the wound inflicted by these reptiles is very small, the injury is never perceived till the poison has entered into the system. Sheep are often observed to be sickly, and to swell. These symptoms are often attributed to braxy and rot, when, in reality, an adder or a viper has occasioned the mischief.

"When it is suspected that a sheep has been bitten by a snake, doses of oil should be given, or, if at hand, small, but frequent doses of volatile salts (ammonia) mixed with water."—(Sir G. S. McKenzie.)

The wool or hair should be cut off round the wound, which should then be well washed with warm water, and oil should be rubbed into it; or a plaster of hog's lard and pulverized charcoal should be bound on to it; repeating these applications at intervals of three or four hours.

New milk, fed to the sheep several times daily, has been found to be an effectual remedy for snake-bites.—(T. Noble.)

VEGETABLE POISONS.

As a general rule, the use of poisonous articles, as medicines for sheep or other animals, should be avoided when possible. They are more or less dangerous to persons and

animals, and are seldom needed by the sheep as internal medicine.

The effects of poisons should be known, that they may be avoided. With this view, an abstract is made, from sundry authors of an account of sundry poisons, their effects, and the remedies used for them.

Mountain Laurel, (Kalmia.) The leaves of this shrub are highly poisonous to sheep, and in man, a small portion of them has produced vertigo and convulsions. There are two species of this Plant.

Broad-leafed Laurel, (Kalmia Latifolia,) grows to the height of 8 or 9 feet—blossoms in June or July—the blossoms are white, tinged with red.

Narrow-leafed Laurel, (Kalmia Angustifolia,) called also Ivy, or Lamb Kill, is a low shrub—grows from three to five feet high—blossoms in June or July—blossoms are reddish variegated.

Symptoms. When Laurel has been eaten by sheep, they appear dull and stupid; swell a little, and are constantly gulping up a greenish fluid, a part of which trickles out of their mouths and discolors their lips.

Treatment. One gill of cow's milk (new milk is the best,) should be sweetened with molasses, and turned down the throat of each sheep; it will shortly operate as an emetic, when the animal will be relieved. Repeat the dose, if necessary.

Also, a gill of hog's lard, given in the same manner, will have a similar effect—repeat the dose as may be necessary.—(Cultivator.)

Also, strong whiskey, or whiskey and molasses, are first rate remedies. These remedies have been fully tested by drovers in passing the Allegheny mountains.

Cherry Trees. The leaves, twigs, and kernels of the fruit of the various species of Cherry—such as the Common Red and English cherries, (Prunus Cerasus,) and the wild red, (Prunus Virginiana,) and black cherry, (Prunus Nigra,) are all poisonous, on account of the Hydrocyanic, or Prussic acid, which they contain.

Peach Tree. The leaves and flowers of the peach tree, and kernels of the peach stone, are also poisonous, on account of the Prussic acid which they contain. Sheep and cattle are frequently poisoned by feeding upon the leaves

of the cherry tree, and, also, sometimes by those of the Peach.

Symptoms. They stagger about, and tumble upon their heads.

Treatment. Ammonia was found by Mr. John Murray, of London, to be one of the best remedies for the poisonous effects of the Prussic acid. He administered fatal doses of it to animals, and immediately applied ammonia to their nostrils. They invariably recovered.

Animals, which have been poisoned by eating cherry or Peach tree leaves, should be treated as if poisoned by the Prussic acid.

If ammonia is administered to animals thus poisoned, it should be applied to their nostrils, or rubbed upon them. It is very acrid, and should not be given internally.

Saint Johnswort, (Hypericum,) if eaten freely by sheep, produces inflammation of the bowels, and is frequently fatal to lambs, and sometimes to full grown sheep. It also produces an irritation of the skin, and a species of scab about the mouth and nose, which sometimes extends over the body and legs.

Treatment. Administer a purgative of linseed oil or hog's lard; anoint the irritated parts with an ointment of lard, sulphur, and tar, as for scab.

Prevention. Feed common salt combined with a large proportion of gypsum and tar.

Groundsel, or Ragwort, (Senecio obovatus,) is a native of the State of New York, and is said to have proved a deadly poison to sheep.—(Silliman's Journal.)

Wake Robin, (Arum Maculatum.) Flocks have been poisoned by this plant in England, where pastures were so short from drouth, that sufficient feed could not be otherwise obtained.—(Cultivator.)

Juniper. The common juniper does not seem to act as a poison; but Mr. E. B. Brown, of Mystic, Connecticut, found, that when his sheep pastured freely upon juniper bushes, their wool fell off.—(Cultivator.)

Sabine, (Juniperus Sabina.) This well known poison produces abortion.—(Beck's Med. Jurisprudence.)

Tobacco. When a strong decoction of tobacco is applied externally, either to man or beast, it produces giddiness,

retching, and vomiting. If used for killing ticks, the decoction should be weak.

Wind Flower, (Anemone.) The various species of this plant are poisonous, Anemone nemorosa, wind flower of the woods, produces dysentery in sheep.—(Beck's M. J.)

Ergot, or Spurred Rye, is a highly poisonous article. It produces, in mankind, gangrene of the hands and feet, and sometimes of the nose ; and is sometimes accompanied with spasmodic symptoms. It produces abortion; and, therefore, rye, or ground provender, which contains much of this article, should be withheld from sheep, and other animals.—(Beck.)

Diseased Wheat. When the farinaceous part of this grain becomes converted to a black powder, it produces colic and diarrhœa. Oats and Indian corn, similarly diseased, will, doubtless, be equally injurious. All such diseased grains should be withheld from sheep.

Treatment. As a general rule, purgatives should be administered, when sheep are poisoned by vegetables. For this purpose, two or three ounces of linseed oil, or melted hog's lard, should be given at a dose. If necessary, repeat the doses. For this purpose, oils will be preferable to alkaline salts.

MINERAL POISONS.

Arsenic. This well known poison should never be used for killing ticks. It is sometimes absorbed by the skin, so as to destroy the sheep.—(W. C. Spooner.)

Mercury. The use of mercurial preparations, by anointing, is injurious to fattening sheep ; it also sometimes makes the wool peel off; and they are sometimes salivated and destroyed by it, when exposed to cold and moisture.

Acetate of Lead, (Sugar of Lead,) taken internally, produces vomiting, weakness and stiffness of the legs preceding death ; but is less poisonous than red lead and white lead.

Sulphat of Copper, (Blue Vitriol,) taken internally, one ounce produces colic, convulsions, death ; should never be used internally as medicine for sheep.

Sulphat of Iron, (Copperas,) is also a strong poison. One-fourth of an ounce was found sufficient to kill a dog in 26 hours. It is used by physicians, in doses of from three

to five grains, to affect the genital organs of mankind. Sheep need no such medicine internally.

Nitrate of Potash, (Salt-petre.) This is also a strong poison; an ounce is sufficient to destroy the life of a man; an over dose produces abortion in females. In small doses, it is cooling and diuretic. It is useful to the sheep only in case of acute inflammatory diseases. Dose, one-eighth to one-half a drachm.

SECTION LVI.

A LIST OF MEDICINES

EMPLOYED IN THE TREATMENT OF THE DISEASES OF SHEEP.

Alum. As an external application, it is useful as a wash or lotion, when applied to the mouth, in several of its diseases, and also mixed with chalk, it makes a good external application to sores.

Burnt Alum, is a safe, convenient, and useful antiseptic and caustic remedy, when applied to fungus flesh, in ulcers, in foot rot, or any other cases.

Ammonia, (or volatile spirits of hartshorn,) is a strong stimulant, and has been found useful when poisonous substances have entered the stomach, as the Prussic acid, and in snake bites,

Antimony, Chloride of, (or Butter of Antimony,) is a useful caustic in cases of foot rot, or fnngus flesh in other cases.

Borax, is cooling, astringent, and detergent; useful in cases of thrush and foul ulcers.

Camphor, is a narcotic, sedative, and anti-spasmodic remedy; dose, one scruple to a drachm. It is also used with oil, or spirits of wine, as an external stimulant.

Chalk, is an absorbent, and slightly astringent earth; is very useful in correcting acidity of the stomach, and as an external application to wounds and sores in some cases.

Copper, sulphat of, (Blue Vitriol,) externally is a mild caustic, when applied to fungus flesh: should never be used internally.

Epsom Salts, (Sulphat of Magnesia.) An excellent purgative, in doses of from one to two ounces, or more, dissolved in warm water or gruel.

Gentian. A useful vegetable tonic; dose from one to three drachms.

Ginger. A useful cordial and stomachic medicine; dose, from half a drachm to two drachms. It is very commonly given with aperient medicine, which it secures from griping.

Ipecachuana. This acts as a stimulant to the stomach. In repeated small doses it is useful in dysentery.

Horse Castor, is a powerful antispasmodic remedy, in cases of Epilepsy, &c.—(See page 328.)

Laudanum. See Opium.

Lead Aceate, (Sugar of lead.) This article, when dissolved in water, or water with a small proportion of vinegar, is a useful application, in

superficial inflammations, in diseases of the skin, and in bruises, ulcers, or wounds. Where there is fungus flesh in wounds or ulcers, alum, or burnt alum in small proportions, is used advantageously, when dissolved along with sugar of lead.

Lead, White, is a useful application for the prevention of the fly, and for superficial inflammations.

Lime Water, or chalk water, is sometimes applied to ill-conditioned sores, and operates as an astringent.

Lime, Chloride of, A valuable antiseptic, and an excellent application to foul and offensive wounds and ulcers; also, useful as a means of preventing infections.

Linseed oil. A safe and useful purgative; dose, from one to two ounces.

Muriatic Acid. A powerful caustic, useful in foot rot.

Opodeldock, Is made by dissolving half an ounce of hard soap, and half an ounce of camphor in one pint of spirits (alcohol); is useful for bruises, strains, and rheumatism.

Olive oil, A gentle laxative and purgative; dose one to two ounces; useful as an external application in cases of burns, or bites of venomous insects or snakes.

Opium. A valuable antispasmodic and sedative. It may be used, either in the form of a gum, or powder; dose, ten grains. It is more usually given in the form of tincture of opium (laudanum); dose, one to three scruples. In diarrhœa or dysentery, it allays pain, and diminishes the increased action of the bowels, and is useful either alone, or joined with other medicines.

Pimento, (Allspice.) A useful cordial and stomachic; dose, one to two drachms.

Rhubarb. Besides its purgative qualities, it possesses considerable astringent powers, which render it useful in diarrhœa.

Salt, Glauber's, (Sulphat of Soda,) is a mild and effectual purgative; dose, one to two ounces.

Salt, Common, [Chloride of Sodium,] in moderate quantities, is tonic and stomachic; in large doses it is a useful purgative, but not so mild as Epsom salts; dose, one ounce; a solution of it applied externally, is a powerful discutient.

Sulphur, operates as a purgative, and promotes insensible perspiration, dose, one to two ounces, when used alone. It is very efficacious in scab; and other diseases of the skin.

Sulphuric Acid, [Oil of Vitriol,] A powerful caustic, useful in foot rot, alone, or combined with tar.

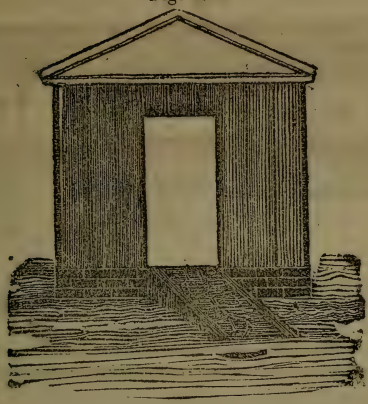
Tar, A useful application to the feet, in cases of foot rot, or cases resembling it, either alone, or when combined with burnt alum, or sulphuric acid, or other caustics; is valuable in the cure and prevention of dropsy and coryza. A small proportion of tar, with lard or oil, is a good stimulant to wounds, and is usefully applied in this manner, to wounds made in sheep-shearing, or for the fly.

Turpentine, oil, or spirits of, is a powerful stimulant and antispasmodic given internally; dose, one drachm; externally, in small quantities, is a useful application to wounds or sores, or to prevent the attack of the fly.

Yeast, is a cooling, antiseptic, purgative remedy, useful in cases of obstinate constipation; dose, half a pint to a pint, mixed with an equal quantity of lukewarm water.

ERRATA.—Page 359—lines 3, 7, 9, 9—For Œstris read Œstrus.

Fig. 3.



ENTRANCE TO A SHEEP STALL.

At Von Thaer's sheep fold, in Germany, the sheep enter each door, by passing up an inclined path, which is of the same width as the door, the object of which is to prevent ewes in a state of pregnancy from being pressed against the sides of the door, on entering the stable. The door is about one foot from the ground; to it leads the inclined path, as seen in the above figure, and this path holds just as many sheep, as there are spaces between the door posts. Should a sheep force its way to the door, it will displace another on the side, which has to jump off and take its turn with the rest; whereby no injury is done to ewes in a high state of pregnancy.—[C. L. Fleischman.]

SHEEP GATES.

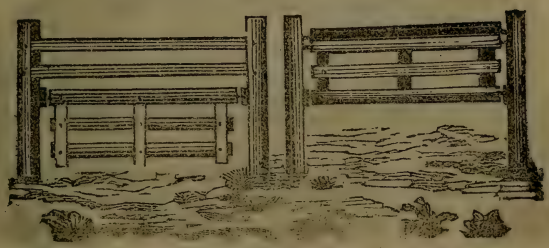
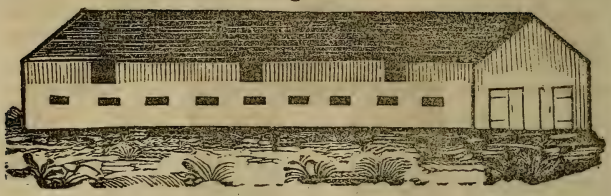


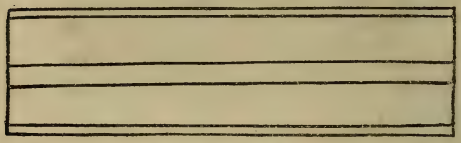
Fig. [illegible]

Fig. 1.



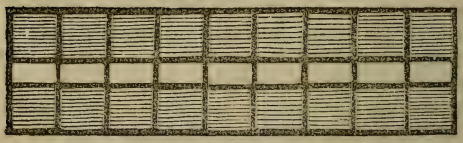
SHEEP BARN.

Fig. 2.



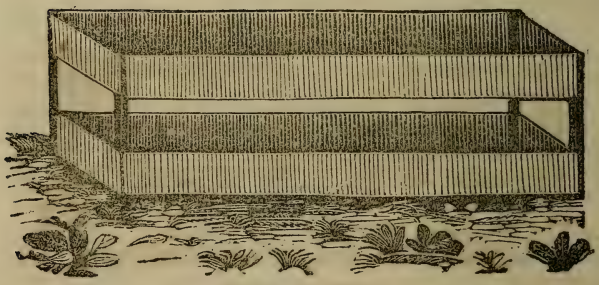
GROUND ROOM.

Fig. 3.



HAY LOFT.

Fig. 4.



SHEEP MANGER.

DESCRIPTION OF A SHEEP BARN AND MANGER.

FIG. 1.—A sheep barn—100 feet long, by 28 or 30 feet wide; height to the eaves, 16 feet, and framed with posts and beams, each bent of which stands 11 feet apart; the beams are supported by 2 posts standing 3 feet apart in the middle of the barn, so as to leave room for mangers or racks between them—windows on the sides, and two doors at each end, so that a sled or wagon may pass through it for removal of the manure. In Germany, "the oblong form is found the best" for sheep barns.—[C. L. Fleischman.]

FIG. 2—Shows the plan of the ground room, and the disposition of the mangers or racks—one on each side of the barn, the entire length of it, and one broad one in the centre, at which two rows of sheep can feed. The ground room may be conveniently divided into four apartments, by moveable cross partitions. In this plan the disposition of the mangers or racks is similar to the most approved German mode.

FIG. 3.—A view of the upper or hay floor, with an opening through it, about two feet in width, the entire length of the barn. Before the barn is filled, this vacant space in the upper floor is covered over with boards. After the barn is filled, a gash is cut in the hay, about two feet in width, directly over the opening in the hay floor, and the temporary boards placed over it, are removed, so that the fodder may be thrown from the loft into the centre mangers or racks, and thence be distributed as may be necessary. The gash in the mow also operates as a ventilator. Around the entire barn dog proof yards may be placed, so as to accommodate each division of the flock.

FIG. 4.—A sheep manger, in the form of a parallelogram. The four upright posts at each corner, may be about 3 inches square, and about 3 feet high, and standing at each end about 2½ or 3 feet apart. To these may be nailed, at the bottom, boards 10 or 12 feet long, and about 12 or 14 inches wide, and the upper boards may be 10 or 12 inches wide so as to leave a space between them, 8 or 10 inches wide, and suitable to the size of the sheep. For lambs, the space between the boards may be 2 or 3 inches less.

Composition of sundry animal substances of which 100 parts contain as follows:

	Carbon.	Oxygen.	Hydrogen.	Nitrogen.	Ashes.
Beef, (dried)	51.83	21.37	7.56	15.01	4.23
Ox blood, (dried)	51.95	21.39	7.17	15.07	4.42
Hog's lard,	79.09	9.75	11.14		
Mutton Fat,	79.99	9.30	11.70		
Sugar of Milk,	40.46	52.93	6.61		
Curd,	59.78	11.46	7.42	21.38	
Gelatin,	47.08	27.04	7.09	16.09	

Composition of Horny Tissues, according to the analysis of Scherer:

	Carbon,	Hydrogen.	Nitrogen.	Oxygen and Sulphur.
Hair of the head				
of man, fair,	49.39	6.57	17.93	26.14
do. brown.	50.62	6.61	17.93	24.82
do. black,	46.93	6.54	17.52	25.49
Hair of the beard				
of man,	51.52	6.68	17.93	23.84
Wool (of the sheep)	50.65	7.02	17.71	24.60
Buffalo Horn,	51.99	6.71	17.28	24.00
Quill of a feather,	52.42	7.21	17.89	22.46
Beard of a feather,	50.43	7.11	17.68	24.77

Temperature of the blood and frequency of the pulse of sundry animals, according to Prevost and Dumas.

The mean temperature is—		Of the pulse in a minute.	Of the respirations in a minute.	
Man,	98.0	72	18	
Horse,	98.2	56	16	
Dog,	99.3	90	28	
Goat,	102.5	84	24	
Sheep, (3 y'r old)	103.	90	30	(Canfield.)
Common fowl,	106.7	140	30	
Duck,	108.5	170	21	
Lark,	117.2	200	22	

Composition of sundry Vegetable substances—100 parts of each article contain as follows:

	Carbon.	Oxygen.	Hydrogen.	Nitrogen.	Ashes.	Water.
Woody Fibre of						
Oak, (dried)	49.40	44.40	6.00		0.20	
Hay dried at 212°,	45.08	38.07	5.00	1.05	9.00	
Grain of Oats, do.	51.97	37.43	6.27	1.74	2.58	
do Wheat do.	45.78	44.16	6.79	2.09	1.18	
Wheat straw do.	46.37	43.73	5.68	0.20	4.02	
Starch,	44.91	48.98	6.11			
Sugar,	42.47	50.63	6.90			
Gum,	42.23	50.84	6.93			
Rosin,	75.94	13.34	10.72			
Olive oil,	77.21	9.43	13.36			
Potatoes, (dried)	44.01	43.51	5.08	1.50	5.08	
Peas,	35.74	35.96	5.40	3.40	3.49	16
Beans,	38.24	34.10	5.84	4.00	3.71	14.11

The annexed quantities of ashes are contained in 1000 lbs. of the dry hay of each of the following grasses:

	Rye Grass.	Red Clover.	White Clover.	Lucern.	Sainfoin.
Potash,	8.81	19.95	31.05	13.40	20.57
Soda,	3.94	5.29	5.79	6.15	4.37
Lime,	7.34	27.80	23.48	48.31	21.95
Magnesia,	0.90	3.33	3.05	3.48	2.88
Alumina,	0.31	0.14	1.90	0.33	0.66
Oxyd of iron,			0.63	0.30	
Silica,	27.72	3.60	14.73	3.30	5.00
Sulphuric acid,	3.53	4.47	3.53	4.04	3.41
Phosphoric do.	0.25	6.57	5.05	13.07	9.16
Chlorine (or muriatic acid),	0.06	3.62	2.11	3.18	1.57
	52.86	74.77	91.32	95.66	69.57

According to the analysis of Sprengel, 1000 lbs. of the grain or dry straw of each kind of grain here mentioned, contain ashes and ingredients each as follows:

	Wheat.		Oats.		Barley.		Rye.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
Potash,	2.25	0.20	1.50	8.70	2.78	1.80	5.32	0.32
Soda,	2.40	0.29	1.32	0.02	2.90	0.48		0.11
Lime,	0.96	2.40	0.86	1.52	1.05	5.54	1.22	1.78
Magnesia,	0.90	0.32	0.67	0.22	1.80	0.76	0.44	0.12
Alumina,	0.26	0.90	0.14	0.06	0.25	1.46	0.24	0.25
Oxyd of iron,	a trace		0.40	0.02	a trace	0.14	0.42	
Oxyd of manganese,				0.02		0.20	0.34	
Silica,	4.00	28.70	19.76	45.88	11.82	38.56	1.64	22.97
Sulphuric acid,	0.50	0.37	0.35	0.79	0.59	1.18	0.23	1.70
Phosphoric do.	0.40	1.70	0.70	0.12	2.10	1.60	0.46	0.51
Chlorine,	0.10	0.30	0.10	0.05	0.19	0.70	0.09	0.17
	11.77	35.18	25.30	57.40	23.49	52.42	10.40	27.98

Analysis of the Leaf and Stalk of the Oat, by M. Fromberg, showing the inorganic ingredients contained in it, at various periods of its Growth.

Day of the month received.	June 4.		June 11.		June 18.		June 25.		July 2.		July 9.		July 16.	
	leaf.	stalk.	leaf.	stalk.	leaf.	stalk.	leaf.	stalk.	leaf.	stalk.	leaf,	stalk.	leaf.	stalk.
Potash and soda,	24.60	24.94	23.51	21.45	26.21	24.69	28.10	28.86	18.78	36.26	16.09	30.10	18.35	42.43
Chloride of sodium,	16.34	32.66	13.54	34.65	11.30	24.94	7.56	24.57	7.92	11.63	4.09	17.82	0.30	4.46
Lime,	8.44	2.40	7.24	4.22	7.33	3.74	6.74	2.42	6.91	2.64	5.93	1.60	5.13	4.12
Magnesia,	5.33	0.88	3.11	3.20	3.47	2.20	3.06	2.58	2.39	1.17	2.35	2.27	1.63	1.47
Oxide of Iron,	0.61	0.39	0.52	0.30	0.72	0.40	0.99	0.58	0.40	0.88	0.34	0.63	0.55	0.62
Sulphuric acid,	11.74	6.15	12.85	7.82	10.59	8.51	7.88	4.87	9.50	7.98	6.45	9.09	13.05	7.84
Phosphoric acid,	16.16	16.15	10.57	13.96	10.12	12.55	8.76	7.81	6.92	2.21	6.44	5.57	2.91	6.31
Silica,	16.58	16.29	28.54	14.32	30.31	20.41	36.50	28.08	47.62	36.64	58.28	32.39	58.25	34.85
	99.80	99.86	99.83	99.92	100.05	99.24	99.29	99.77	100.14	99.97	99.97	99·52	100.14	100.33

NOTE.—The growth of Oats is similar to that of grasses of rapid growth; and the large quantities of alkalies and alkaline salts, particularly chloride of sodium, [or common salt] which is contained in them, in the early stages of their growth, sufficiently accounts for their relaxing properties, at that period, and the propriety of feeding salt moderately at that stage of their growth; and the very small quantity of common salt contained in the oats on the 16th of July, at which time the grain was formed, but not ripe, shows the propriety of feeding an increased proportion of salt to animals feeding upon hay, which is cut after the grasses have attained the same degree of maturity. Also, it appears that common salt acts an important part as well in the growth of vegetables as in the nutrition of animals; in fact, the digestion of the carbon is accomplished, both in animals and vegetables by means of the same ashes; that of animals being performed in the stomach, and that of vegetables in their leaves; and the carbon is deposited, both in animals and in vegetables, in the form of cells which are very similar in each of them.

Composition of the Ashes of Heath Grass and of horse-tail grasses—1000 lbs. of the dried hay of each of these grasses contain as follows:

HORSE-TAIL GRASSES.		HEATH GRASS.	
Sulphat of Potash,	12.00	Sulphat of Potash,	5.00
Chloride of Potassium,	11.40	Chloride of Potassium,	1.20
Silica,	50.00	Carbonat of Potash,	6.80
Carbonat of Lime,	6.20	Silica,	37.50
Sulphat of Lime,	14.40	Carbonat of Lime,	28.00
Phosphat of Lime,	2.20	Phosphat of Lime,	13.00
Magnesia,	3.00	Magnesia,	1.20
		Oxyd of Iron.	1.40
	99.20	do. Manganese,	6.10
			94.20

NOTE.—All grasses were designed for the use of such graminivorous animals as they are adapted for; therefore, it may be noticed, that in the ashes of horse-tail grasses, besides a large proportion of sulphat of lime, there is also a large proportion of sulphat of potash, which is a powerfully antiseptic salt, and was doubtless placed in these grasses, in addition to the sulphat of lime, in order to neutralize the injurious influence of the form of the leaves of these grasses.

The ashes of the Seed and Straw of the field bean and field pea, dried in the air, contain in 1000 parts of each, as follows:—

	FIELD BEAN.		FIELD PEA.	
	Seed.	Straw.	Seed.	Straw.
Potash,	4.15	16.56	8.10	2.35
Soda,	8.16	0.50	7.39	
Lime,	1.65	6.24	0.58	27.30
Magnesia,	1.58	2.09	1.36	3.42
Alumina,	0.34	3.10	0.20	0.60
Oxyd of Iron,		0.07	0.10	0.20
Oxyd of Manganese,		0.05		0.07
Silica,	1.26	2.20	4.10	9.96
Sulphuric Acid,	0.89	0.34	0.53	3.87
Phosphoric Acid,	2.92	2.26	1.90	2.40
Chlorine,	0.41	0.80	0.38	0.04
	21.36	31.21	24.64	49.71

The Turnip, Carrot, and Potatoe, each, as they are carried from the field, contain respectively in 1000 lbs., as follows:

	TURNIPS.		CARROTS.	POTATOES.	
	Roots.	Leaves.		Roots.	Leaves.
Potash,	23.86	32.03	35.33	40.28	81.09
Soda,	10.48	22.02	9.22	23.34	0.09
Lime,	7.52	62.00	6.57	3.31	129.07
Magnesia,	2.54	5.09	3.84	3.24	17.00
Alumina,	0.36	0.03	0.39	0.50	0.04
Oxyd of Iron,	0.32	1.07	0.33	0.32	0.02
Oxyd of Manganese,			0.60		
Silica,	3.88	12.08	1.37	0.84	49.04
Sulphuric Acid,	8.01	25.02	2.70	5.40	4.02
Phosphoric Acid,	3.67	9.08	5.14	4.01	19.07
Chlorine,	2.39	8.07	0.70	1.60	5.00
	63.03	180.09	66.19	82.83	308.04

ANALYSIS OF SUNDRY SOILS, BY SPRENGEL.

(A.) Surface soil of a mountainous district in the neighborhood of Ohio. (B.) Analysis of the subsoil. This soil is also distinguished for its great fertility.

	A.	B.
Silica, with fine Silicious sand,	87.14	94.26
Alumina,	5.66	1.37
Peroxide and protoxide of Iron,	2.22	2.33
Peroxide of Manganese	0.36	1.20
Lime,	0.56	0.24
Magnesia,	0.31	0.31
Potash, (principally combined with silica,)	0.12 }	0.24
Soda,	0.25 }	
Phosphoric acid,	0.06	a trace
Sulphuric acid,	0.02	0.30
Chlorine,	0.03	a trace
Humus soluble in alkalies,	1.30	
Humus,	1.07	
Carbonat of lime,	0.08	
Nitrogenous organic matter,	1.01	
	100.00	100.00

Analysis of a very fertile alluvial soil from Honigpolder in Germany. No manure had been applied to it. Wheat has been raised on this land for 70 years without manuring; it is occasionally left fallow. One hundred parts of the earthy portion of this soil contained as follows:

Silica and fine Silicious sand,	64.80
Alumina,	5.70
Peroxide of Iron,	6.10
do Manganese,	0.09
Lime,	5.83
Magnesia,	0.84
Potash, principally in combination with Silica,	0.21
Soda idem,	0.39
Phosphat of Lime,	0.43
Sulphat of Lime,	0.21
Chlorine (in common salt)	0.20
Carbonat of Lime,	3.92
Humus soluble in alkalies,	2.54
Humus,	5.60
Nitrogenous matter,	1.58
Water,	1.50
	100.00

Surface soil, of alluvial land in Ohio, remarkable for its great fertility. One hundred parts consisted of—

Silica and fine Silicious sand,	79.53
Alumina,	7.30
Peroxide and protoxide of Iron (much magnetic iron sand,)	5.82
Peroxide of Manganese,	1.32
Lime,	0.61
Magnesia,	1.02
Potash, (principally combined with Silica,)	0.20
Soda,	0.02
Phosphoric acid, (combined with lime and oxyde of iron,)	1.77
Sulphat of lime,	0.12
Chlorine,	0.03
Humus soluble in alkalies,	1.95
Nitrogenous organic matter,	0.23
Wax and resinous matter,	0.02
	100.00

(A.) Analysis of a barren heath soil from Aurich, in Ost Frieland.—(B.) A sandy soil containing much humus, but also sterile (C.) A sandy soil possessing the same characters:

	A.	B.	C.
Silica and coarse silicious sand,	95.77	85.97	96.72
Alumina,	0.32	0.32	0.37
Peroxide aud protoxide of Iron,	0.40	0.44	0.48
Peroxide of Manganese,	a trace	a trace	a trace
Lime,	0.28	0.16	
Magnesia,	0.06	0.24	0.08
Soda,	0.03	0.01	0.03
Potash,	a trace	a trace	a trace
Phosphoric acid,	a trace	a trace	a trace
Sulphuric acid,	a trace	a trace	a trace
Chlorine in common salt,	0.05	0.01	0.05
Humus,	0.76	0.63	0.80
Vegetable remains,	2.30	8.20	1.45
	100.00	100.00	100.00

REMEDY FOR THE FOOT ROT.

A new remedy for the foot rot has been tried, with signal success, on the extensive flocks of Humphrey Howland, Esq., of Cayuga county, N. Y., and the continued application of the remedy has wholly removed the disease from his flocks, so that not a solitary case remains; and so simple and effectual is the remedy, that had it been applied at the commencement of the disease, it would have saved him several thousand dollars.

The remedy is now in use for the second season, during which time, the foot rot has diminished from thirty per cent to one per cent. Other flocks in the neighborhood, to which the remedy has not been applied, are as badly afflicted as ever.

The remedy consists in mixing flour of sulphur with the salt given to the sheep, in a proportion just sufficient to discolor the salt or about one-twentieth part. They are regularly and constantly fed with this mixture through the whole season.—(Cultivator for October, 1848.)

Gypsum contains sulphur; hence the feeding of it to sheep possibly may be as useful as the pure sulphur in cases of foot rot.

The rationale of the operation of sulphur in cases of foot rot appears to be, that foot rot is produced by morbific matter which is generated in the skin or which is applied to it externally and is absorbed into it, between the hoofs or near them; sulphur opens the pores of the skin and excites it into action, so as to expel the excrementitious matter, and nature restores the parts affected.

Buckwheat is a kind of grain which powerfully stimulates the skin, and being a very wholesome grain for sheep,* may be useful along with sulphur in diseases of the skin.

*See page 232.

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