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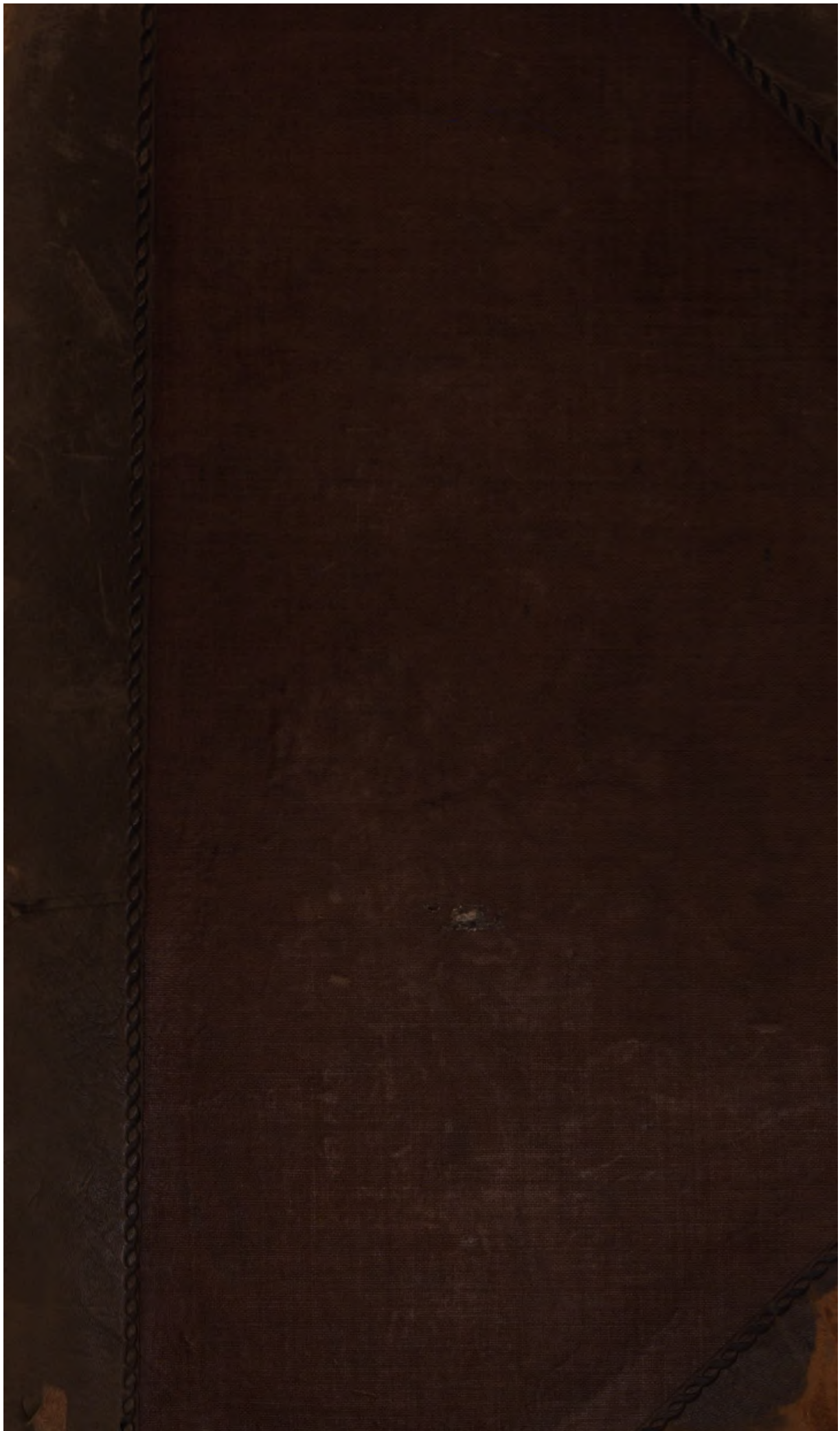
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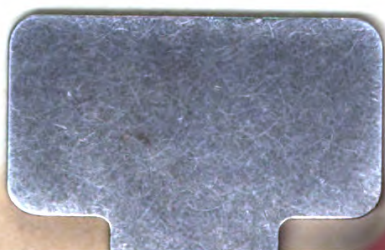


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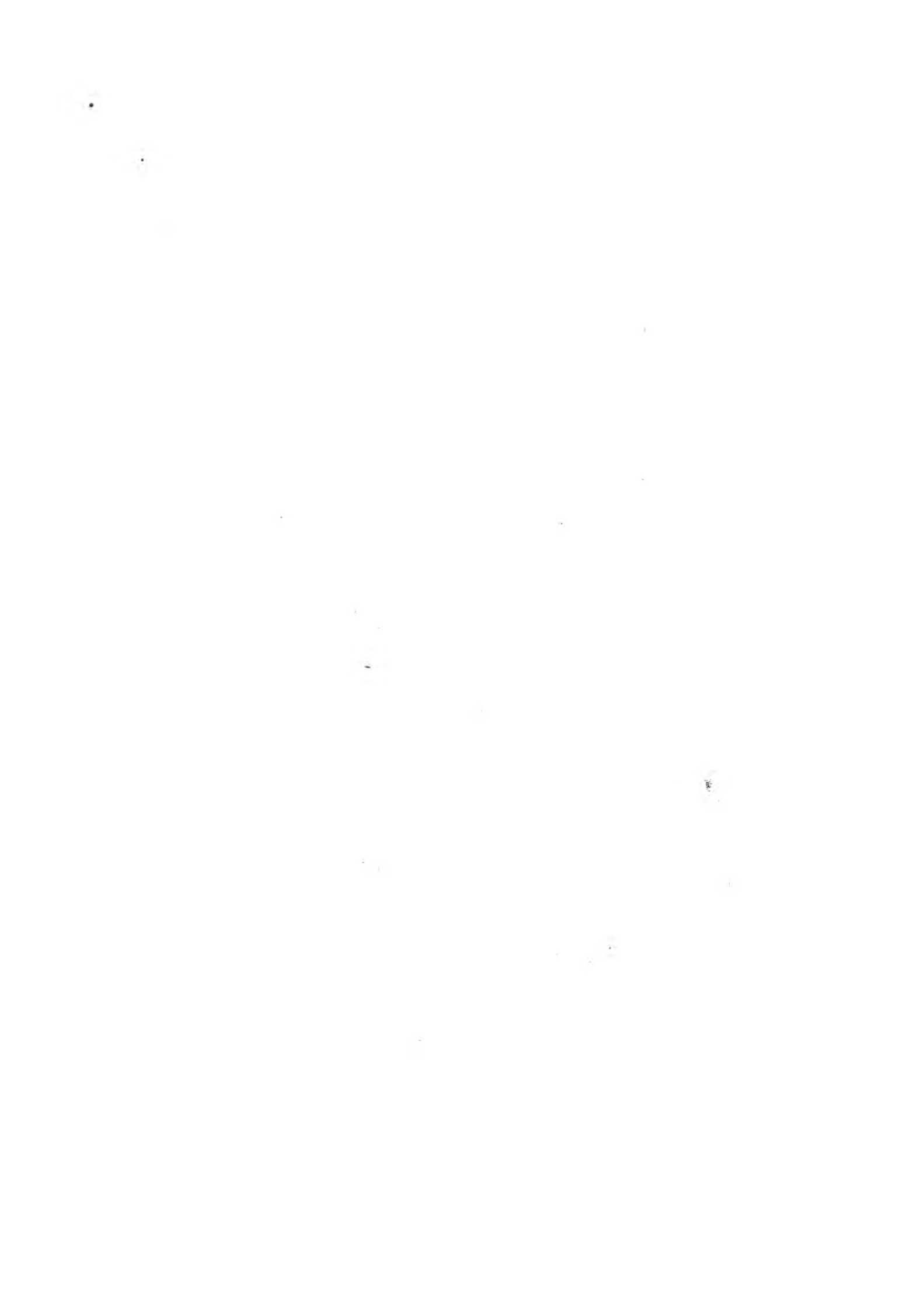
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AN
ECONOMICAL HISTORY
OF THE
HEBRIDES
AND
HIGHLANDS OF SCOTLAND:

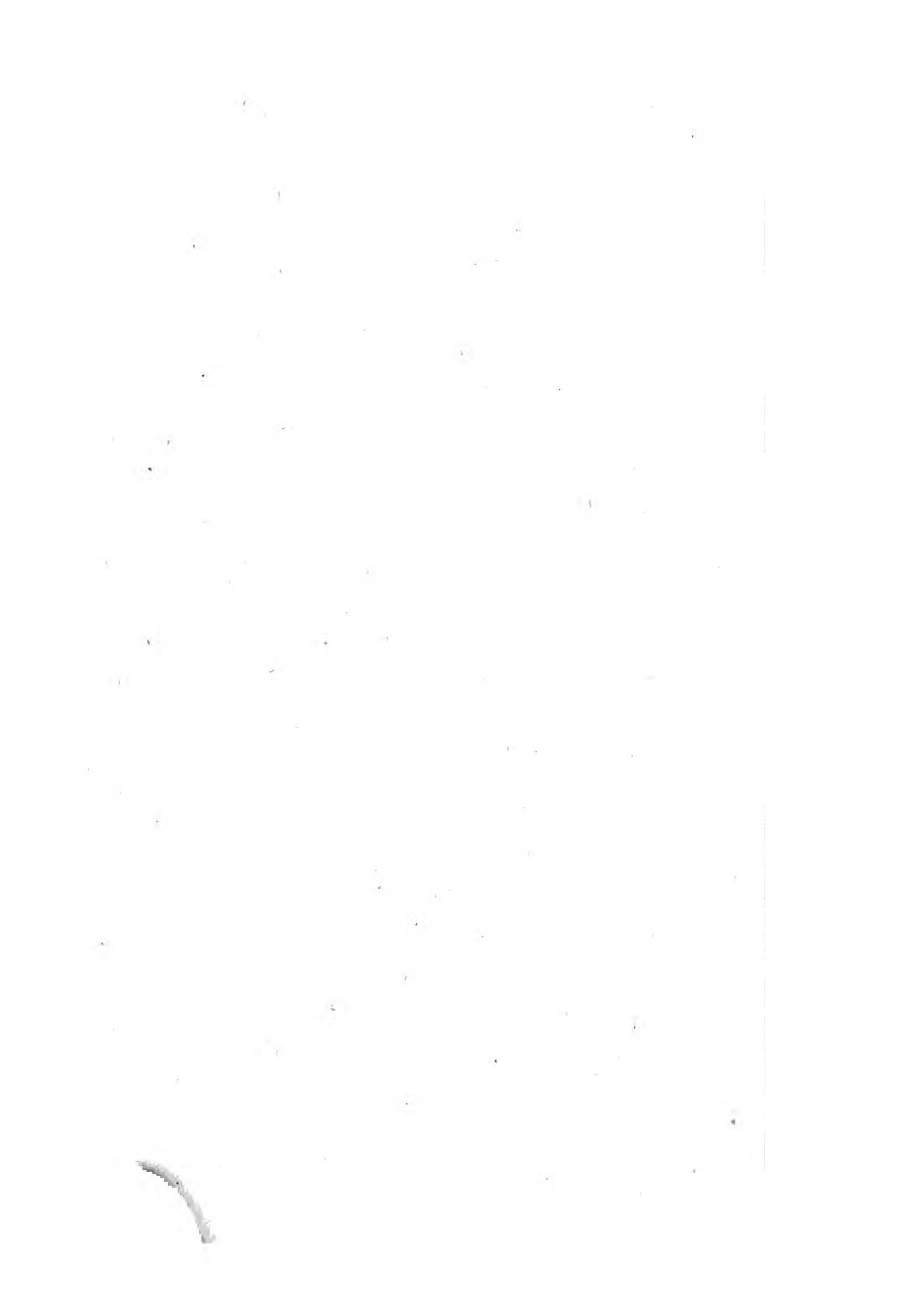
BY
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UNIVERSITY OF EDINBURGH.*

IN TWO VOLUMES.

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ECONOMICAL HISTORY, &c.

SECTION IX.

GRASS CONTINUED.

ARTIFICIAL HAY.

To increase the quantity of winter food for cattle in the Highlands, is evidently a most important and necessary measure. One method of doing this, and which may be considered as one most obvious and expedient, has now been suggested; but there are others which require attention, and especially the introduction of artificial hay crops.

The artificial grasses not only employ the plough, and fit the soil for the production of more grain; but they likewise raise more pasture and provender than the land could otherwise yield. Without them, our country can never arrive at its highest produce either

of corn or cattle ; and without them, the safety of our cattle in winter must always be precarious.

The most rigorous winters that have occurred in England for a hundred and thirty years past, were those of 1673, 1709, and 1740 ; and of these, the the year 1673 seems to have been the most severe. It is said *, that during that winter, most of the cattle in England perished, except in those districts where sown grass had been introduced. This used to be the case in Scotland in every hard winter. It is not now the case in the south, where sown grasses prevail, but it is too often still the case in the north, where they are yet wanting.

The celebrated Mr Ray travelled into Scotland, during summer, in the year 1664. He passed through Berwickshire, the Lothians, Stirlingshire, and returned by Glasgow to England. He observed, and with a degree of surprise, that in all this route, there was not one fallowed field. The practice of fallowing had not then taken place in Scotland, nor was it adopted for many years after. It was introduced in the year 1708, at Tynningham in East-Lothian, by the earl of Haddington. About the same time also, and at the same place, rye-grass and clover were first sown by that enlightened and pa-

* Body of Husbandry, Fol. p 26.

triotic nobleman. These two essential improvements soon spread through East Lothian, and from thence have been gradually communicated to the rest of the country.

The use of these sown grasses has altered and improved, and will continue to amend the whole system of husbandry. The farmer who would carry on the culture of his fields in the most frugal and beneficial manner, must keep his labouring horses in the stall, both summer and winter. If they are turned out to graze, after being heated with labour, they contract cold and diseases. To travel them to their pasture, and to bring them from it, which must be four times a-day in summer, occasions an intolerable waste of time. In that season, two hours feeding in the stall will give them more strength for their labour, than double the time at pasture. When fed with sown grass in the stable, they may be supported on one third of the extent of ground they would require for pasturage. The dung also to be obtained by this practice, ought to be considered as the chief source of manure upon the farm.

Palladius, in the time of the Romans, and Stephanus *, above two hundred years ago, mention the sowing of hay seeds as a practice in their times; but

* Car. Stephani Pratum, p. 7.

both seem only to mean the sowing of a mixture of grass seeds from natural hay. Rye-grass appears not only to have been the first, but is to this day, the only gramineous plant that has ever been set apart, and extensively cultivated, for the production of hay and pasture. It was probably first raised in Flanders for this purpose, and from thence, the practice was adopted in England.

In Johnston's edition of Gerard's Herbal, published in the year 1636, this plant is figured and described by the name of Red darnell, but is not mentioned, either as a sown grass, or by the name of rye-grass. It is probable, therefore, that its culture was introduced into England after that year, when it obtained the name of Ray-grass, perhaps from the French name of Darnel; or the name of Rye-grass from the resemblance of its spike to that of rye. It is likely, however, that it came to be treated as an artificial grass soon after that period, as we find that the culture of rye-grass and clover had made considerable progress in many parts of England, in the year 1673.

Lolium perenne, Linn. Rye-grass.

1. Rye-grass has been often noted, as an impoverisher of the soil. It is certainly capable of impairing or improving a soil according to the manner in which it is managed: it is a plant that does not run and pro-

pagate at the root like other grasses ; it has few radical leaves, but shoots forth numerous stalks, like the different sorts of grain which it resembles in its manner of growth ; if it stand till the seeds are fully ripe, most of it dies at the root, and then, no doubt, it impairs the soil in some degree, like a crop of corn, which is the cause of the bad reports that have been given of it ; but this is prevented, by cutting the grass before the seeds are formed ; it then vegetates again at the root, and becomes an improving crop to the soil. If a first and second crop of rye-grass are cut in the same season, and each time before the plant flowers, both the soil and the aftermath will be bettered ; whereas both will be essentially hurt by one crop, if the seeds are allowed to ripen. The rye-grass seed may be reckoned profitable, but it is, in fact, a very costly crop to the farmer.

2. As rye-grass abounds more in stalks than in foliage, it is better suited to be a hay than a pasture plant. It is the leaves chiefly, not the stalks of the grasses, that are coveted by cattle. Every pasture is in its highest perfection, when the flower stalks have begun only to spindle, and are not so high as the leaves. But rye-grass is in this state, only for a very little time, and very early in the season. As the flower-stalks are neglected, it very soon ceases to be a useful pasture ; and is most profitably employed, when eaten by ewes and lambs. It answers well, however, as a cut grass ; for after its stalks and

spikes are shot forth, cattle and horses will eat them in the stall, though they would neglect them in the field.

3. Rye-grass also is far from affording an ample crop for pasture, because of the smallness and thinness of its leaves. In a tolerable soil, the natural grass will throw up much more pasture for cattle, than it can do in rye-grass. Its chief merit lies in the hay crop, which is weighty, though the pasture crop is light; for the stalks make the greater part of the hay, though they are of little use in pasture. After a field of strong rye-grass is cut, it has the appearance rather of stubble, than of grass ground; nor does it ever afford a foggage equal to what follows a good crop of natural hay.

4. Though rye-grass is a native plant, in many of our dry pastures, yet neither in its natural state, nor when sown, does it ever afford a thick regular sward. It is always thin, and in detached tufts.—When sown, it soon wears out, unless the soil is peculiarly fitted for it; and gives way to other natural grasses that propagate more briskly at the root. Where grounds are to be laid down in pasture, for a number of years, there is not much, therefore, to be expected from rye-grass.

Such are the disadvantages of rye-grass, but in spite of these, it is a valuable acquisition, wherever

tillage is practised, and especially in such a climate as ours. Notwithstanding these, or other faults complained of, it has been a leading cause of converting much of England into a garden; and a principal source of the improvement that has taken place in the soil of Scotland.

α. Being a native plant, it is hardy, and capable to withstand every vicissitude of our climate.

β. Except the vernal grass*, we have none so good that is so early. In most places, it is fit for pasture, between the 1st and 10th of May. It flowers by the 20th of June, and if cut at that time, or some days previous, it is capable to afford a good hay crop, and perhaps a second, or otherwise a profitable foggage.

γ. Its stalks being firm and hard, it is the more easily dried, and is able to withstand a great deal of wetness, without much injury. For the same reason also, it shrinks less both in bulk and in weight, than any other herbage we make into hay.

δ. There are some spots of natural grass, that throw up a surprising quantity of hay, but they are only spots. Rye-grass, according to the soil and

A 4

* *Anthoxanthum odoratum*. Linn.

season, is capable to yield from one hundred, to three hundred and fifty stone weight of hay, upon the Scots acre, which is much more than the land in general could otherwise afford.

Annual Rye-Grass.

There have been complaints of late, concerning what is called an annual rye-grass, brought from England; but there is no rye-grass known, that is, properly speaking, an annual plant. In the cases complained of, the rye-grass sown in the spring with barley, affords a crop of hay, in the summer of the following year; but after that, disappears for the most part in the soil. In these cases, therefore, it is at least a biennial plant, which, in certain circumstances, is the case with all rye-grass; but it cannot properly be termed an annual. Rye-grass at any rate, is not a very durable plant; and its duration is abridged, when it is sown not in its natural soil, which often happens, or when it is allowed to ripen its seeds before it is cut. In both these cases, little of it will remain in the soil after the second year; and it is probable, that from instances of this kind, the reports concerning an annual rye-grass have arisen.

Trifolium pratense, Linn. Red Clover.

Clover, no doubt, will grow luxuriantly in many parts of the Highlands. A rainy climate is friendly to its growth, but very unfavourable for its being made into hay. There is little call to sow it alone for green forage; as it is winter, not summer feeding, that is wanted in the Highlands. Rye grass, on the contrary, is excellently suited for a hay crop in a rainy country, and along with it, clover may be sown; but only in such a sparing quantity, as may serve to thicken the crop and improve the soil. In a large proportion, the crop of hay would be endangered, and perhaps lost in a rainy season.

The hardness and thinness of the stalks of rye-grass, require that it should be thickened, especially towards the roots, with some more succulent and luxuriant herbage. The yellow clover* answers this end in some degree; but the common red clover is by far the best for the purpose. In a proper proportion, it adds greatly to the crop, both of hay and aftergrass; and also obviates any bad effects of the rye-grass upon the soil. This mixture is, upon the whole, the best artificial crop of grass for general use, hitherto discovered, and may undoubtedly im-

* *Trifolium agrarium*, Linn. Hop trefoil.

prove the Highlands, as it has done the other parts of the country.

Instead of sowing rye-grass and clover, in the spring, with barley; Miller, who is accounted a great authority, advises to sow them by themselves, in the month of August. That in this way, he has known them to afford a good feed the same autumn, and a ton and an half of hay per acre, early in the next season; but with us, no person could find advantage, either in cutting or pasturing a crop any time in autumn, from grass seeds that were sown in August. The want of the barley crop never can be made up. The grass crop in the following year, may, perhaps be stronger, though even this is doubtful; as it will have a better chance to stand the winter, when sown in spring than in autumn; but unless it can be made to surpass both the crop of barley, and the following crop of hay, it could be of no advantage. Clover and rye-grass do but little impair the growth of the barley, and the following year, do probably afford a larger hay crop, than if these grasses had been sown in autumn without any grain.

Where a piece of clover is requisite, either as an early pasture to ewes and lambs, or for cutting during summer; a very favourable opportunity for the purpose occurs in many parts of the Highlands; that is, to sow the clover along with lint, as both succeed well on the same ground. The clover does

not at all obstruct the progress of the lint, as the lint is a plant that shoots up only one stem, and does not tiller at the root. On the other hand, the lint ground being generally in good heart and clean, and the crop upon it soon removed, it has been seen to yield, next season, the heaviest crop of clover any where to be observed. Wherever, therefore, land, under a lint crop is inclosed, it cannot, perhaps be turned to better account the following year, than by producing clover in this way.

Clover is naturally but a biennial plant. If it is allowed to ripen its seeds, or even to advance far in the flower, little of it remains in the soil after the second year. Its continuance, however, may be prolonged, by frequent cutting, which is often convenient upon a farm. When sown by itself, it has been retained by this practice, so as to fill the soil, during four years. It was cut three times in the season, and in two of the years four times; but always before it came into flower. In this way, it afforded, during the four years, a surprising quantity of green forage.

Rye-grass and clover, with all their defects, have been the principal means of advancing the agriculture of Britain to its present improved state. The tillaged soil over the Highlands in general, is well adapted for them; though they are as yet cultivated, but in few places, and in sparing quantity. In many

extensive districts, they have never hitherto been seen. In the Hebrides, they were first sown in Ila, in the year 1761, and in Tirey about the same time, when it appeared, that neither the soil nor climate was any hindrance to their being cultivated with advantage. Though the rains in summer, may in some degree, be unfriendly to the making of clover hay; yet these grasses ought undoubtedly to be every where raised, in as large a quantity as possible, wherever any arable land happens to be inclosed. The particular method of their cultivation, is now so generally known in Scotland, that it is unnecessary to take notice of it in this place.

HAY HARVEST.

The most proper time to cut rye-grass, or any other hay composed of gramineous plants, is immediately after they have flowered; that is, when the chives have all burst, and thrown abroad their powder, and before the seeds are formed.

a. Till this happens, the grass has not arrived at its full stature, and therefore a full crop of hay is not to be obtained.

β. The growth of the plant is at that time completed, and the stems and leaves make no further

progress. All that remains to be accomplished, is the ripening of the seeds.

γ. At this period, both the stems and foliage of the grass are fresh, soft, and succulent; but from thence, they become every day, more and more dry, hard, and withered.

δ. At this period, the grass is green and wholesome to the roots; but soon after this, especially if it is rank, all the older leaves towards the root become blanched and putrid.

ε. If the hay is allowed to wither on the ground, before it is cut, or if it is over-dried, after being cut, in either case, all that is unnecessarily evaporated, is so much weight, and so much nutrimental matter lost.

ζ. When hay is cut at that early period, it is incomparably of a better quality, and should give a higher price, than when allowed to stand till the seeds are ripe. Though it may be less in quantity, this deficiency is more than compensated by the advantage of the after crop.

η. If rye-grass is allowed to stand on the ground, till the seeds are completely ripened, and are then threshed out, it affords a provender little better than that of oat straw.

θ. Wherever the seeds of rye-grass, or of any other grass, are perfectly ripened, no second crop of hay can be obtained; and even the foggage becomes good for little or nothing, during all the rest of the season.

ι. But if grass is cut, immediately when it has flowered, it gives a more vigorous and beneficial after crop, either for hay or pasture, than when it is not cut till the seeds are ripe.

κ. Hay of all sorts cannot be cut too near the ground. What is left at the bottom, is so much hay entirely lost; for it is neglected by the cattle, which feed only on the after growth. It is an error to imagine, that the rankness of the hay stubble promotes the springing of the grass, for it has quite the opposite effect.

The most accurate method of making hay, and the nice preservation of the green colour, are not to be looked for at present in the Highlands. The important point is to acquire a great quantity of hay that is wholesome and useful, though not of the finest quality, nor in the best preservation. On this subject, however, it may be of some use to attend to the following remarks.

α. One great object in haymaking, is to preserve the green colour, and consequently the sap and nu-

trimental matter, as much as possible. This, no doubt, depends much on favourable weather: yet our best hay is never so green as that in England, which must be owing to less skillful management.

β. The quicker that hay is made, it will always be of the better quality, and the labour also is much abridged. The period necessary, depends indeed on the state of the weather; but it likewise depends much on assiduity and expeditious management. If the weather is hot and dry, the hay may be in the riek, at farthest, on the fourth day; but, in general, it is kept with us too long on the ground. It is either too much exposed to the rain and dews, or it is overdried in the sun. In consequence of this, most of the hay in Scotland is either bleached or scorched.

γ. When the grass is cut, it should not be allowed to lie in the swath, which it too often does, for a length of time, but ought immediately to be put into wind-rows.

δ. From the wind-rows, it should quickly be made up into small cocks, and from these successively into others, larger and larger. If the weather during the day is fair, the hay should never remain above six hours in the same place and position. The great art is to keep it as constantly in motion as

possible, which both saves time and improves the quality of the hay.

ε. To preserve hay in the sap, and at the same time to prevent it from heating, the great matter is to keep it skin-dry. It is not the sap in the hay that is so much to be feared as the external moisture. Hay that is still green, and full of its natural sap, may be cocked or stacked in safety, provided it is perfectly dry at the surface: but on the other hand, though it has been dried till it is almost half burnt, if the surface becomes wet, it will infallibly heat. It never, therefore, should remain spread during the night, or be exposed to the dews. Whatever may be its state, it should always be cocked before sunset, and, during rain, to be piled in cocks as large as possible.

ζ. Much hay is hurt and lost by standing too long in the field, in ricks, before it is put into the stack.

η. To graze a bad crop of sown grass, is a frequent but a hurtful practice. Though never so short, thin, and unpromising, it should rather be cut than pastured; and ought to be cut without hesitation at the first, whenever its recovery appears doubtful. Either a second crop or a plentiful foggage is to be expected, which will be far more profitable than the pasturage of the first

0. All hay stubbles should be completely shut up till they are well grown.

HAY PLANTS TO BE INTRODUCED.

The gramineous plants, or what are strictly and properly called grasses, afford the most natural and acceptable food to horses, black cattle, and sheep. There are no plants of any kind that they are equally fond of. They eat indeed a great variety of other plants, but there are none which they prefer to these. The plants with a pea blossom, or the papilionaceous tribe, are acceptable to them in the next place. But the richest crop of pease, beans, vetches, clover, lucern, or St Foin, is forsaken by cattle for the simple herbage which is afforded by some of our most common grasses.

There are now discovered above six hundred species of gramineous plants. But of this great number, there are only four, which have ever been cultivated to produce green and dry forage for cattle. These are the Scotch and Dutch grasses in the West Indies, the fromental in Swisserland, and the rye-grass in Britain. The use of these seems rather to have arisen from accident than design. But it cannot be doubted, that, among the six hundred species, there are other grasses which, upon trial, might be found still more beneficial, and possessed of diffe-

rent and valuable properties. Though grasses, like other plants, may be translated with great advantage, from a country of a very different climate, yet, in experiments made with the view of discovering new and useful plants for hay and pasture, the native grasses of a country certainly deserve the first attention. We have in Scotland a number of grasses, which, from their appearance and known properties, promise to be still more useful than rye-grass, the only plant of the kind hitherto cultivated. There are several at least, that certainly would be more valuable than rye-grass in some particular soils and and particular situations. In this view, the following plants deserve to be noticed. They are all adapted to the climate of the Highlands, and most of them to soils in which rye-grass would not succeed.

The only grasses which deserve to be tried for the above purpose, are such as are known to be a wholesome and agreeable food for cattle, both when green and dry, and which are of a growth capable to afford such a weighty crop as may be profitable. The greatest difficulty in making an experiment of this kind, is the collecting in the fields a sufficient quantity of the seeds of the grass to be tried; and in sowing them apart in a garden or field, where the soil is clean, and preserving them unmixed with other grasses. By these means, any grass may be propagated to a great extent, in the course of three

or four years, and its seeds preserved separate and clean for field culture, as rye-grass is at present. From the numerous tribe of grasses which are native in Scotland, the following species are selected, as the most likely to succeed in an experiment of this kind.

Avena elatior, Linn. var. β . Fromental.

This grass, though a very hurtful weed in our corn fields, promises beneficial effects as the reward of its cultivation. At present it may be justly vilified by the name of a weed; but this means only a plant in an improper place, for the attention and industry of the husbandmen may certainly change it from a nuisance to a real advantage.

It is found in great variety of soil and climate. It grows from the southern to the northern extremity of Europe, in high and in low countries, in rich and in poor lands, in wet and in dry places. All this variety, however, produces but little alteration either in its size or manner of growth; and there are few plants which appear so much the same in such different situations. It abounds in most parts of Britain, and few of our hedges are without it; but it is spread in greater quantities over the arable outfield lands that are sown with oats. Though it agrees with different soils, it particularly affects those which have been recently laboured; and shoots with

great luxuriance, even in the poorest loam that is turned by the plough. It is a grass of a great stature, growing usually above four feet high, and with such rank foliage, as to afford both a tall and a thick crop. It is of such a vigorous growth, that, with us, it strangles many hedges; and in the gardens of Sweden, Linnaeus* tells us, it sometimes entirely kills the Spiraea, and such like shrubs, wherever it prevails. Its foliage, when young, is a pasture for all sorts of cattle, but it turns coarse in an advanced state; and they refuse it, as they do most other grasses, when it comes to the ear. In ley pastures, however, wherever it abounds, it is so much cropped by the cattle, that few of its flower stalks are ever suffered to spring up.

From this account of the plant in its natural state, it is reasonable to suppose that it might be turned to advantage as an artificial grass; yet no such notice has been taken of it in Britain, and it grows with us even without a name. But foreigners have been more attentive. It is the *Fromental* of the French, which for some years past has been an object of husbandry in that kingdom. It seems first to have been cultivated in Burgundy; afterwards introduced into the territory of Geneva, and several parts of Swit-

* Faun. Suec. p. 36.

zerland *, where it is known by the name of *Fenasse*; and of late years into the province of Brittany †, from whence we have the best account that has hitherto been given of it.

In that province it is generally sown in the spring, but sometimes in August or September. The first year it seems to afford but a scanty crop; the second year it is fit to cut for hay in the beginning of May; and if allowed to stand till full maturity, rises to the height of five French feet and a half. They find it proper to sow along with it a small proportion of lucern, or red clover, as we do with rye-grass. It has been cut on the 8th of April above twenty inches high. It has even been cut on the 26th of March, and from that day to the 8th of April has been found to grow near a foot in height. They cut it for hay three times a-year; on the 1st of May, the 30th of June, and the 31st of August. The quantity produced is beyond every thing known to be afforded by any other kind of artificial grass, and almost incredible; five times more than what is commonly obtained from their other hay fields in Brittany.

If we consider attentively the natural appearance of the plant in our own country, and the experience

* Memoirs de Berne, an. 1762. Part. 4. p. 95.

† Observations de la Societé de Bretagne, Tom. 1. an. 1759, p. 39.

of the French, we cannot doubt of its turning out most useful as an artificial grass, and superior to rye-grass, or any other yet cultivated in Britain. In translating the culture of a plant from one country to another, the difference of climate is usually the great obstacle; but in this case it forms no objection; the plant is a native of the north of Scotland, as well as of the south of France, and grows in this country to as large a size, and in as luxuriant a manner. Our climate, indeed, may not admit of three hay crops in a year; nor can we expect to cut this grass in April or March, as in France; yet, if by one or two plentiful crops, we can gain, instead of five times, but double the quantity of forage that is commonly afforded, with this we would have reason to be satisfied as a very high improvement, and this, it is highly probable, may be attained.

If trial should be made of this grass, it is the hay crop which should be the principal view. It is a plant too rank and luxuriant to form a sward for pasture. For the same reason, if we would obtain from it hay of a good quality, it must be cut young, about the middle of June, before it is in full flower. At this season it pushes so vigorously, that there will be time for a second hay crop in such parts of this country as enjoy the best climate. But if this is not reckoned expedient, it will afford a full crop of green forage, which may be cut from about the 1st of August to the middle of October.

From many observations made upon this plant, it appears that there is no native grass in Britain that can afford so great a crop of hay upon poor land. This is to be considered as its peculiar and chief excellency. It waves its head a couple of feet above a crop of oats, upon land too poor to bear any of the sown grasses which are in common use. It is upon land of this kind that the trial should be made; which, of all others, is the land that stands most in need of improvement in Scotland.

*Avena nodosa**. Knotty oat grass.

This grass has been usually considered as a mere variety of the former. They are indeed extremely similar in their general aspect and properties. But they differ so much in their habit and roots, and likewise in the more minute and essential parts of their fructification that they are rather to be considered as two distinct species.

The tuberous root of this plant, which is well known to those who traverse ploughed fields, consists of a number of knobs, sometimes larger than hazel nuts, and linked together. They are white, fresh, and succulent all the winter over, and are greedily sought after both by sheep and hogs, when turned up by the plough.

* *Avena elatior*, Linn. var. α .

It is a plant that merits cultivation almost equally with the former, and is to be treated in the same way. They are both very conspicuous on much of our poorest outfield land when in crop, and overtop the oats sometimes two or three feet. It is on such land they should be raised, and sown with a crop of oats, as rye-grass is with a crop of barley. Upon this land, three successive crops of oats are commonly taken, after which the soil produces nothing for six or seven years but the poorest pasture. If, instead of this unreasonable and unprofitable practice, one or other of these grasses was sown with the second crop of oats, a plentiful hay crop, for at least two or three years, might be expected. The soil, instead of being scourged with a third crop of oats, would be spared and improved. Nor would manure be necessary for this purpose, as these grasses grow luxuriantly, without cultivation, on the poorest dry outfield. To reap a crop of hay from such land, equal to, or perhaps superior to a crop of rye-grass on our best soils, would be a matter of most essential benefit to many parts of Scotland.

The culture of the Knotty oat grass might be attended with this additional advantage, that when the land was broken up, a number of hogs might be fed, and even fattened; they would not only clear it of the roots, but would both dig and manure the soil.

Holcus lanatus, Linn. Soft grass.

This grass is dispersed in most parts of Scotland, and, from its general appearance, promises to be one of the best plants for a hay crop. Upon wet grounds it forms frequently a great part of the natural hay, and a weightier crop than almost any other of our native grasses.

It seems peculiarly suited for all lands near the sea which are manured with slesch. On a slesched field in Galloway, which, after being cropped, was suffered to remain ley, it rose naturally in such quantity as to exclude all other grasses; and so entirely occupied the soil, that the crop of hay was wholly composed of it. That crop amounted to two hundred and forty stone upon the Scots acre; which was at least sixty stone more than would have been expected from rye-grass.

This hay from the soft grass is very salutary to all sorts of cattle, and answers remarkably both for fattening and for milk. They prefer it to rye-grass hay, but it goes not so far in feeding, as they eat much more of it, owing to its being much softer and more agreeable to their taste.

This valuable grass grows vigorously in the highest and coldest parts of Scotland that are arable. It forms a great crop upon wet mossy grounds, wher-

ever the moss has an admixture of clay, sand, or gravel. This is the soil in which it would be most useful, and it is a soil in which no grass equally valuable will prosper so well. It vegetates in a greater degree of cold, and remains longer green during winter, than any other of our native grasses. It is a plant, therefore, that very much deserves attention and cultivation, not only in the Highlands, but in all the higher countries of the south of Scotland.

Phleum pratense, Linn. Timothy grass.

This grass is said to be cultivated in North Carolina, but that it was brought originally from Virginia, where it is a native. Yet no such plant is mentioned by Gronovius in his *Flora Virginica*, or by any other writer concerning the plants of America. It is likewise said to have been carried to North Carolina, from the province of New York, by one Timothy Hanson, from whom its name was derived; and that it was first brought from Virginia to England in the year 1763. All this seems to have been given out by dealers, who either knew not, or wished it not to be known, that it was a plant of our own country. For some time they held it forth as the fittest grass for all sorts of soil, and the most eligible food for all kinds of cattle. But as it is a common grass, both in England and Scotland, we have therefore full opportunity of being acquainted with its properties.

The Timothy grass, or, as we call it, Cats tail grass, is capable, on a particular soil, of affording a strong crop of coarse hay. As the soil and climate of England can afford crops of more valuable grasses, it has therefore, after frequent trials, been very much dropt in that country; but it deserves not to be rejected in many parts of Scotland, and especially in the Highlands.

It chuses, naturally, a moist, and even wet meadow soil where it grows very luxuriant, rising to the height of three or four feet, with spikes near half a foot long. It is only upon a soil of this kind it should ever be sown; for, if the soil is dry, its growth is inconsiderable. The stalk has many large fresh leaves upon it, and is surrounded with many suckers which are later in coming into flower. This renders it a heavy crop about the time that the earliest spike has flowered. Being a strong and coarse grass, it ought to be cut at this period, which, in the higher parts of the country, is about the 26th of July. Its stalks and leaves being quite smooth, when cut at this season, they afford hay of a very good quality for barren cattle, and afterwards a plentiful foggage. As it grows in great perfection in some of the high and wet grounds of Scotland, it may reasonably be presumed to prove a valuable sown grass in such parts of the country.

Poa palustris, Linn. Marsh meadow grass.

Though the different sorts of *Poa* or Meadow grass, form the most acceptable and nourishing food to cattle, this species has often been observed to be preferred by them to all the others; but, from the situation it delights in, it is not so frequent a plant as many others of the kind. It is to be found only in the wettest meadows, or immediately by the side of rivers, brooks, or standing water. There it grows three and even four feet high, with strong creeping roots, and forms thick heavy patches of herbage. Was the whole of a wet meadow covered with this grass, it could not yield any other crop so valuable; for, beside the large quantity which it affords, its quality, both in pasture and hay, is not exceeded by any other grass whatever. It is likewise of a quick and vigorous growth. It flowers on the 14th of June, and its seeds are ripe before the 1st of July. It is, therefore, a plant that well deserves to be cultivated in wet meadow grounds, where our other sown grasses would not succeed, and which are at present chiefly occupied by the marsh marygold and other noxious and useless plants.

Aira coerulea, Linn. Fly bent.

The plants hitherto cultivated in Britain for hay or pasturage, are natives, either of the southern parts of Europe, or of the low fertile lands of Eng-

land and Scotland. In consequence of their native situation, lucern, saintfoin, ribwort, rye-grass, and the red, white, and yellow clovers, do all require a low country and a dry rich soil, being nowhere else cultivated to advantage.

The mountainous tracts of Scotland, which must always be pasture countries, are but too well known to be insufficiently provided with hay, both for their black cattle and sheep. In these countries, the above grasses cannot be raised; but the want may undoubtedly be supplied by some other hay plant better suited to their soil and climate. The most likely place for the discovery of such a plant, is certainly among the indigenous plants of these alpine countries.

Of all the mountain plants in Scotland, the *Aira coerulea* seems the best adapted for this purpose; it is known among the shepherds in the high countries, by the name of the Fly or Flying bent.

It bears long, broad, and grassy leaves, which form both a tall and a thick crop. Its stem rises from two to four feet high, and its panicle waves or flies in the wind, which is the reason why it is called the Fly bent. It grows in a wet soil of pure peat earth, and at a great height on our mountains, where no other grass of equal value is to be found. It appears usually in a straggling and dispersed manner;

but, in some places, it forms of itself whole acres with few other plants intermixed; and these tracts, were they inclosed, would make excellent hay without any cultivation.

From the middle of May till near the end of June, it affords the best summer feeding that the black cattle and sheep have in some high pastures; but when it grows tall, they shun it as they do all grass of a great height. It is in its flower and strength, and fit to cut, between the 20th of July and 1st of August. It is agreeable to all kinds of cattle when green, yields a heavy crop of hay, and its seeds are very numerous, ripen well, and are easily collected.

Of the alpine grasses, this seems to be the plant most worthy of cultivation*. It is precisely the hay plant which is most wanted in the high parts of the country. It grows vigorously and affords a plentiful crop, where none of the artificial grasses, at present

* There is another alpine grass, however, very promising for the same purpose, and which grows at a still greater height than the Fly bent. This is the *Cynosurus coeruleus*, Linn. or Blue dog-tail grass, which is also exceedingly agreeable to cattle. It has often been seen growing vigorously, between two and three feet high, in a mossy soil, and in the most exposed situation, at a height of near three thousand feet above the level of the sea

in use, can succeed ; that is, in a mountainous situation, and in a wet and mossy soil.

Elymus canadensis, Linn. Canadian lime grass.

Though this is not an indigenous grass, it promises to be useful as a hay plant in the high parts of Scotland, where the soil is mossy and the climate severe. It is a native of Canada, and, like all other Canadian plants, thrives remarkably well in this country. It grows also in Virginia ; but the trials made upon it here, were with plants brought from the province of New York. It has been long kept in a garden, in different soils, and its manner of growth and qualities attentively observed. A considerable spot of boggy ground, in an inclosure, of a mossy soil, was planted with it, and cultivated during four years. It appeared from this experiment, that in such a situation, it may be rendered very valuable.

It has strong perennial roots, which neither wetness nor frost can injure. Its foliage is tall and thick, and the stalks grow from three to five feet high. It rises early and vigorously in the spring, and may be cut with the scythe in the last week of April, or the first week of May. At the time it is about eighteen inches high, the foliage, in its size, colour, and qualities, resembles very much a luxuriant crop of oats at the same period of growth, and is

equally grateful, as a green food, to cows and horses. At this time, or soon after, it should be cut for hay, and a second and ample crop, either of green or dry provender, may be obtained from it in the course of the season; for, if suffered to stand till the seeds are ripe, it becomes rather strong and coarse for either of these purposes. It produces plenty of ripe seeds in August and September.

These six grasses now described, are peculiarly calculated for a hay crop, in those parts of Scotland where the present artificial grasses can be of no use. They are suited, either for poor dry outfield land, or for a wet mossy soil, even in the highest parts of the country. The extent of ground, of one or other of these two sorts, is well known to be very considerable. To reap from them a beneficial crop of hay which they have never yet afforded, would be to turn them to the greatest advantage of which they are capable.

There are other native grasses, which, though not of so fine a quality, nor so valuable as the former, might afford, even upon the wettest and most unprofitable bogs, a great quantity of coarse hay, fit to support barren cattle in winter.—Such are the following :

Phalaris arundinacea, Linn. Reed grass.

Arundo Calamagrostis, Linn. Wood reed grass.

Poa aquatica, Linn. Water meadow grass.

Carex gigantea. Giant carex.

—— *trigona*, Three edged carex.

—— *elata*. Swamp carex.

—— *nemorosa*. Coppice carex.

The reed grass is everywhere frequent; but the others occur only in a few parts of the country. The Wood reed grass is found in Galloway.—The Water meadow grass grows in the carse of Falkirk and Stirling, about the town of Perth, and in Leith water, below Edinburgh.—The Giant carex, a plant six or seven feet high, grows luxuriantly on the banks of the Evon, in Hamilton Park, and by the side of the South Esk, in Mid-Lothian.—The Three edged carex, abounds in the wet meadows in Tweeddale, and in the ditches of East-Lothian.—The Swamp carex, and Coppice carex, are frequent in the swampy woodland grounds in Annandale and Clydesdale.

These grasses are all of a strong robust growth, but they are eaten by cattle both when green and dry. In a boggy soil, they afford a weighty crop, but require to be cut young, when not above eighteen inches high; for they soon grow up to be too rank and coarse, both for green and dry forage. They might be sown either separately or mixed, for they are all attached to the same wet soil, and vegetate

at the same season. Their growth is so quick and vigorous, and their foliage so rank, that a piece of boggy ground occupied with them, might afford two, or even three crops of hay in the season. This hay would be indeed of a coarse quality; but the coarsest hay that cattle will eat is valuable in the Highlands, and in all the high parts of the south of Scotland.

Such are the plants which might serve for an artificial hay crop in many of the most barren and unproductive parts of the country. Rye-grass is the only gramineous plant as yet used for the purpose, and that only in the driest and most fertile soils. Among the other disadvantages of that grass, it generally affords only one full hay crop. This answers extremely well, where one green and one white crop are required regularly to succeed each other; but on many occasions, it would be useful to secure a full crop of artificial hay on the same land, for some years without intermission: this cannot be obtained with rye-grass. For this end, some exotic grasses may probably in time be introduced; but at present, it may be proper to consider how far any of our native grasses may be applied to answer the purpose. Those now to be enumerated, appear the most likely to succeed, in producing upon dry infield land, a full crop of artificial hay, for several successive years.

Anthoxanthum odoratum, Linn. Vernal grass.

This plant is frequent in many of our dry pastures, and is a perennial grass of peculiar and valuable properties. Its natural soil and situation are much the same with those of rye-grass, and it is generally found in the same place. It is remarkable for its early growth: it springs so as to be fit for pasture by the 1st of April; shoots forth its spike in that month, and flowers the first week of May: the seeds are ripe before the middle of June, and the spike becomes yellow.

There is no plant that flowers so early and so late in our pastures. In any field where it abounds, it may be observed more or less in flower, from the beginning of May, to the beginning of October. Its natural time of flowering is May; but its flowering stems being eaten down by the cattle, which only happens to the grasses they are extremely fond of, fresh ones are produced: these being again eaten, others succeed; and so the flowering of the plant is prolonged from spring till autumn.

The very early growth of this grass is a circumstance much in its favour; but the excellent quality of its herbage is no less remarkable. There is no plant of our climate, not even the finest meadow grasses, that cattle and sheep prefer to it. When dried, it has a decided superiority over every other

hay plant. The smell of new made hay is generally agreeable ; but the vernal grass, when dried, has a finer flavour than any other grass, and resembles very much that of green tea. There is accordingly no dry provender that cattle eat with such avidity.

The only apparent obstacle to the cultivation of this valuable grass, is the smallness of its stature. In our dry hard pastures, it throws up only a scanty crop ; but in a deeper and moister soil, it becomes sufficiently luxuriant. When we see our native ryegrass on a thin dry soil, its appearance in like manner is so diminutive, that we could scarcely expect from it such weighty crops of hay, as are obtained from it by cultivation.

A parcel of the seeds of this grass were sown in a spot of a hay field, carefully dug and cleaned, on the 15th of May :—The spot was verdant on the 27th. The grass was thirty inches high on the 4th of July, though at that time it had not perfected the seeds. The radical leaves were thick, reaching half way up the stalk ; and the spikes were larger than any to be seen in our pastures, being three or four inches long. It yielded a tolerable hay crop when cut on the 20th of July ; after which, it sprung briskly, and afforded a good foggage.

It appeared in general, from this experiment, that if the vernal grass was sown in a good soil, be-

fore the 1st of March, that it would yield both a sufficient crop of hay, and a plentiful foggage in the same year. This is a property which is not as yet known to reside in any other hay grass.

Alopecurus pratensis, Linn. Fox-tail grass.

This is one of our best pasture grasses, and frequently forms a considerable part of our best ley hay. Being a plant of a larger growth, it promises, upon cultivation, a greater quantity of hay than the vernal grass. Next to that grass, likewise, it comes earlier in the season than any other. Its spikes are fully shot forth, and the stalks are about two feet high on the 10th of May, soon after which time it flowers.

On a piece of well dressed ground, in a hay field, a parcel of the seeds of this grass was sown on the 15th of May.—They rose on the 2d of June, and formed during the season, a tall thick sward. The next year, on the 20th of June, when it was past the flower, the stalks were forty inches high, and it afforded a full hay crop of the finest quality, followed with excellent pasturage.

The difference between the vernal grass and this plant, in their manner of growth, was remarkable. The vernal grass, though sown on the same day, and late in the season, on the 15th of May, produced its flowering stalks, and a crop of hay the same year ;

but the fox-tail shewed no flowering stalks, nor was fit for cutting till the next season.

Dactylis glomerata, Linn. Cocks-foot grass.

This grass grows luxuriantly in old gardens, orchards, and other places where the soil is good; and it forms a very heavy crop of hay, though not so fine in quality as the two former grasses: it is also much later in the season. It shoots forth its panicle the first week of June, and if it is to be made into hay, it should be cut soon after the 10th of that month, before its flowers disclose. About that time, its growth is strong, and the stalks above two feet high; but soon after this, it comes to form but a hard and harsh forage.

It was sown with the two former grasses, on the 15th of May, and rose on the 1st of June, but afforded only radical leaves, during the season. The second year, it was cut on the 20th of June, and gave a great crop of hay. The stalks were between three and four feet high, and the foliage thick and tall, reaching half way up the stalk.

Where this grass grows naturally, it generally runs into large tufts; but when sown, it perfectly covers the surface, in a uniform manner; and when cut, affords a great quantity of foggage for black cattle.

These three species of grass now described, appear to be the best calculated, of any of our native grasses, for producing a hay crop upon dry infield land. After affording one crop, they do not wear out, which is the case with rye-grass. When cut, they spring and spread at the root, and continue to occupy the soil, so as to afford several successive crops of hay. By the same property also, they afford from year to year, a plentiful foggage of the very best quality. Whereas rye-grass, when it wears out, after giving but one crop, resigns the soil to weeds, or to such inferior grasses as casually spring up. The cultivation of these grasses, appears therefore most eligible, wherever repeated hay crops are required, or where land is intended to continue for a number of years in pasture.

Beside the grasses, there are other native plants, which might be recommended as proper to be cultivated for a hay crop, and especially the two following:—

Vicia cracca. Linn. Tufted vetch.

This is a strong growing perennial plant of the pea kind, and the most nourishing food to cattle, both when green and dry. It prevails in a variety of soils. It sometimes strangles and overwhelms our thorn hedges, where they happen to be neglected. It often forms considerable spots in ground kept

for natural hay, and these spots always afford the heaviest crop, and the best hay in the field. The plant prospers also exceedingly, on many of the sandy downs in the West Highlands and Islands, where it is well known, and much esteemed as the best pasture in these countries. In such places it ought certainly to be cultivated. When it is found to be so useful, even in the sparing and dispersed way in which it grows naturally, it would be much more so if raised by art. Instead of summer pasture, it would then produce a great stock of dry provender; an article much more requisite in these countries. Where it grows luxuriantly, it produces a much greater quantity of hay than any gramineous plant; and on lands of the above description, no crop could be raised equally beneficial.

Lathyrus pratensis, Linn. Yellow vetch.

This plant grows in all the different soils and situations which are occupied by the former; and also produces a great load of hay of the best quality. Both plants may be suffered to stand till the later stage of their vegetation; that is, till their seeds are formed, and even ripened. At such an advanced period of their growth, their substance is firm; and they shrink very little by drying, either in bulk or weight. The quality of the hay is still good, and its quantity is thereby greatly increased. The yellow differs, however, from the tufted vetch, in not being

so productive of seeds. This arises from its disposition to spread and propagate more by the root; yet, a sufficient quantity of seeds, for the purpose of cultivation, may be every where procured. Where this plant takes place, in fields of natural hay, it spreads so vigorously at the roots, as to encroach upon, and exclude all other plants, even the grasses. Neither is its progress obstructed by frequent cutting; for although cut as a hay crop, from year to year, it still continues to spread. Wherever it may be desired, therefore, to obtain from the same ground, a perennial or permanent crop of hay; as is the case in England, by means of lucern and saintfoin; the tufted and yellow vetch appear to be the plants best calculated for the purpose in this country. Like lucern and saintfoin, they are capable of producing a much greater quantity of hay, than can be obtained from the same ground, by means of natural grass.

No notice has been taken here of Burnet, as it has not merit to be generally adopted, either as a green or dry forage, and has been laid aside, in many places, where trial has been made of it. Saintfoin has nowhere succeeded with us for want of its proper soil. Lucern may undoubtedly be rendered a profitable crop to many Scots farmers; but it requires such an accurate and polished culture, as no farmers in the remote parts of Scotland are as yet known to practise.

GENERAL REMARKS.

By the various methods above proposed, for augmenting the quantity both of green and dry forage, to serve during winter and spring ; it may be safely presumed, that the two following ends would be obtained, much to the advantage of the Highland countries.

First—That the heavy losses sustained by the death of cattle, would be effectually prevented.

It is by the loss of cattle that the Highland farmers, are generally either hurt, or ruined in their circumstances, and the revenue of the proprietors impaired. This is a calamity in some degree unavoidable, and must frequently happen, in the present state of the country. The cattle having no provender, but what they can find in the fields, are, before spring, reduced to an impoverished state. They can subsist, for the most part, till about Candlemas, upon the decayed herbage of the former summer ; but from thence, till the return of the grass, they are always, even in the best seasons, in great necessity. If the winter is severe, and the spring backward and inclement ; a third, an half, and sometimes even a larger proportion of the cattle upon a farm, perishes for want of food.

At no very remote period, many tracts in the south of Scotland, were in the same situation, and liable to the same disaster. They have been happily relieved from it, merely by providing abundance of winter provender. There can be no doubt, but that the like method may be pursued in the Highlands with similar advantage. If upon any Highland farm, ten weeks, either of green or dry forage, can be secured for the cattle, to be given them between the 1st of February and the middle of April, which, by the above methods, may unquestionably be done; they would then be as safe from the spring mortality, as any cattle that are kept abroad all the year in the south.

Secondly—That the breed of cattle would be improved, and the annual produce from every farm increased.

It is pretty certain, that cattle will always increase or diminish in size, according to their pasture; and that their bulk will always be in proportion to their sustenance. The Highland cattle, though of an excellent strain, are at present as small as the country at any time can produce. The soil and climate, without the interposition of art, affords the present size. But are the Highlands of Scotland the only country in Europe where the breed of cattle cannot be improved and enlarged by the exertions of art? as in other countries, the cattle of the Highlands

must increase in size, as the quantity of their sustenance is augmented. The winter and spring feeding above proposed, must necessarily have this effect. Time, no doubt, is required, to produce any considerable alteration in the breed of cattle; but it is not unreasonable to suppose, that in the course of but a few years, the Highland cattle, by this single expedient, may so far increase in size as to exceed by a fifth, or even by a fourth, their present value.

SECTION X.

LIVE STOCK.

PROPORTION OF CATTLE AND HORSES UPON A FARM.

THE proportion between the different sorts of cattle and of horses, upon a Highland farm, and their total number compared to the rent, must appear surprising to a stranger. A farmer in Skye, or its neighbourhood, in the year 1764, who kept one hundred and sixty black cattle upon his farm, had usually twenty horses upon it, the proportion being one to eight; but the horses are more numerous upon the smaller farms, being to the black cattle as one to six, and sometimes more. On a farm of this extent there were about two hundred and forty head of sheep, and sixty of goats. These proportions, or

nearly these, were very frequent in that part of the country; but in most of the Islands, the horses are still more numerous, being sometimes as one to four compared with the black cattle. A farm in Kintail was found to have upon it forty milk cows, which with the young stock, from a calf to a four year old, made about one hundred and twenty head of cattle; also about eighty ewes and forty goats, which with their young, were about two hundred and fifty, and ten horses. The farm containing all this stock, beside arable land more than sufficient to supply a family, was rented at twenty pounds a year.

It is merely the number of black cattle, of three or four years old, annually sold off from every farm that pays the present paltry rent, with sometimes a small overplus to the tenant. There is little else on the farm that brings any money. All the grain and the potatoes, all that is afforded from the dairy, all the sheep, the goats, and every other article the farm yields, serves only as a scanty maintenance for the farmer's numerous household; but it cannot be doubted that the produce of a Highland farm, in corn and cattle, if rightly managed, should do a great deal more, both for the landlord and the tenant.

The sheep, till lately, made a very small proportion of the stock upon any farm. Before sheep farming came to take place upon a large scale, the tenants were often restricted by the landlord to a

certain number of sheep. They were allowed to keep only one sheep for each cow. If a farm maintained fifty milk cows, and was presumed, with the young beasts, to have upon it one hundred and fifty head of black cattle, such a farm was restricted to fifty ewes, which with their young, were supposed also to amount to about one hundred and fifty in number. The interest of the landlord, whether real or imagined, seems to have been the cause of this restriction. As the payment of the rent depended entirely upon the sale of the black cattle, the sheep were considered not as a matter of profit, but merely as an article for the cloathing and sustenance of the farmer's family. For this reason, the landlord was anxious that their number should not be more than what was necessary; but the case now is happily altered, since the profits derived from sheep have become so considerable.

A mixed stock, however, of black cattle and sheep on the same farm, is by no means adviseable. There are districts and farms properly adapted for each, and each should be kept separate from the other, as much as possible. Tracts of low ground, where there are rank and wet pastures, are unfit for sheep, though proper for cattle. Higher and dry grounds, again, where the herbage is both short and soft, will always be most profitably employed as a sheep walk. The sheep also should occupy the steepest and highest mountains, provided there is a fall to the sea, to

a lake, or a river ; but from every sheep farm, if it is properly managed, black cattle ought to be excluded. Beside other bad effects, their dung, or rather indeed the grass that springs from it, is most destructive to a sheep stock. The grasier of cattle should buy his lamb, mutton, and wool ; and the sheep farmer his beef, butter and cheese. Yet this cannot be expected to take place of a sudden in the Highlands. It is the general inclination of the people to have every thing upon every farm ; and to this, indeed, they have hitherto been necessarily led, by the state of the country. But that every thing must be cheap to the farmer, because it is produced on his farm, though a common, is sometimes a very erroneous idea.

The number of horses is by far too great upon every Highland farm. They are so numerous, because they are inefficient ; and they are inefficient, because they have neither stature nor food to render them sufficiently useful. Their number has never been restrained by the authority of the landlords, like that of the sheep. For in many places, they are bred and sold off the farm to advantage, being sent in droves to the south. In this case, their numbers upon a farm may be proper. But in general, there are six, eight, or ten horses upon the smaller farms, and sixteen, twenty, or more upon the larger ; without any being bred for sale, and even few for supporting the stock. None of them perform the

work of a horse ; even where such numbers are kept, and purely for labour, each of them, in many places, do not plough two acres of land annually. They get no food the whole year round, but what they can pick up upon the hills, and their sustenance is therefore unluckily accounted as nothing. To alter the Highland farming in this article, is a matter of great moment, which can only be done by increasing the size, the value, and the food of the horses.

OVERSTOCKING.

Where there is a command of green or dry forage, the pasture of a farm may be compleatly stocked and eaten down by cattle ; but where they have nothing to depend upon in winter but pasture, it must be very lightly stocked, otherwise many of them must suffer. In all grounds overstocked, both cattle and sheep must be liable to poverty, diseases, and death ; and their breed also must be diminished in size and value ; but though this is abundantly evident, yet it requires something more than the mind of a common farmer, to abstain from the pernicious extreme of overstocking. The ignorance of the generality of farmers, with their great anxiety to do the best they can, and to make the most of it, lead them sadly astray in this article. They are deceived by a false view of their own interest. They suffer, yet they persevere in the practice, nor is it an easy mat-

ter to persuade them to the contrary. It is certain, that two cows, or two ewes fully fed, must be more profitable than three, starved upon an overstocked pasture. Yet in general, over all the farms in the north, there is kept above one third more of cattle, than what by the present management can be properly supported. Instead of gain, this must be productive of inevitable loss.

SUMMER GRASINGS.

In many parts of the north, there is not food during summer, upon a farm, even for the labouring cattle. This is a certain symptom of the most deplorable husbandry. When the spring labour is finished, about the end of May, the horses and oxen employed in it, are sent off to mountain pastures, sometimes thirty or forty miles distant, where they continue till the end of August. They are there maintained indeed at a small expence, and the poor farmer erroneously imagines, that this is so much gain. In the mean while, his farm is deprived of all summer labour. The dung of these cattle for a fourth of the year is entirely lost. By the absence of the labouring cattle, no tillage is executed in summer, no fallowing, no horse-hoeing, nor any provision of manure laid up in that season for the soil. How can husbandry succeed under such management, especially on farms, in which there is every

year extensive tillage, and where there is abundance of improveable land? Farmers in this situation must be entirely ignorant, how small a quantity of arable ground, properly cultivated, is sufficient to support, during summer, all the cattle necessary to labour a farm. How comes it, that they should continue thus ignorant of what is so requisite for their prosperity? If by other means, they cannot be persuaded to abandon this pernicious custom; it should be restrained by the authority and prohibition of the landlord.

BREEDING AND FATTENING PASTURES.

The Highlands being properly a breeding country, there are very few cattle fattened for sale, except in some districts bordering on the Lowlands. In many parts, there are tracts of pasture very well fitted for the fattening of cattle, but so distant from a market, that they cannot be employed expressly for that purpose. The distinction, however, between breeding and fattening pastures, deserves the attention of every grazier, that each may be applied to its proper use. The breeding pastures, though calculated to rear a stock of black cattle or sheep, are incapable to fatten them fit for the shambles. On the other hand, the fattening pastures are not only capable of rearing cattle and sheep, but of rendering them fit for the butcher, which is the most profitable

purpose to which they can be applied. Breeding grounds, therefore, ought not to attempt fattening; nor should fattening grounds be employed in breeding; unless where the fat cattle cannot be disposed of to advantage. As this last is the case with many places in the Highlands; wherever there are fattening pastures in the remote parts of the country, they ought therefore to be made subservient to the benefit of the breeding stock. These pastures are strongly distinguished from those of the breeding kind, by the nature of their herbage.

The herbage of the fattening pastures in the Highlands, for black cattle, consists chiefly of the following plants.

- * *Anthoxanthum odoratum*, Linn. Vernal grass.
- * *Alopecurus pratensis*, Linn. Foxtail grass.
- * *Poa pratensis*, Linn. Great meadow grass.
- * ——— *trivialis*, Linn. Common meadow grass.
- *compressa*, Linn. Creeping meadow grass.
- *palustris*, Linn. Marsh meadow grass.
- * ——— *angustifolia*, Linn. Narrow leaved meadow grass.
- * ——— *annua*, Linn. Annual meadow grass.
- * *Agrostis capillaris*, Linn. Fine bent.

Dactylus glomeratus, Linn. Cocksfoot
grass.

Festuca fluitans, Linn. Floating fescue.

Bromus mollis, Linn. Goose grass.

Avena elatior, Linn. Tall oat grass.

———— *nodosa*. Knotted oat grass.

———— *pubescens*, Linn. Rough oat
grass.

———— *pratensis*, Linn. Meadow oat
grass.

* ——— *flavescens*, Linn. Yellow oat
grass.

* *Lolium perenne*, Linn. Rye grass.

Triticum repens, Linn. Dogs grass.

* *Cynosurus cristatus*, Linn. Crested dogs
tail.

* *Holcus lanatus*, Linn. Soft grass.

* ——— *mollis*, Linn. Creeping soft grass.

* *Plantago lanceolata*, Linn. Ribwort.

———— *maritima*, Linn. Sea plantain.

———— *carnosa*, Linn. Succulent plan-
tain.

* *Ranunculus repens*, Linn. Butter cups.

* *Lathyrus pratensis*, Linn. Meadow pea.

* *Vicia sepium*, Linn. Bush vetch.

* *Trifolium repens*, Linn. White clover.

Lotus corniculatus, Linn. Birdsfoot tre-
foil.

* *Leontodon Taraxacum*, Linn. Dande-
lion.

- * *Bellis perennis*, Linn. Daisy.
Achillea millefolium, Linn. Yarrow.

Of the above list, those plants marked with an asterisk, are the most valuable, and more peculiarly the inhabitants of a fertile soil ; by the presence or absence of these seventeen plants, upon a farm or in a field, a person without any previous knowledge, may determine, whether or not on such a farm or field, cattle are capable of being made fat. Among all the plants of the list, the poas are the most certain sign of a rich soil and a fattening pasture.

These plants abound in many of the low fields in the Highlands, where they afford a very luxuriant pasture ; yet they cannot be used merely to fatten the cattle, for the reason already given. They abound also in many of the more remote and fertile islands, where the case is different. The transportation of the cattle from these islands by sea, forms a great drawback upon their value. Wherever they can be fully fattened, which they may be in many places, it certainly would be much more profitable to kill them and barrel them up for sea provision. Salted beef, properly cured, has a good and ready market at hand in the shipping and towns of the Clyde.

The breeding pastures on the other hand, though they frequently possess many of the plants of the above list interspersed ; yet, in general, they consist

of a tribe of plants quite different, and chiefly of those contained in the following catalogue.

- Scirpus palustris*, Linn. Club rush.
 ——— *caespitosus*, Linn. Deers hair.
Eriophorum polystachion, Linn. Cotton grass.
 ——— *vaginatum*, Linn. Bog cotton.
Nardus stricta, Linn. Ling.
Phalaris arundinacea, Linn. Reed grass.
Phleum pratense, Linn. Catstail grass.
Aira coerulea, Linn. Fly bent.
 ——— *montana*, Linn. Mountain hair grass.
 ——— *flexuosa*, Linn. Heath hair grass.
Briza media, Linn. Cowquakes.
Festuca elatior, Linn. Tall fescue.
 ——— *ovina*, Linn. Sheeps fescue.
 ——— *duriuscula*, Linn. Hard fescue.
Juncus squarrosus, Linn. Wire bent.
 ——— *articulatus*, Linn. Spret.
 ——— *bulbosus*, Linn.
 ——— *pilosus*, Linn.
Erica vulgaris, Linn. Heather.
Spartium scoparium, Linn. Broom.
Anthyllis vulneraria, Linn. Kidney vetch.
Caltha palustris, Linn. Marsh marygold.
Hieracium paludosum, Linn. Marsh hawk-
 weed.
Hypochaeris radicata, Linn. Long rooted
 hawkweed.
Serratula arvensis, Linn. Way thistle.

Chrysanthemum Leucanthemum, Linn. Ox eye daisy.

And the following species of *Carex*, known in general by the name of one pointed grass.

Carex arenaria, Linn.

— *polygamia*.

— *leporina*, Linn.

— *vulpina*, Linn.

— *brizoides*, Linn.

— *flava*, Linn.

— *pitulifera*, Linn.

— *panicea*, Linn.

— *pallescens*, Linn.

— *caespitosa*, Linn.

— *trigona*,

— *hirta*, Linn.

These two tribes of plants form a most material distinction in the pasture of the Highlands. The first occupies the lower, the dry, and the more fertile fields.—The second, the more sterile and wet, or the higher parts of the country.—The first consists of those plants which afford the earliest pasture, and should therefore be eaten up soon in the season. They are, in general, soft and tender, and fittest for early summer grasing.—The second contains plants of a later growth, of a harder substance, and of a hardier nature: they are therefore more

durable, and better adapted for winter feeding.— The first should be completely pastured before the 1st of July. From that time till the 1st of September, the cattle should be employed in consuming the herbage at the greatest heights. From the 1st of September, they may again be put upon the second growth of the lower fields, then become very luxuriant, and which will last till the 1st of November. After that time, the finer grasses in these fields decay, and afford little winter provision, though generally and improperly preserved for that purpose. From this time, all that the cattle have to depend on, are the coarsest grasses which resist the severity of winter. And these whether in low tracts of wet ground, or on the skirts of the hills, should be preserved for them during that season.

BLACK CATTLE.

BREED.

The size of every sort of cattle will always be in proportion to the quantity and quality of their food, provided they are properly managed; for they will increase or diminish in size, even upon the same keeping, according as they are skilfully or carelessly treated. To attempt a larger size of cattle than what

the feeding can fully sustain, is a frequent and egregious error. A large cow will decline and starve upon a pasture that would support a small one in health and in good heart. There will always be more profit, and much more satisfaction in having cattle of a size rather inferior, than superior to the pasture. In the first case, they will be always well fed, kept in a thriving state, and the breed gradually improved; but if the cattle are too large for the pasture, they must be pinched for want of food, they never can be in good order, must be liable to poverty and diseases, and the breed must decline. Many instances of this have occurred in the Lowlands, and they should serve as a warning to the Highlands, especially in their present state, not to grasp at any very bulky or heavy breed of cattle, sheep, or horses.

The breed of black cattle in the Highlands is excellent of its kind, and the best adapted for the country. Instead of being improved, it may be hurt by any mixture of Dutch, English, Irish, or Lowland breed. It must be allowed, indeed, that in most places, it has been suffered greatly to diminish and degenerate; but in others, it still remains good, and is everywhere capable of being recovered, and raised to be the most proper and profitable strain for the Highland countries. This can only be done, however, by a greater degree of attention, than has hitherto been paid to the improvement of the breed. No cattle should be raised but from males and fe-

males of the largest size, and of the best form. The breed, at any rate, should be preserved pure and unmixed with any foreign blood; as no cattle of the same size are equally valuable. The cows, indeed, are more remarkable for feeding fat, than for giving milk; but it is this property that renders the Highland breed so eligible to a grasier; and it is not the milk, but the carcass that should be the principal object in a breeding country. Alterations in the breed, by means of crosses with other cattle, may be attempted by individuals, and possibly with success; but all the premiums offered by the public, for the improvement of the Highland cattle, ought certainly to be restricted to the native breed.

If any new breed was to be introduced, the most proper, perhaps, might be that of Guernsey. The Guernsey cattle are nearly of the same size with the largest in the Highlands; they are of a fine shape, hardy, active, and easily supported; they give the richest milk, though not in great quantity, and when fully fed, afford meat of a superior quality. Their native food is exactly similar to what abounds in many of the Western Islands,—a short sweet pasture on a thin dry soil, or on sandy downs. If a trial was to be made of them, some of these islands would be the most proper place; but this, and every other trial of the kind, should, for a time, be confined within narrow bounds. No foreign breed

should be allowed to spread in the country, till its merit has been fully established.

MANAGEMENT.

The Highland cattle lie abroad all the year round, and have little or nothing to eat during winter and spring, but what they can pick up in the fields. Till this practice is rectified, no essential improvement either in corn or cattle can be expected; for the cattle are starved, and the soil is left destitute of manure. These two most material defects can only be remedied by providing winter provender, and winter accommodation for the cattle in houses and sheds. It is commonly imagined in the Highlands, that the housing of the cattle would enfeeble them, and render them less hardy; but were they housed and fed in winter, they would not perish for want as many of them do at present; a great stock of manure would be supplied upon every farm, and the cattle remain hardy enough for the climate of the south of Scotland and of England to which they are driven.

The richest milk is always produced upon the poorest pasture; and wherever it is small in quantity, it is usually superior in quality. The best cows in many parts of the Highlands, afford only a Scots

quart of milk a-day: of this, the calf gets a chopin in the morning, and the same quantity in the evening; but many of them yield not daily above a Scots pint of milk. This milk, however, is like cream, compared to that of large cows fed upon clover, which give from fourteen to eighteen Scots pints of milk a-day.

One of the best, and one of the worst milk cows yield together, during the summer season, about two stone weight of butter, and four stone of cheese, at twenty-four pounds the stone; sometimes in all, seven stone, but seldom eight. The butter they afford, is often more than one half of the quantity of the cheese, which shows the peculiar richness of the milk.

In consequence of this superior quality of the milk, the butter made in the Highlands, is in general excellent. Where there is a large herd of cows, the milk also is churned once, and sometimes even twice a-day; in this way, the butter is always formed from sweet cream, and it is from this only, that butter of the most exquisite flavour and sweetness can be obtained. The richness of the milk is also very remarkable in the quality of the Highland cheese. Wherever it is made of the entire milk, it is richer than any other cheese in the kingdom, that is formed without any addition of cream.

It is obvious from these facts, that the dairy work in the Highlands is capable of being greatly enlarged and much improved. Butter, cheese, and milk, in various forms, make a principal part in the sustenance of the people, nor are these articles anywhere fully equal to the consumption. The quantity of milk may be greatly increased, perhaps four or six fold, but this can only be done by alterations and improvements in the management of the cattle.

Many of the cows, from poverty and weakness, do not bring a calf but once in two years. If the cows calve before the 1st of March, it will be sometimes a month or six weeks before they have milk sufficient to feed the calves, many of which perish annually by this defect. It is the great misfortune of the Highland cattle, that they are thus starved, and sometimes to death, in the calf's skin. There is a remedy, indeed, for this, and it ought to be universally known and practised in the Highlands:—It is the use of hay tea. This would not only serve to save the life of many of the young calves, but likewise to save the consumption of a great deal of milk.

The preparation of hay tea is a very simple process. A large pot or kettle should be firmly packed with hay, and then filled with water. When the water has been brought to boil for fifteen or twenty minutes, and then cooled, it is fit for use. This de-

coction contains all the nutrimental matter of the hay, which is the natural and nourishing food of the animal; but it is conveyed in a liquid form, which is necessary, while the calf is incapable of being supported with solid food. This decoction may be mixed with milk, in the proportion of two, three, or four to one. A Scots pint of milk a-day, is certainly a very short allowance for a calf, and scarcely sufficient to preserve its life; but mixed with three pints of strong hay tea, it is capable not only to support the calf, but sufficient, in a great degree, to encourage and enlarge its growth: it has even been found, by some trials, that a calf may be reared upon hay tea alone, without the assistance of milk.

DISEASES.

The black leg, or black spauld, prevails in some degree in most parts of the Highlands. The disease seizes one of the legs, and generally one of the hinder legs. It does not swell, but the cow or ox becomes quite lame, and the leg has the appearance of being palsied. When the animal is dead, the flesh of the leg is found to be of a blue or blackish colour, and not so solid as the muscular flesh of the other limbs. It affects chiefly the young cattle, and prevails most in winter and spring. It cannot be perceived till the lameness takes place, and there is no cure known for it. The disease is ascribed to the

feeding of the calves entirely on milk, to their lying in the heat of the sun without exercise, and to the want of water, which are all very unlikely causes.

The black cattle are subject also to what is called the scour, in which the excrements become quite liquid, and much blacker than ordinary. It prevails in the end of spring, and in summer. It can be discerned several months before the above effects take place, by a heaviness about the eyes of a cow, and an uncommon degree of languor. It is seldom or never cured, yet it certainly might be prevented in some degree, if what is said of it be true, that it runs in the breed.

There is another disease that is peculiar to the cattle of some of the islands. They become extremely hard in the belly, then pass bloody urine, after which they die in one, two, or a few days, and the cows are more subject to it than the oxen. This distemper prevails in the cattle of Tirey, Canna, Muick, and other islands, but not till they are removed to the main-land, especially if this happens in May or June, for if they are removed in October and November, they are not so liable to the disease. In these islands there is no heather, but all the pasture consists of soft rich grasses and herbage. In winter and spring, the cattle feed much upon sea weeds, and especially on the two most common sorts

tangle*. These keep them loose in the belly, and this looseness is increased by the fresh succulent grass they feed upon in May and June. If, at this season, they are removed to a hard, dry, heathy pasture, which is generally the case on their leaving the islands, they fall into this distemper. It is pretty evident that this change of food is the cause of the disease; and, accordingly, the cattle on the next adjacent islands of Rume and Eig, where there is plenty of heather, are not subject to it.

SHEEP.

INTRODUCTION.

There is a particular product fittest for every country, which its soil and climate, and its situation with respect to a market, point out. This, however, is frequently overlooked and neglected by the inhabitants, and product adopted other than what nature dictates. In one article this is remarkably the case in the Highlands; the only product that brings money is black cattle; but they are low in size, and

* *Fucus saccharinus*, Linn
 ——— *polyschides*.

few in number, compared to the nature and extent of the country, nor do they yield the profit which it ought to afford. In the valleys there is, indeed, excellent pasture for black cattle. But more than one third of the country consists of mountains and declivities too steep and abrupt for black cattle; and the grass they produce too short and fine to afford them a tolerable pasture, except in the height of summer. The greater part of this pasture is therefore lost, though it might all be beneficially consumed with sheep. A flock of sheep will thrive where cows and oxen would starve, and will go at all seasons of the year to such heights as are inaccessible to black cattle. The mountains in many places, though of a great height, are dry and green, with such a proportion of heather as is beneficial upon sheep grounds. In a situation of this kind, the very wool of a flock would amount to more than the whole profit to be obtained by black cattle.

The cultivated land at present in the Highlands bears but a very small proportion to the extent of the country and the number of the people. Every consideration points out the necessity and the advantage of its being enlarged, and every measure should be avoided by which it is abridged. On extensive sheep farms in a mountainous country there should be little or no tillage. In the Highlands, whatever land is capable of cultivation, is of too much value to be employed in the pasture of sheep.

But it is the valuable property of a sheep stock, that it can be kept, and can prosper, on land that is incapable of tillage. It is to lands of this sort that the sheep in the Highlands should be chiefly restricted. While they are confined to high and uncultivated tracts, they will be a matter of emolument to all concerned ; but if they are kept on lands that have ever been under cultivation, or prove a bar to what would be cultivated, whatever may be the interim advantage to a landlord or an occupier, the country at large, and all its inhabitants, from the highest to the lowest, must eventually suffer.

The proportion in the prices of cattle is very different in the Highlands from what it is in other places. Of the native breed in the south of Scotland, a cow is equal in value to twelve sheep, and a horse equal in value to two cows. But before the introduction of the south country sheep, the proportion was very different in the Highlands ; for in many places five or six sheep were equal in value to a cow. This high value of sheep, and the high rents offered by sheep farmers from the south, induced many proprietors to substitute sheep instead of black cattle on their lands.

About the year 1762, some sheep farmers in Annandale, and other places in the south, took leases of farms in the Highland parts of Dumbartonshire and Perthshire, bordering on the low country. They

gave a higher rent than had formerly been given for these farms when under black cattle. They stocked them entirely with sheep, and soon found their enterprise to turn out very profitable. They were of course followed by others, who continued to go still further and further north ; so that the sheep farming of the south of Scotland is now introduced, and in a manner established over all the Highlands. This is an event that must materially alter the whole agrestic economy of the north of Scotland. The management of sheep must become an important object in the management of the country, and every thing relative to the improvement of a sheep farm highly interesting. The following observations on the culture of sheep will not therefore be misplaced in an *Economical History of the Highlands*, and may possibly be useful.

BREED.

The native breed of sheep in the western Islands and Highlands is evidently aboriginal, having subsisted since the first introduction of that domestic animal in these countries. Till of late years, this is the only sort of sheep that has ever been known in them, and is widely different from all others in Britain. When it was first introduced is uncertain. The Caledonians may possibly have acquired this

domestic animal during the Roman invasion ; but it is more probable that the present race was planted in these countries by the Norwegians, between the eighth and twelfth centuries, while they held the dominion of the western Islands and coasts. In confirmation of which it is remarkable, that this native sheep of the Hebrides and of the Shetland Isles, is exactly the same with what subsists to this day in the kingdom of Norway.

The Hebridian sheep is the smallest animal of its kind. It is of a thin lank shape, and has short streight horns. The face and legs are white, the tail extremely short, and the wool of various colours ; for, beside black and white, it is sometimes of a blueish grey colour, at other times brown, and sometimes of a deep russet, and frequently an individual is blotched with two or three of these different colours. In some of the low islands, where the pasture answers, the wool of this small sheep is of the finest kind, and the same with that of Shetland. In the mountanous islands, the animal is found of the smallest size, with coarser wool, and with this very remarkable character, that it has often four, and sometimes even six horns.

Such is the original breed of sheep over all the Highlands and Islands of Scotland. It varies much indeed in its properties, according to the climate and pasture of different districts ; but, in general, it

is so diminutive in size, and of so bad a form, that it is requisite it should be given up, wherever sheep farming is to be followed to any considerable extent. From this there is only one exception: in some places the wool is of such a superior quality, and so valuable, that the breed perhaps may, on that account, be with advantage retained.

But as this small race ought to be, and will be, in general, dismissed, it is an important enquiry—What are the proper sheep to come in their room, with which the Highlands and Islands ought to be planted?

When sheep farming was introduced into the Highlands, about the year 1762, by people from the south, they naturally stocked their farms with the sheep of their own country. These were the sheep of Linton market, from the hills of Tweeddale, Annandale, Nithsdale, and Clydesdale. They, commonly indeed, but improperly, pass by the name of the Black faced sheep, in opposition to the sheep whose face is entirely white. But the sheep of these countries, in general, consist of what are called Brockit sheep, their face and legs being blotched with black and white. These, though much inferior to the real black faced sheep, are a great improvement upon the Highland breed, and deserve to be propagated.

The true black faced sheep is distinct from these, and is a peculiar strain, that still subsists upon several farms in Annandale. His body is of a plump barrel shape, his head is horned, and his face and slender legs are as black as jet, without any mixture of white. His face is set off with a thick prominent collar of wool surrounding the neck. His wool is superior, both in quantity and quality, to that of the brockit sheep. He is the boldest, the most hardy and active of all the sheep kind. He fattens readily, and to a considerable size. When this is the case, and when he is of a proper age, with access to heather, his meat, by general consent, is preferable to every other sort of mutton*.—The brockit sheep are but a degenerated cross between this animal and the old white faced Scots sheep. His breed has been long carefully preserved by some skillful Annandale farmers, who, on that account, found their stock always preferred by the English dealers. The pure breed is still to be obtained from many farms, and is, unquestionably, the best that can be procured for those parts of the Highlands where no artificial food is provided for the sheep in winter.

* The black faced sheep, with high feeding, has been often raised to 20lbs. and even to 25lbs. the quarter.

It is uncertain from whence this black faced breed was originally derived; but there is a tradition of its having been first planted upon the king's farm in the forest of Ettrick. That farm used to contain a flock of five thousand sheep for the use of the king's household, and probably gave rise to that mode of sheep farming which still subsists in the south of Scotland.

The Cheviot breed are English sheep of a large size, with white faces and legs, long bushy tails, and without horns. Cheviot, from which they are named, comprehends a group of mountains between one thousand and two thousand five hundred feet in height, of course equal to many in the Highlands, and with similar pasture. But to imagine that what are called Cheviot sheep, are the sheep bred upon these mountains, and consequently fit to be bred upon such mountains in the Highlands, is a great deception. What are commonly termed Cheviot sheep, are not bred upon the mountains of Cheviot, but upon the low and fertile lands in their neighbourhood, where they have such winter sustenance upon turnips and hay as the Highlands do not yet afford. In such a situation, and with such sustenance, no sheep give a greater return: but, unless they are managed, and indeed pampered, in this way, they cannot be profitable. They would perish with poverty and diseases, where the black faced or brockit sheep would prosper. In the valleys of the High-

lands, where there is good summer pasture, and where turnips and hay can be afforded in winter, the Cheviot sheep is the stock to be chosen; but, where there is no such winter provision, it will be found very hazardous to adopt them; as they are of a size too large, and of a nature too delicate, to live all the year on a Highland pasture.

There is another breed that deserves to be noticed here, and which, of all others, appears to be the most proper for the Highlands, if it could be procured, that is the Spanish sheep. He is of a size greatly inferior to that of the Cheviot sheep, not much larger than that of the black faced breed, and such as a good hill pasture in Scotland is able to support. He is horned, his body is full and well made, and though his limbs are short, he is abundantly active. His face is not white, but of a uniform grey colour. He has a remarkable tuft of wool on his forehead, hanging down upon the eyes, and his legs are covered with wool even down to the hooves. By these characters he is strongly distinguished from all other sheep. His wool is short, but extremely thick, and of the finest quality. He bears the greatest quantity of wool for his size. No animal of the sheep kind is capable of enduring more cold. He is clothed to resist a far more severe climate than that of Scotland. He is evidently robust and hardy, and better fitted for a

mountanous country than any of the large English sheep.

Owing, as it would appear, to mere neglect, the Spanish sheep has never, even to this day, been established in France. Though it may be regretted, it is not surprising, that it has never been fairly introduced into England. A Spanish ram or ewe has often been brought over, but merely with the intention, by means of a cross, to improve the quality of the English wool. The Spanish sheep is small, and its carcass is therefore no object of attention to an English grasier; but the case is quite different in Scotland. The sheep of Spain are of as large a size as our best sheep walks can in general support, and their wool is the best that can be produced. It is, therefore, a breed better calculated for the hills of Scotland, than for the champaign and rich parts of England. It ought certainly to be established in this country, but not merely by means of rams. In this way only a mixed and mongrel breed can be obtained, which would soon wear out. A number both of Spanish ewes and rams ought to be imported, and if they succeeded, as it is highly probable they would, the full breed, which is the great object, might then be propagated and spread in the country.

The propriety of this measure appears from the experience of Sweden. In that country, they have

long been in use to import Spanish rams. The improvement which these make in the Swedish flocks is considerable ; but it does not descend beyond the third generation. In this tract of time, which is not many years, the native blood comes first to predominate, and then to extinguish the foreign strain. A successive importation of Spanish rams becomes therefore necessary ; and especially so, from an opinion of the Swedish shepherds, which prevails too much with ourselves ; “ that the merit of the breed “ depends almost entirely upon the male.” No general and permanent alteration in our Scots sheep can, therefore, be expected, from a mere mixture of the Spanish breed ; as the native stock must always, in time, prevail over it. If that breed is to become materially useful to the country, it must be introduced, preserved, and propagated, pure and entire. In this way, it certainly promises to be the greatest improvement on the sheep farming in Scotland.

It is certain, that large sheep removed to an inferior pasture, will degenerate in spite of all endeavours ; and on the other hand, that small sheep will improve, when put upon a better pasture, without any particular attentions. From this, it is held by some skillful storemasters ; “ that the pasture will, “ of itself, without any extraneous breed, raise the “ sheep to that size that is proper for it.”

This conclusion may be plausible, but it is certainly fallacious. If this was the case, it would be unnecessary to introduce any where a new breed, because it can be followed by no advantages which may not be attained by the breed upon the ground. But it is certainly too bold to say, that the practice of changing the breed of cattle, so universally followed in all ages and nations, is unnecessary; and rash to affirm, that no good consequences have ever arisen, from altering the breed of sheep in a country or upon a farm. The reverse in numberless instances has been found to be true.

To know if the breed of sheep in your district or upon your farm, may be mended, observe if in other districts or upon other farms, where the pasture is inferior, or but of an equal quality with your own, you can discover a better breed than what you possess. This is a discovery that may be often made, and renders it certain, that your breed may be altered for the better, and rendered more profitable.

With skill and care, a good breed of sheep may be preserved upon a farm, and even improved, when without these, it would degenerate.

For this purpose, the following rules are to be observed.

α. The ewe hogs, or ewes under one year old, must not be suffered to have lambs. The strongest lambs, and the best breed, are to be obtained from the ewes that have no lamb till the second, or even till the third year.

β. That no ewes should be continued as breeders after the sixth year.

γ. That the early weaning of the lambs, and the milking of the ewes should be abandoned, and the lambs allowed to be suckled as long as the ewes will suffer them.

δ. That the rams should be confined in autumn, to postpone the lambing time, till the spring is as far advanced as possible. And,

ε. That a breed too large for the pasture should not be attempted.

Beside other rules of management, the observance of these, tend to preserve the breed of sheep upon a farm in vigour and perfection. But if they are neglected, let the pasture be what it will, the breed must diminish and decay.

No animal, nor even man himself, is capable of enduring greater variety of climate, than the sheep. Having been long domesticated in almost

every region of the earth, he has assumed so great diversity in his form and characters, as to appear in one country almost a different species from what he is in another.

In a temperate climate, and rich pasture, the sheep grows to a large size. The wool increases in length, in quantity, and in fineness; the face and legs are white; the tail grows to be very long, broad, and bushy with wool; the head comes gradually to be deprived of horns, and the ewes bring two or more lambs.

On the other hand, in a northern and mountainous country, where both the climate and pasture are coarse, the sheep dwindles in size. The wool diminishes in length and quantity, becomes hairy, and of different colours beside white; the face and legs are black, or blotched with black and other colours; the tail decreases, and is covered with hair instead of wool; but the horns increase both in size and number; and the ewes bring only one lamb.

By extreme heat, the finest wool of a sheep, degenerates entirely into hair; which is well known on the coast of Guinea and in the West Indies. In very cold countries again, the wool changes partly into long hairs, but these at the base, are intermixed with a thick short growth of the very finest wool. By these alterations, the animal, in the one case, is

protected from the heat, and in the other, from the cold of the climate.

The sheep armed with horns are bold, intractable, and much given to fighting. The polled sheep again, or pollards, are mild, docile, and peaceable. The change of form and constitution, by the want of horns, is evidently accompanied with a change of temper and disposition. The horned sheep, however, are more hardy, can better withstand the hardships of the weather, and are less subject to distempers than the pollards. The sheep also, whose horns are rather straight than spiral, are the hardiest of all, but their fleeces often are of the coarsest quality.

The attempts that have been made of late in Scotland, to improve the breed of sheep, and the quality of the wool, are highly commendable. But it is questionable, whether the pains and the expences which have been bestowed, might not have been better directed. A few of the best breeds have been brought into the country, but to propagate these, they have been crossed with others confessedly inferior. The result is generally a degree of improvement; yet it is still only a mongrel and imperfect breed. But why should we aim only at half a breed of the best sheep, if the whole can be obtained? The four varieties that promise to be of the most advantage to Scotland, are the Leicester, the Hereford,

the South Down, and the Spanish sheep. Each of these has its peculiar excellencies. They have all been introduced into the country, but none of them have been preserved pure. They have been every where intermixed with sheep of a very inferior sort; but these four valuable breeds have no where been preserved pure. It is probable, however, that there are lands in Scotland fitted for these four breeds, and capable to support them in all their good qualities. Instead of allowing them to degenerate into a mongrel race, would it not be better to preserve them pure and entire, with all their intrinsic properties? This can only be done by keeping them free from all intermixture, which might undoubtedly be accomplished. Let the climate and pasture for each race be chosen, and there let the full breed be preserved and propagated. If it is found to answer, it may then be easily translated from one place to another. The skillful storemaster knows, that even in the best flock, there are a number of weaklings. These are to be dismissed, and only the best kept, to uphold the breed. By observing this rule, these four races of sheep, which are the most valuable that are at present known, might be preserved in purity. There is reason to think, that in many parts of Scotland there is climate and pasture sufficient to support them in an equal, or nearly an equal degree of perfection to what they possess in the countries from whence they are brought.

FOOD.

Sheep make choice of the short and soft grasses for their food, in preference to all other plants ; and chiefly the different species of Aira, Poa, and Festuca, with the Agrostis and Cynosurus. These abound most in dry pastures, where, it is well known, sheep are always in the most prosperous state. They feed also only on the young foliage of all plants, except from necessity.

The following grasses are what constitute the principal part of the best sheep pastures in this country.

- * 1. *Anthoxanthum odoratum*, Linn. Vernal grass.
- * 2. *Agrostis capillaris*, Linn. Fine bent grass.
- 3. *Aira flexuosa*, Linn. Heath hair grass.
- 4. — *montana*, Linn. Mountain hair grass.
- * 5. *Poa trivialis*, Linn. Common meadow grass.
- 6. — *compressa*, Linn. Creeping meadow grass.
- 7. — *annua*, Linn. Annual meadow grass.

- * 8. *Festuca ovina*, Linn. Sheeps fescue.
- * 9. ——— *duriuscula*, Linn. Hard fescue.
- 10. ——— *decumbens*, Linn. Decumbent fescue.
- 11. *Avena pratensis*, Linn. Meadow oat grass.
- 12. ——— *pubescens*, Linn. Rough oat grass.
- 13. ——— *flavescens*, Linn. Yellow oat grass.
- * 14. *Lolium perenne*, Linn. Rye grass.
- * 15. *Cynosurus cristatus*, Linn. Crested dogs tail.

A great variety of other plants are cropt by sheep, but these fifteen species are what they prefer to all others which grow in Scotland. The seven grasses of this list marked with an asterisk, are those which are most prevalent in our best pastures, many of which are almost entirely composed of them.

There is no grass that has been so signalised with encomium, as the *Festuca ovina*, or Sheeps fescue; but its value seems rather to have been exaggerated. It is not any where in Scotland, at least, of that great importance as a sheep pasture, that it is represented to be in Sweden and England. Where it abounds most in our pastures, it never forms a sward of any considerable extent by itself. Its leaves are

the most slender of any grass, and are both thin and short. They afford therefore but a scanty crop, and though very agreeable to sheep, are insufficient to afford a proper pasture either for black cattle or horses. It yields little food, even for sheep, during winter and spring. It is of little moment, except during twelve weeks, from the 1st of June till the 1st of September, when all the other grasses are in the greatest abundance. It grows only on dry wholesome grounds, and though it forms but an inconsiderable part of the herbage, it is a certain sign, that the pasture is both nourishing and salutary for sheep. The cultivation of it has even been proposed, but this could never possibly turn to any account. Other grasses grow on the same soil, which might be as easily propagated, which afford a much larger crop, and are as eagerly coveted by sheep.

The plants of the above list are all summer grasses, which afford no pasture in spring, but little when autumn is far advanced, and scarce any at all in winter. On a mountainous pasture, the sheep must therefore depend for about one half of the year upon other plants. There is accordingly a tribe of plants, capable, at least, of supporting them in life, during that period, without the aid of artificial provender. These are of the greatest importance upon a store farm, and deserve here to be particularly noticed.

LIST OF PLANTS

Which serve chiefly to support the sheep on a hilly pasture, from about the 1st of November, to about the 1st of May.

1. *Erica vulgaris*, Linn. Heather.

From the decay of the summer herbage, about the 1st of November till the 1st of March, the sheep, wherever they have access to it, feed much upon this plant. It is not indeed a fattening, but a very salutary food, and peculiarly agreeable to sheep. They browse chiefly on the summer growth, but when pinched, they eat likewise the growth of the former year.

2. *Ulex europaeus*, Linn. The whin.
3. *Spartium scoparium*, Linn. Broom.

These two shrubs afford to the sheep both shelter and food during all the winter. The shelter, indeed, is something like that which a man receives from the law—it is always at the expence of part of the fleece. But though briars and thorns, for this reason, ought to be extirpated from every sheep farm, yet whins and broom should be carefully preserved; wherever they are wanting, they should be planted

and propagated. In the season of scarcity, they afford a great quantity of wholesome food, and are a sure refuge in the time of deep snows, when the sheep are excluded from almost every thing else.

Neither sheep, nor horses, nor black cattle will starve in winter, if they have the command of whins and broom. They will not prefer them, indeed, to grass, or hay, or turnips; but where these are wanting, they will all feed on whins and broom with avidity, which, though not a luxuriant or fattening, are a wholesome food. Where they grow rank and tall, they preserve the foggage that is among them for a long time in winter, which would otherwise fall sooner into decay. The best winter pasture for the cattle in Galloway, is among whins and broom of a great height. These shrubs, indeed, come to be unnecessary and superseded, as they have been in Forfarshire and other places, where winter provender, consisting of straw, hay, and turnips, is raised in sufficient quantity for all the cattle upon a farm. But till that is accomplished, which is not the case in the Highlands, an abundance of whins and broom is a sure refuge to prevent horses, cattle, and sheep from perishing by want, which is too often the case.

4. *Juniperus communis*, Linn. Juniper.

This evergreen shrub cannot be too abundant on a mountain sheep walk. It is usually intermixed

with very good pasture. The sheep crop it to the quick, are healthy, and especially free from the rot, wherever it abounds.

5. *Nardus stricta*, Linn. Ling.
6. *Juncus squarrosus*, Linn. Wire bent.

Of the gramineous tribe, these are the two most important plants to our mountain sheep, during winter and spring. They grow only on a mossy or wet soil, and, for a great space, often cover the whole surface. They are neglected by the sheep in summer, but yield them a great supply of food in winter, being hardy, and in a manner evergreen.

The ling has slender leaves, but forms a thick turf. When it first springs, the sheep feed upon it, but desert it for better grasses, as the summer advances. Its foliage and flower stalks decay and turn white in the end of September, making entire mountains appear white at a distance. Even in this decayed state, the sheep are glad to feed upon it in the time of a storm; but it continues to vegetate in some degree, and to form fresh green leaves in the heart of the turf, through the whole winter. The roots of the plant are gross, white, and succulent, and these, where the soil is soft, the sheep tear up in the spring, and devour with great avidity.

The Wire bent is so called, because the flower-stalks very much resemble, in shape and size, a stocking wire. It is also called by the shepherds the Stool bent, because the leaves, at the base of the stalk spread out in a round thick tuft, and in a radiated form. This plant, during winter, is the principal food of the sheep in the mountains of Scotland. Its foliage remains verdant and succulent in spite of all the severities of winter. It is then eaten down by the sheep, in many places, as smooth as a bowling green. Without it, few mountain farms could afford sufficient winter food. In the time of snow, the sheep are directed to it by the tops of its stalks which remain above, and there, they scrape away the snow with great assiduity, to get at it. In spring, they tear up the plant wherever they can, and feed upon its white succulent roots. A storemaster, in taking a farm, often judges of its value according to the quantity of the Wire bent that grows upon it. In a severe winter, where this plant is wanting upon a farm, numbers of sheep die through weakness and want of food; whereas, on a farm in which it abounds, they are healthy and vigorous.

7. *Eriophorum polystachion*, Linn. Moss-crops.
8. ————— *vaginatum*, Linn. Moss-crops.

These two gramineous plants produce what is called bog-cotton, and are frequently to be seen in

mosses and bogs. They afford not a great crop, but are of importance from their early appearance. In March and April, they form the first spring growth that is tasted by the sheep, and when in sufficient abundance, are a great relief at that season.

9. *Scirpus caespitosus*, Linn. Deers hair.

This plant covers the sides of many of our mountains, where there is a mossy soil. Its slender stalks form a thick sward, which is so tall as to be pliant before the wind. In the month of July, they begin to be tipped with brown, which gives the whole a gross resemblance to the pile or fur of a red deer. It springs early, and affords a welcome pasture to the sheep, from the 1st of April to the 15th of May. It is the first new herbage that brings them into flesh; but after this time, they scarcely touch it till the return of winter.

10. *Juncus articulatus*, Linn. Spret.

This is well known to be a prevailing plant upon all wet soils in mountain pastures. The sheep eat of it plentifully when it first springs, from about the 15th of April till the 15th of May; but they never touch it after it grows tall. It is indeed only the young foliage of all plants they delight to feed upon; nor do they ever, except from necessity, touch those parts of plants that are come to maturity.

Though the sheep is very hardy, in regard to climate, it is a very delicate animal with respect to its food. The translation of it from one country to another, or even from one farm to another, is therefore hazardous. In such a transition, it is the pasture more than the climate that is to be regarded.

All wet pastures are inimical to sheep, and that chiefly by the plants with which they are naturally occupied. Many of these are of a very hurtful nature; and though they are not readily eaten by a sheep that has choice of food, yet, when constrained by hunger, he will devour them, and it is certain they produce many diseases. A list of such plants, may be very properly inserted in this place.

The plants most frequent and pernicious to sheep in our wet pastures, are the following :

1. *Veronica Anagallis aquatica*, Linn. Water speedwell.
2. ———— *scutellata*, Linn. Marsh speedwell.
3. *Pinguicula vulgaris*, Linn. White rot.
4. *Montia fontana*, Linn. Water chickweed.
5. *Myosotis scorpioides*, Linn. Mouse ear scorpion grass.

6. *Anthericum ossifragum*, Linn. Lancashire asphodel.
7. ——— *calyculatum*, Linn. Scottish asphodel.
8. *Alisma Plantago aquatica*, Linn. Greater water plantain.
9. ——— *ranunculoides*, Linn. Lesser water plantain.
10. *Polygonum Hydropiper*, Linn. Pepper grass.
11. *Hydrocotyle vulgaris*, Linn. White rot.
12. *Drosera rotundifolia*, Linn. Red rot.
13. *Chrysosplenium alternifolium*, Linn. Golden saxifrage.
14. *Anemone nemorosa*, Linn. Wood anemone.
15. *Ranunculus flammula*, Linn. Water spearwort.
16. ——— *lingua*, Linn. Upright spearwort.
17. ——— *Ficaria*, Linn. pilewort.
18. ——— *acris*, Linn. Acrid crowfoot.
19. ——— *sceleratus*, Linn. Marsh crowfoot.
20. ——— *auricomus*, Linn. Goldilock.
21. ——— *aquatilis*, Linn. Water crowfoot.

22. *Caltha palustris*, Linn. Marsh marygold.
23. *Trollius europaeus*, Linn. Lucken gowans.
24. *Pedicularis palustris*, Linn. Marsh lousewort.
25. ———— *sylvatica*, Linn. Common lousewort.
26. *Melampyrum pratense*, Linn. Meadow cow-wheat.
27. *Myrica gale*, Linn. Gale.
28. *Mercurialis perennis*, Linn. Dogs mercury.
29. *Equisetum arcense*, Linn. Paddock pipe.
30. ———— *sylvaticum*, Linn. Wood horsetail.

Wherever all or any of these thirty plants predominate in a pasture, it is unfit for sheep, and ought to be applied to some other purpose. Some of them are so acrid as to inflame and ulcerate the skin, others of them act by a narcotic quality; but they are all noxious to sheep, and productive of diseases.

There are also many other plants peculiar to woods, and which grow under shade, that are very hurtful to sheep. This is one reason, among others, why sheep never thrive in woods. Every woody pa-

sture should therefore be eaten up by black cattle and horses, and not by sheep.

MANAGEMENT.

There are some articles in the management of sheep to be noticed here, which suggest remarks that may be useful in those parts of the Highlands where sheep farming may not as yet be fully understood.

Smearing.

The first is the custom of smearing the sheep in autumn, between the 20th of October and the 1st of November, with a mixture of tar and butter. This practice has been generally and immemorially observed in all the store countries of the South of Scotland, but was never known in the Highlands till of late years, that is, since the introduction of the south country sheep. To dissuade from this practice, it is urged,

α. That it is expensive.

The expence varies indeed in different years, according to the practice of the materials employed, but, in general, it amounts from fourpence to six-

pence a head. This, exclusive of the labour, comes, no doubt, to a considerable sum, wherever there is a large flock.

β. That it spoils the wool.

The wool is so deeply discoloured by the mixture of tar, that no scouring can compleatly remove the defect. Though tarred wool receives black, blue, and other deep dyes equally well with white wool, it is totally unfit for the lighter and finer colours.

γ. That it is unnecessary for the protection of the sheep from cold.

Though it were admitted that the smearing really keeps the sheep warmer, it must also be allowed, that no artificial warmth is requisite to preserve a sheep from the greatest cold of our country: His own coat and constitution are fully sufficient for that purpose; nor is there any instance of sheep perishing with us merely by the cold of the climate, unattended with other hurtful circumstances.

These are the arguments used against the practice of smearing; but the following reasons, on the other hand, are advanced in its favour.

α. That it both increases the quantity of wool, and improves its quality.

Both these assertions are affirmed by persons who have had the greatest experience in the business. They suppose that it increases the weight of the fleece near four times. Of the smearing materials, it is the tar only that can weigh considerably when the sheep is shorn, for, by that time, the butter must, for the most part, be either absorbed or evaporated. The smearing indeed must encourage the lodgement of dust and earth in the fleece, and so increase its weight; but it can scarcely be presumed, that both these combined, could amount in weight to near three times more than what the fleece would be without smearing. It is affirmed too, that in a high country, the wool of the smeared sheep is finer than that of the sheep which remain white or unsmeared; and likewise, that it is not so dry and rigid, but more soft, pliant, and ductile.

β. That it accelerates the growth of the wool.

The wool of a sheep continues to grow, so long as he continues to fatten and is in good condition; but as soon as he begins to fall away, the growth of the wool ceases. In the interval between the 1st of November, when he is smeared, and the 1st of January, the wool usually grows between half an inch and an inch in length. This may be exactly seen by the rise of the tar. When he is smeared, the wool is coloured by the tar to the very skin; but as wool grows not at the extremity, but only at the root, the

new growth is of a pure white, and by its progress may be easily discerned. During January, February, and March, the growth of the wool is at a stand, unless the sheep is kept in high order, and then, even in these months, it continues to grow. This remarkable growth of the wool in November and December, is ascribed to the smearing; but it is not certain whether the same growth would not take place though the sheep remained white. It is a proof, however, among many others, that the smearing is by no means detrimental to the health of the sheep.

δ. That it preserves the fleece longer entire on the sheep.

Tar and butter, especially the latter, like every other greasy and oleaginous substance, is most inimical to all insects, and when applied, occasions their death. The sheep is infested with a peculiar insect, the sheep head or tick *, as it is called, which fastens in the skin, and occasions a perpetual itching and uneasiness. In rubbing violently to get rid of the insect, he rubs off the wool, and, before the spring, he is sometimes deprived of most of his fleece. Beside the loss of the wool, this is always accompanied with poverty and decay, and sometimes

* *Pediculus ovis*, Linn.

occasions death. But these bad effects seldom take place in a sheep that is thoroughly smeared. He retains his fleece entire, till it comes naturally to wear off.

1. That it prevents the scab.

This disease makes its first appearance on the lips of a sheep, which become tumid and covered with pustules. These gradually spread over the whole body, and cover it with a scurf or scab. No domestic animal is so liable to vermin as the sheep, owing to the shelter and warmth of the fleece. This disease is produced by a very minute insect, a species of acarus, similar to that which occasions a like disease in black cattle. It multiplies in myriads, and by communication, renders the malady contagious. A disease only affecting some individuals, is often bad enough; but an infectious disease that threatens the whole flock, is most formidable. A remarkable instance of this happened in the year 1790 in Shetland. A few sheep of the large kind, and unsmeared, had been imported for mending the breed; these were infected with the scab, and spread the disease to such an extent among the Shetland flocks, as to become a great calamity.

2. That it preserves the sheep from wetness.

It was never on account of cold that sheep have been smeared in Italy, both in ancient and modern times, with turpentine, tar, and oil; but merely to preserve them from vermin, to which they must be still more obnoxious in a warm, than in a cold climate. With us, the smearing is quite unnecessary to a sheep, as a defence against cold; but it is of great use in preserving him dry. The coat of tar and butter, repels and resists the wet, and prevents the animal from being drenched to the skin by every fall of rain in winter. In the coldest dry weather, and in the hardest frosts, sheep are always in good health, and never suffer, if they have plenty of food; but they, and especially their lambs, are always hurt, and sometimes destroyed by wetness. In some places, oil is used for smearing, instead of butter, but the wool neither scours nor dyes so well. Snow and hoar frost lie on the back of a sheep smeared with butter, and are shaken off; but they are never seen to lie on a sheep smeared with oil. In this case, they immediately thaw, and sink to the sheep's skin as soon as they fall. But the butter and tar form a paste that confines the heat of the sheep's body, which the oil and tar do not. Hence, the sheep receives much more shelter from wetness, by means of the butter than the oil.

Tobacco liquor, soap, and other materials have likewise been tried, but none have been found of so much use, as tar and butter, in a right proportion.

The wool smeared with Norway tar, has a fairer and softer look before it is scoured ; but what is smeared with the American tar, scours to a much whiter colour, and is preferable for light dyes.

Though this custom of smearing, may seem to many, as it once did to myself, expensive, unnecessary, and even hurtful ; yet, from the above detail, it must appear, in certain situations, to be a necessary and useful practice. In the low and fertile parts of the country, and in a mild climate, where the number in a flock is small, where there is plenty of food at all times, where they are in a manner hand-fed, and sometimes even housed ; smearing seems not to be requisite, except to preserve the sheep from the inconveniencies and diseases that arise from vermin ; but the case is quite different in other places ; for in the high and stormy pastures of the South of Scotland, and of the Highlands, where the flocks are large, where they are so widely dispersed over bleak mountains, as seldom to be seen, and where they are destitute of any artificial provender, the practice of smearing seems indispensibly necessary to preserve their wool, their health, and their life.

The general run of the tarred wool in the South of Scotland, loses one-third of its weight, when scoured. That which is heavily smeared with tar, frequently loses near one half. This great additional weight, created by the tar, is one reason that in-

duces some farmers, though without any real advantage, to be so liberal of it upon their sheep. The use of too large a proportion of tar is the great error in the practice of smearing, and to abridge its quantity is a great improvement.

Those who smear heavily, use equal quantities of tar and butter, and sometimes even a larger proportion of tar. In the north of England, where the practice is termed salving, two thirds of butter are used to one of tar. Some of the best farmers in Eskdale, have improved both their wool and their stock, by using only one-fourth of tar to three-fourths of butter; and it is probable, that the proportion of tar may, to advantage, be still further diminished.

Some farmers also in Eskdale, who are anxious about the quality and character of their wool, wash their sheep carefully before they are smeared, in the same manner as is done before they are shorn. This practice is not, indeed, general, but it deserves to be imitated. That the real weight of the wool is diminished, by being deprived of its filth and impurities, is a deception that ought to be abandoned.

Muir-Burning.

The burning of tracts of heather, is a practise that has prevailed in the sheep countries in the South of

Scotland, for above a century past, and has always been found beneficial *. Wherever heather grows close and rank, it totally suppresses the growth of all other herbage, and affords to the sheep, only a little stunted annual growth, which they crop during winter. When it is burnt to the ground, it springs indeed again from the root, but all the intervals are, in one season, filled with a growth of useful herbage, for heather frequently occupies a soil that is naturally good. In this way, the sheep pasture comes to be greatly enlarged. A fresh and copious growth of heather proceeds from the roots, most agreeable and salutary to sheep. This, with the grasses that spring up, affords them a much greater quantity of food, than ever the ground produced before.

* The present system of sheep farming, or store farming, as it is called in the South of Scotland, does not appear to have taken place till about the end of the reign of James VI. Before that period, the mountainous south country districts were kept under a stock of black cattle, and some small straggling flocks of sheep, as was the case in the Highlands till of late years. When the sheep farming came to be extended, the practice of muir-burning for the improvement of the sheep pasture came then to be introduced, and has ever since been continued. The progress of this practice for about a hundred and sixty years, has, no doubt, considerably altered the appearance of the heaths and mountains, and that even within the memory of old persons yet alive.

Muir-burning, by the law, must be performed before the 1st of April, on account of the game. But whatever may be the fate of the game, it is not a law that bears hard on the sheep farmer, though he sometimes complains of it. There are few years in which muirs may not be burnt with more advantage before than after the 1st of April. Heather, and all its concomitant plants, are in the most arid state in the months of January, February, and March. It is then they are most inflammable, and in any short interval of dry weather, which generally occurs some time during that period, they may be burnt to most advantage. The sooner indeed in the season that the heather is burnt, so much the better, as there is more time given for its springing at the root, and for the growth of the grasses that are to replenish the soil.

The beneficial effects of muir-burning are well known, and generally acknowledged in the South of Scotland. By repeated burning, the heather comes to be extirpated and replaced with more valuable herbage. In the memory of persons still alive, many hills, formerly black, are by this practice become green, and afford three times more pasture for sheep than they formerly did. But there is a much stronger call for the practice in the North than in the South of Scotland. The mountains in the North, now occupied by the sheep, are, in many parts, immoderately encumbered with heather ; though it is a

very long lived shrub, it continues to grow there without molestation, till it decays through time, and is then succeeded by a new growth; it strikes a man sometimes to the middle, or even breast high, and is often thickly interwoven at the ground with the rambling branches of the *Uva ursi*. In such a situation, muir-burning is most necessary, not to extirpate these plants which are friendly to sheep, but to renovate them and make them shoot from the root, along with a growth of valuable pasture grasses, which by the prevalence and luxuriance of these shrubs have been suppressed. The only thing against the demolition of rank heather, is its usefulness to sheep in the time of deep snows. Where no better winter provender is provided for them, it should, no doubt, for this emergency be in some degree preserved; for though muir-burning may be highly beneficial, yet it is so only by judicious management. Heather is a highly useful, and important article in the pasture of sheep, wherever they are kept abroad the year round, with little or no aid from artificial dry or green forage. When it is suffered to grow old, shrubby, and stunted, it ceases to be so remarkably useful. This points out the necessity of burning it down to the ground from time to time. When the stems or branches of the old are destroyed by fire at the proper season, the plants spring again immediately and more vigorously from the root. It is this new growth, which, for the first and several subsequent years, affords a most valuable sheep pasture

during the inclement months of December, January, and February.

To answer this important purpose, the months of March and April, are the most proper season for burning heather, to encourage its immediate growth from the root, and likewise that of the various grasses which form the sheep pasture. The burning of the heather late in summer, or early in autumn, has been recommended by some as a more effectual season for destroying it in the soil ; this, no doubt would, in some degree, be the effect of burning the heather at those seasons ; but it is the improvement of the heather as a sheep pasture, and not its extirpation that is the object of the judicious storemaster in the practice of muir-burning.

Heather is of great utility to sheep during the whole winter, but especially in deep snow, when sometimes it is their only refuge ; old heather rises commonly from one to three feet high ; when of this height it over-tops the snow, and affords sustenance to the sheep, when they can have nothing else ; the skillful sheep farmer, therefore, always preserves a track of this old heather, and on the lowest and least stormy part of the farm, for the preservation of his flocks in time of deep snow.

Haining.

The preserving a certain district of pasture upon a farm, for a particular purpose, is termed haining, or a hained pasture. A proper degree of skill in this article, is one of the greatest arts in a store-master, and yet it is an article in which there are great errors committed; where sheep are provided with artificial food, a scrupulous attention in this matter is less necessary; but where large flocks are destitute of this assistance, and dispersed over extensive mountainous tracts, and great variety of ground, it becomes a matter of the greatest importance.

It is obvious, that the earliest grass on a farm should be devoted to the ewes and lambs, during the months of April and May. If this is not sufficient for the whole flock, the barren sheep, the rams, hogs, yeld ewes and wedders, ought still to be kept upon their winter foggage. All the high and stormy parts of the farm, inaccessible and unproductive at other seasons, should be compleatly eaten down by the whole flock, between the 1st of June and the 1st of September. The early grass on the lower grounds, being then recovered and luxuriant, should again be pastured. After the 1st of November the flock must chiefly depend for its winter provision on

the fields of heather, and the rank and coarse pasture in the low and sheltered places.

What is called the hog fence, is the pasture that is hained and set apart for the sheep rising two years old, during autumn, and the beginning of winter. These form the most valuable, and likewise the most perishable part of the flock, being more liable to disease than any other. This hog fence, is often injudiciously chosen in low and wet grounds, on account of shelter; but it is the driest soil, and the shortest sward upon the farm, accompanied with heather, that should determine the choice of the ground for this purpose.

The utility of this practice of haining, depends entirely upon a right choice of the pastures to be reserved, and that again, upon the nature of the plants which they produce. If the grounds to be used in summer, abound only in late and winter grasses, which the sheep during summer are disposed to neglect; or if the grounds to be saved for winter, abound chiefly in summer grasses, which decay in autumn, and come to nothing in the winter season; in either of these two cases of mismanagement, and they often occur, both the flock and the farmer must suffer.

Dunghills.

Many of the sheep farms in the South of Scotland, are entirely without tillage, though of great extent. Many, containing from one thousand, to four thousand Scots acres of land, have not had a stalk of corn growing upon them for near a century; yet on these farms, a certain number of cows and horses, must necessarily be kept, for the accommodation of the farmer's family and his herds. These horses and cows pasture upon the farm in summer, and are fed in the house upon coarse natural hay in winter. There is consequently a considerable quantity of dung produced, but this, instead of being an advantage, is accounted by the farmer, a great incumbrance.

It is true, indeed, that the grass which rises upon land recently dunged, is unwholesome and detrimental to sheep. They are even apt to be hurt by the grass which springs upon their pasture from the dung of black cattle and horses, if it is in considerable quantity. It is this that renders the storemaster so much afraid, perhaps more than is necessary, of suffering dung on his sheep grounds in any form whatever. Dung being considered in this light, it has been often thrown, where there was opportunity for it, into the adjacent brook or river

when in a flood, in order to get rid of it as a nuisance. Where such an opportunity of having it destroyed was wanting, it was accumulated in a spot. Great heaps of dung were therefore to be seen, and are still to be seen, near the houses of such farmers and those of their herds, the produce of more than half a century, and overgrown with rank weeds.

Though such conduct indicated great want of management both in the landlords and tenants, instances, similar to what has been mentioned, may possibly happen on the sheep grounds in the Highlands. If they should, the same measure ought to be adopted that has, though only indeed of late years, taken place in the South. The sheep farms, where the destruction of the dung was such a material object, were all open and uninclosed. It could not, in this state, be laid upon any part of them without detriment; but the remedy was obvious, and has been put in practice in several places; that is, to form two, three, or more small inclosures in the lowest ground, sufficiently fenced against sheep by a dry stone dyke. Upon these the dung may be laid with impunity, and turn to great account, even though there is no tillage upon the farm. A large crop of hay may be immediately expected, and, when these inclosures have rested for some time, they will afford the best sheep pasture which the farm contains.

Fleeing.

In the high and stormy farms of the South of Scotland, the snow, in some seasons, lies so equal and deep, accompanied with severe frost, that the sheep are entirely excluded from every sort of pasture. As there is no hay nor any other winter provender for them, the farmer is obliged to Flee, as it is called, with his whole flock down into some low part of the country, where there is little or no snow, and where the frost is less intense. There are few storemasters in the high parts of the country, who have not, at least once in their lives, been dangerously hurt in their circumstances, and some, even of the more wealthy, have been broken in their fortune by this disaster. It is commonly attended, likewise, with a very considerable loss to the landlord. When the face of the earth is covered deep with frozen snow, and the sheep left quite destitute, the farmer has no other alternative, but either to run the risk of keeping them without food till the return of a thaw, or, which is often equally hazardous, to drive them through deep snow to a low part of the country, perhaps ten or twenty miles distant. He generally adopts the last measure; and then, beside his other misfortunes, he falls a prey to the extortion of another farmer, who seldom fails to take the ad-

vantage of his necessity. The usual demand made upon the distressed storemaster, is a year of his rent, for pasturing his sheep during the storm, only upon poor lea or moorish fields ;i and this exorbitant price he must either pay, though his flock should remain but one night on the ground, or lose perhaps all he has in the world.

Such are the unhappy effects of this practice of fleeing ; but they all proceed from an obvious and inexcusable neglect in the farmers who occupy grounds liable to this disaster. They are not liable to it indeed in a mild winter, but in one that is severe, they have to encounter all the hardship and distress now mentioned. The calamity proceeds entirely from the want of hay, which these farmers never provide for their flocks, and against the use of which they urge many frivolous objections. The hay on these high grounds, to be sure, is none of the best, but it is always to be had in sufficient quantity. The sprets, the ling, the deers hair, and even the rushes, made into hay, would always be sufficient to preserve the sheep from the melancholy effects of a storm, when they are sometimes forced even to devour each others wool, and when the very straw of a dunghill would save them from starving.

The sheep farmers in the Highlands cannot, therefore, too soon, get into the practice of feeding

their sheep with hay in winter. On Salisbury plain, that extensive sheep region in England, enjoying a mild climate and early pasture, all the sheep are fed with hay from the 15th of December to the 1st of March. There is certainly much more reason for the practice on the hills of Scotland. The higher and more stormy the situation is, the practice becomes more necessary. Nor is there any sheep farm on which it may not take place. Even among the highest and most rugged mountains either of the South or North, there is not a farm, but what, with sufficient care, is capable to afford hay to support all the sheep in winter which it should graze in summer. If this was the case, not only a larger number might be maintained, but of a larger size, and with less mortality among them than is experienced at present.

There are already sheep farms in the Highlands, and many others there may be in future, which, in particular years, will be liable to the calamity now described. The most effectual method to prevent it, is that which is here suggested: "To provide upon the farm a sufficient quantity of coarse hay during the summer." This will constantly be of use, even in the mildest winter, when the flock may not be forced to abandon the farm by the rigour of the season. The propagation likewise of whins and broom, in such a situation, will always be found to be of great utility. They are not overwhelmed even

by deep snows ; they are invulnerable by frost ; and afford to sheep, even in the most rigorous winter, a certain resource both of food and shelter.

Exposure.

The value of sheep grounds depends not only upon their soil and climate, but likewise upon their exposure. It is requisite, upon a sheep farm, to have shelter from almost every wind, and especially every quarter from whence heavy snows proceed. This can only be had by variety of ground. It is nothing though the mountains on a sheep farm are high, provided they are intersected with deep and low valleys in different directions, so as to afford a refuge from every blast.—On the contrary, where a farm in a hilly country is all exposed towards one point of the compass, the sheep stock upon it in winter, must often be in a very perilous situation ; and this sort of farm always lets at a lower rent. Many, or most of the sheep upon it, will sometimes be lost by snow, in a winter when no such accident takes place in the adjacent and better sheltered farms. Two objects of great dislike are therefore united in one saying among the storemasters : “ A “ two faced man, and a one faced farm.” It is true, indeed, that, in the Highlands, there is great inequality of ground and variety of exposure ; yet, as the farms were not originally laid out for the

accommodation of the sheep stock, it is likely that, in many places, they would require for this purpose to be differently arranged.

Stock.

The proper sheep stock to be kept by a farmer, must be determined by the nature and situation of his farm, and his most advantageous market.

In some places, it is most profitable to sell off all the lambs, except what are necessary to support the stock: in others, where hay and turnips can be afforded, the farmer's profit consists in fattening large sized sheep of two, or at most of three years old. In fine hill pastures, and with a near and convenient market, as in the Ochells, the farmer depends chiefly on his fat wedders, kept till the fourth, fifth, or sixth year.

But in many, or most of the sheep farms in the Highlands, a method of managing the stock, similar to that which is practised in the sheep countries of the South of Scotland, will probably be found most expedient. There, the extensive flocks, kept on extensive mountainous pastures, as in the Highlands, without the assistance of hay or turnips in winter, consist of what is called a breeding stock; that is,

they are composed entirely of ewes, with a suitable proportion of rams and of the young sheep.

From a stock of this kind, there is sold annually a number of lambs. These go to the different market towns; and they are a greater or lesser article of sale upon different farms, because some raise lambs which are fatter and in greater perfection than others. The next article of sale, and the chief one upon many farms, is that of hogs. These, with a number of two year olds, are almost all driven to England, and are generally brought up in the country by English dealers. The third article of sale consists in what are called the draught ewes. These are the old ewes dismissed off the farm in October and November, when they are in the best condition, though that is commonly but very indifferent, and are purchased by the butchers in the market towns. In the present state of these countries, this, upon the whole, is perhaps the best arrangement, and the most profitable way of disposing of the stock, that can be devised.

These are properly breeding, not fattening countries. They attempt not to fatten widders or old sheep expressly for the market. The farmer again, who has rich pasture, and feeds for the shambles, must depend chiefly upon his widders; he is led to this, from the common opinion in favour of widder mutton. Some, however, not without reason, look

upon this as a mistaken taste. The ewes by bringing a lamb every year, and being drained of milk during four or five months, are always kept low in the body. The wedders on the other hand, not being exhausted in this way, continue fat and in good condition. In several domestic animals, the meat of the female, being of a finer fibre, is preferred to that of the male, which, beside being of a coarser structure, is often accompanied with a strong and disgusting taste. This is remarkably the case with the ram; and his disagreeable flavour, though greatly diminished, is not entirely removed in the flesh of the wedder; but the meat of the ewe is quite free from it. Ewe mutton, in perfection, is rarely to be seen, however, in any market. The draught ewes, as they are called, sent off a breeding farm, are usually eight, nine, or ten years old, and in a lean state. These are sold in our markets, by the name of gimmer mutton, and in this situation it is no wonder indeed that it should be disliked; but a ewe of a proper age, on a good pasture, and fully fed, will be found, on trial, with respect to taste, digestion, and nourishment, to be preferable to any wedder mutton whatever. This is seldom indeed seen, unless in the case of a yeld ewe, or one that having had no lamb during the summer, comes to be well made up, and thoroughly fattened before winter. What is here said of the meat of the ewe, would probably become better known and fully confirmed, if the practice of spaying the ewe lambs could be established in the Highlands, which it cer-

tainly should. They would bring a higher price, and admit of driving to a greater distance than any other part of the flock.

In the sheep, the best quality of the meat, as in all other animals, is confined to a certain age, beyond which it declines. Mutton is in perfection only during two or three years, that is, between the 4th and 7th year of the sheep's life. In the 8th year, the animal loses the first pair of its cutting teeth; a sure symptom of decay; after which, it is unreasonable to suppose that the meat improves.

Where sheep are kept upon a heathery pasture, the meat, as it were, becomes sooner ripe; the flesh grows dark, and affords a gravy of a deep red colour, sooner at least by a year, than the sheep that are fed upon soft and luxuriant grass. The sheep is an animal of Africa, where the numerous species of erica or heath form the greatest part of the pasture of the country. The plants of this genus seem to form his most natural food; accordingly, our common heather, the only plant of the kind we have in great abundance, is well known to afford to the sheep the most agreeable and wholesome pasture; it will not indeed make him thoroughly fat, but it communicates to his flesh a different, a superior, and apparently a more natural taste, than what the fattest mutton ever acquires from the richest grass.

The flavour of mutton is exceedingly various, and seems to be easily and greatly altered by different causes. Among these, the driving of sheep has a very remarkable and bad effect. The market of Edinburgh is supplied with some of the best sheep, in the remote parts of the South of Scotland ; but it is well known to many, that the mutton of these sheep from the Edinburgh market, never has the same, nor such an agreeable taste, as when the animal is immediately taken off the hill. These sheep are driven in the course of a week, fifty or sixty miles, with little or no food. They are slaughtered in a fatigued and exhausted state. In consequence of this, the flesh, when cold, does not stiffen, which indicates such an alteration in the texture of the meat, as must naturally be attended with an alteration in its taste and flavour.

WOOL.

It may here be proper to enquire into the causes which occasion the different qualities of wool, and especially those on which its fineness depends. These may be referred to the breed, the climate, the pasture, and the management of the flock.

Breed.

In the different sorts of sheep, there is indeed great variety of wool; but this variety has arisen merely from external circumstances. All sorts of sheep are but varieties of one species:—they all generate together, and are capable of producing a fertile progeny. That they should differ greatly in their wool and other characters, is by no means surprising, when we consider the great diversity of climate, pasture, and management to which they have been exposed in the course of ages. By these causes, the qualities of their wool have been altered, and by such causes they can again be changed, and be made to revert to what they formerly were.

The wool of a sheep bears but a small proportion to the value of the meat. But though it is not the first, it is the second, and almost only other article from which the storemaster derives profit. The wool may form a fifth, and sometimes even near a fourth of the whole annual produce of his flock: both its quantity and its quality therefore deserve his attention. The sheep that yields the greatest profit upon any pasture, with respect to carcase, will always be the most profitable, likewise, with respect to wool. It is therefore a mistaken idea to imagine

that either the carcase or the wool can be improved with profit, if it is to the prejudice of the other. The fleece of the greatest value, taking the quantity and the quality together, is, no doubt, what ought to be chosen ; yet, fine woolled sheep, if they answer with regard to their carcase, are certainly to be preferred. It is generally the farmer's interest to preserve the quality of his wool where it is valuable, and to raise and improve it, where it happens to be of an inferior kind.

For this purpose, the mere breed is not to be entirely depended on, at least for any length of time. The wool in sheep of the same breed, may be brought to vary exceedingly, and in a short period, by difference of climate, of pasture, and of management. There is but one original breed of sheep in all the Highlands and Islands of Scotland, yet from these causes, the wool in different places, is of very different qualities. Fine and coarse wool may be found, indeed, in the same district, but it is no proof of a different breed. This may be owing merely to a difference of pasture, to different individuals in the same flock, and even to different parts of the same fleece.

Though there may not be any certain dimension among sheep, adapted to produce the finest wool ; yet it appears, in general, that it is always produced

by those of the smallest size. A coarser wool is no doubt often to be found on a small, than on a large sheep; yet in Spain, England, and Scotland, it is certainly the smallest sheep in each country that afford the finest wool. Where the animal is smaller in all its parts, it is reasonable to think, that even the pile of its wool will be more slender. The sheep of Hereford, Gloucester, Somerset, Devon, Dorset, and Lincolnshire, form a scale from the least to the largest size of English sheep; but by the same scale, the comparative fineness of English wool is also exactly measured. It is also well known, that when the same breed of sheep are raised to a larger size, though the length and quantity of their wool is increased, it is diminished in fineness.

Climate.

From the great difference of wool, in the different regions of the earth, it is obvious to conclude, that it must be regulated in some degree, with respect to its fineness, by the climate of the country. To produce wool of the finest and most uniform kind, a climate that is cool, or even one that is moderately cold, appears to be requisite. A temperate climate is requisite, even in the temperate zone of the earth. In the southern parts of that region of the globe, the heat of the vallies is too much; in the northern parts of it, the cold of the mountains

is too great, for the production of the finest wool. It is not to be obtained in either of these extremes. Accordingly, no climate in the world, seems to be so well calculated for this valuable produce, as the mountains of Spain and the plains of England.

But when the finest woolled sheep of England and Spain, are carried to the intratropical colonies of these kingdoms, their wool first becomes coarse, and at length degenerates into hair; by this alteration, nature delivers them from the accumulated heat of the wool, which in those countries would be insupportable. On the other hand, the sheep on the arctic mountains and islands of Scotland, Norway, and Iceland, are covered as it were, not with uniform fine wool, but with a coat of down, and a coat of bristles; a sort of double defence against the inclement cold of the climate.

The finer the wool or fur of an animal is, the greater must be the protection it affords from cold. A cloth made of fine wool is much warmer than one made of coarse wool, though of equal thickness. The finest furs are found upon the animals, which are the natives of the coldest climates. These likewise give the highest price in the raiment of mankind, to defend them against immoderate cold. The furred animals have a thicker and finer coat in winter, than what they have in summer; the fur of the white alpine hare, which inhabits only the summits

of our highest mountains, is much finer than that of the brown hare in the low parts of the country. The annual fleece of a sheep falls off naturally, about the beginning of summer, that it may be replaced by a new growth, for his defence in winter. The fine wool of Spain is all raised on the mountains; that upon the sheep of the vallies, where great heat prevails, is comparatively coarse.

All these facts would seem to intimate, that the finest wool should be produced in the coldest climate—but this, we find, is by no means the case. Though the influence of climate may be considerable, there is evidently some other interfering cause. Beside climate, and exclusive of heat and cold, there must be something else necessary for the production of the finest wool; and this, we may fairly presume, is the food of the animal.

Pasture.

Without any great difference in the temperature of the climate, the quality of wool, with respect to fineness, varies exceedingly, according to the variety of pasture. The finest wool is in general produced from the finest grass. The wool in the fenny countries in England is coarse, compared to what is found on the dry pastures of Hereford, Gloucester, or the chalky plains of Wiltshire. In the low parts of Scot-

land, where there is good grass, the wool is finer than what the same race of sheep produces on a muir-land and coarse pasture. The short sweet grass, on dry sandy downs by the sea shore, is well known to be everywhere productive of the finest wool. Let the climate, therefore, be what it will, we are not to expect wool of the finest kind, from wet, heathy, or woody pastures, nor even from the grass that is rank and luxuriant. Unless in mere spots, or very confined districts, no very fine wool is to be expected from the Highlands of Scotland.

The Island of Oransay, belonging to Mr Macneil of Colonsay, consists almost entirely of dry, sandy, but fertile downs. These throw up a short sward of grass, the most agreeable and wholesome of all others to sheep. Not a rank weed or plant is to be seen in the island. Above fifty years ago, a breed of large sheep was introduced into Oransay from Ireland, which still remains. In the course of years, they have dwindled in size, but their wool has improved. Upon this pasture, it has gradually become finer and finer, and is not exceeded, perhaps, by any in the British Islands.

In the low islands of Icolumbkil, Coll, Tirey, Canna, and others, the Hebridian sheep feed on a pasture similar to that of Oransay. They are of a much smaller size than those of Oransay: their wool is shorter, and intermixed with some hairs, but

equal in fineness, and of the same nature with the Shetland wool. The very same breed of sheep, however, in the other islands, and on the main-land, where the pasture is coarse, produces wool of a much inferior and coarser sort.

But, beside climate and pasture, there are certain practices in the management of a flock, by which the wool becomes finer or coarser.—These are, the smearing, shearing, pulling of the wool, and the housing of the sheep.

Smearing.

It is reasonable to suppose, that the practice of smearing must have an effect upon the wool, one way or other, so as to render it either finer or coarser. That it renders the wool coarser, has never been alleged even by those who disapprove of the practice; but, on the contrary, it is affirmed from frequent experience, that it improves the fineness of the wool. The black-faced sheep is of a race that naturally bears the coarsest wool of any in Britain. It cannot be supposed to be improved by the coarse pasture on the bleak mountains of the South of Scotland; yet in every fleece of these sheep, there is a considerable portion of very fine wool, which, it is probable, would not be the case, if they were not smeared. It has often been found, that when these

sheep have remained two years white, the wool is more hairy, and not near so fine as it would have been, if the sheep had been smeared. It seems, therefore, pretty certain, that the smearing tends to make wool finer; nor is it improbable, that the fleece of the original breed of sheep in the Highlands, and even of those of the Shetland Islands, might be improved both in quantity and fineness by the practice of smearing.

Shearing.

In the South of Scotland, the rams, the hogs, the two year olds, and the ewes that have had no lambs, are shorn about the 25th of June. The ewes that have lambs are not shorn till the 20th of July; but none of the flock are ever shorn but once a-year.

It appears, however, that in a favourable climate, and where short or cloathing wool is required, sheep may be clipped to advantage twice, instead of once a-year; and that, by this practice, both the quantity of wool is enlarged, and its quality improved.

The growth of the wool, like that of the hair of animals, is always most vigorous and rapid at its commencement:—Their progress becomes slower as

they approach nearer to their natural length. When a sheep is shorn, and the fleece remains on his back for a twelvemonth, it grows more during the first, than it does during almost the four last months of the year. The wool of a sheep, so far as we know, is everywhere an annual crop. Its growth with us, is finished much within the year; and if, at the expiration of the year, it is not removed, it decays and wears away of itself. Mountain sheep, shorn about the 1st of July, have their fleece compleated in eight months, or about the 1st of March. From this time, it receives little or no increase. If it remains, therefore till the 1st of July, no less than four months growth of the wool comes to be in a manner lost. By shearing sheep twice, instead of once a-year, it is natural to think that, for this reason, a larger quantity of wool should be obtained. Two crops, one of five, and the other of seven months, must amount to a greater length of wool than the single growth of an entire year: this, accordingly, is found to be the case in several places. In Sweden *, it is the general custom to shear the sheep twice a-year; once in the spring, and again in autumn. It is there found to be a beneficial practice; and the summer crop is always observed to be both more plentiful, and of a better quality than that of the winter. In some parts of Ross-shire,

* *Linnaei Amoen. Acad. Vol. iv. p. 176.*

where the sheep are folded in summer, and housed in winter, they are also shorn twice a-year, that is, about the middle of May and the 1st of October. The summer crop, as in Sweden, is by far the largest; but both crops are of a finer quality than the wool that remains a whole year on the sheep. The two crops, taken together, form about a third more in quantity than is afforded by one annual crop. In that country, long wool is in most request, because they spin their wool only upon the rock or the large wheel. Long wool, or that of a whole year, will therefore give twelve shillings the stone, when this half-year wool will sell only for eight shillings; but these prices would be reversed where there was a demand for short cloathing wool, to be spun into fine worsted upon the small wheel.

It appears also, both from reason, and from some experience on the subject, that wool becomes finer by being clipped twice, instead of once a-year.

Wool scarcely differs in any thing from hair, except in its consisting of finer filaments; both, indeed, are of animal substance, but in their manner of growth, bear a great resemblance to vegetables. Some vegetables grow upon other living plants; wool and hair, in a very similar manner, may be said to vegetate upon living animals. Plants and the hair of animals thicken by frequent cutting; the same must naturally be the case with wool, and

as it thickens, its filaments must become more slender and finer. It is accordingly well known, that the finest wool is always contained in the thickest fleece. By sheering the wool twice a-year, it must therefore become both thicker and finer, which accords with the experience of those countries where the practice obtains. When wool continues on the sheep the whole year, it grows, no doubt, to its full length, and affords combing wool, which is necessary for many different sorts of woollen goods; but it is not thereby improved in its fineness. The sheep that affords the best short and cloathing wool, have their fleece separated, especially at the conclusion of its growth, into small distinct curled locks, which give it the appearance of being crisped or frizled. These locks, after a full year's growth, are terminated by a small pencil of very minute hairs; but these do not appear when the wool is only five or six months old. The wool evidently becomes coarser as it remains longer on the sheep. To obtain it therefore of the softest quality, and fit for the very finest cloth, it would seem necessary that it should be clipped twice a-year. When wool degenerates into hair, the change is partial and gradual: it does not take place at once through the whole filament of the wool; it begins at the top, and descends by degrees: Hence, the filaments in a great part of a fleece can be discerned to be of the substance of hair towards the upper extremity, and of the substance of wool towards the base.

Pulling.

Frequent clipping evidently tends, not only to prevent the wool from degenerating into hair, but to render its threads more numerous and slender. It is also well known, that the closer the wool is shorn to the skin, the new growth becomes both finer and more copious. For the same reasons, it would appear that the pulling or plucking of the wool, instead of shearing it, must produce a fleece of a much finer staple. This has the appearance, indeed, of a cruel operation, but it is not the case. When the wool is ripe, the pulling of it occasions little more uneasiness to the animal than the shearing. This was the custom in very ancient times, before sheep-shearing, or rather indeed before shears were known. We have at least the authority of Varro for thinking, (and he was the most learned of the Romans) that the Latin word *vellus*, a fleece, was derived from the word *vello*, to pull or to pluck. In former times, this custom was prevalent in Europe, and it still remains in some of the Scandinavian countries. At present, it is nowhere known in the British islands, except in Shetland. It is certainly to this practice that the peculiar fineness of the Shetland wool is to be ascribed, and not to any peculiar breed of sheep, nor to the pasture or climate of the country.

Housing.

The above articles in the management of sheep; the smearing, the shearing twice a-year, and the pulling of the wool, do all seem to improve its quality with respect to fineness; but there is another practice, that of housing sheep, which appears to have an opposite effect. A certain degree of cold, and full exposure to the weather of the British climate, seem to be requisite for the production of the finest wool. All shelter and adventitious heat appear not only unnecessary, but hurtful. If sheep with us are to be exposed to the weather only in summer, and are to be screened from it in the house during winter, they have then no call or occasion for a thick, fine, warm fleece. The provision of nature for the exigences of the animal kingdom, is always sufficient, but never superfluous or oppressive. In our climate, a sheep treated in this way, must stand in need of cold, and of protection from heat. As in the case of sheep translated to a climate too warm, nature will relieve him from the heat, by giving him a coarser fleece, and consequently a cooler dress. Hence, the housing of a sheep in Scotland, cannot be expected to increase, but must probably diminish the fineness of his wool. The finest wool in the Highlands, or indeed almost anywhere else, is in some of the Hebrides, where the fox never existed.

Being in no danger from that enemy, the sheep affording this fine wool have been suffered immemorially to lie abroad the whole year round, in a cold and tempestuous climate. At the same time, the sheep in the Isle of Skye, and on the shores of the main-land, were all housed on account of the fox. The breed of sheep in all these places was exactly the same, and the climate and pasture quite similar; yet it was always well known and ascertained, that the wool of the housed sheep was of a much coarser quality than that of the sheep which lay constantly abroad.

Wool Stapling.

The same sheep frequently affords some of the finest and some of the coarsest wool. If the whole is mixed it forms wool of a very inferior quality; but if the finest part is properly separated, the fleece may be sometimes rendered three or four times more valuable. In the Highlands, and especially in the Hebrides and Shetland islands, there is a vast quantity of the finest wool produced by the native sheep; but it has never been turned to such account for the behoof of these countries as it ought to be. Though some of it is superlatively fine, and that in large quantity, it is intermixed in every fleece with a proportion of very coarse wool and of hair. The whole combined in one mass, as is usually the case, forms

but a wool of the lowest price, and fit only for the coarsest manufactures. The true value of the wool of these countries can easily be obtained by the art of the skillful wool-stapler, or wool-sorter, who can distinguish the different kinds of wool in a fleece, and who, by a judicious separation, can render the whole much more valuable.

The wool of a fleece is capable of being sorted into three, four, or more parcels, but is most commonly divided into three. The first, which is the strongest, of the greatest length, and fit for combing, is taken from the back, the sides, and hinder part of the fleece. This combed wool answers for all those manufactures in which length of staple is required, and is sometimes subdivided into two, three, or four different sorts, according to their fineness. The second, termed cloathing wool, is shorter and finer, and grows chiefly upon the neck and belly of the sheep: this is not combed, but carded, and is used for making broad cloth and other fabrics which require short wool. The third, is taken from about the tail and the flank; and being full of rude locks and long hairs, is spun for blankets, and other coarse woollen goods.

The following statement shews what may be made of the very coarsest wool in Scotland, by means of a little art and industry. A stone of the heaviest smeared and coarsest wool in Annandale,

was put into the hands of an expert wool-comber to be sorted and dressed. This was during the American war, when wool was at the very lowest price. The stone of wool employed, weighed twenty-four pounds English, and was bought from the farmer for two shillings and sixpence. When thoroughly scoured and washed, it weighed only fifteen pounds, and these, when divided and dressed, turned out as follows :

	Lbs.		S. D.		S. D.
Combed wool.	Of the finest .. 1	Value per lb. ..	1 8	Total value ..	1 8
	Second fine ... 3	..... ..	1 4	..... ..	4 0
	Third fine 4	..... ..	1 1	..... ..	4 4
	Fourth fine ... 1	..... ..	10	..... ..	10
	Short wool ... 3	..... ..	6	..... ..	1 6
	Backings 3	..... ..	3	..... ..	9
Total value of the stone of wool dressed					<u>13 1</u>

It appears then, that the stone of wool, in value two shillings and sixpence, by being sorted and dressed, became worth thirteen shillings and one penny. The expence of sorting and dressing amounted only to three shillings at three-pence per pound for the twelve pounds of dressed wool. Had the fifteen pounds of scoured wool been applied to use without sorting, they would not have sold for more than four shillings. Had they been carded in the mass, as usual, without sorting, the expence would have exceeded three shillings. There was, therefore, a profit of seven shillings and sixpence upon

this stone of wool, merely in consequence of its being sorted into different parcels according to their fineness. By the art of the wool-stapler, the value of the wool was trebled.]

Such is the advantage of having even the coarsest wool in the south of Scotland skillfully sorted : but the profit arising from this practice would be much greater in the Highlands and Islands, where the fleece, though it is mixed with strong hairs, contains a much larger proportion of fine wool. We see from the above experiment, though it was highly profitable, that from a stone weight, only one pound of wool was obtained, that could be called moderately fine, being in value one shilling and eightpence : but, from the wool of the Highlands, and especially that of the Hebrides and Shetland, several pounds might, by this practice, be procured from every stone weight, which would be worth half a crown or three shillings per pound and upwards.

In the sorting of wool it is likewise to be noticed, that the wool of the ram is always the coarsest in the flock, and that the wool of the ewe is always finer than that of the wedder. The wool of a lamb is much finer than that of an aged sheep ; and, though it is not certainly known, it is to be suspected, that the wool becomes coarser as the sheep grows older.

Wool of every colour ought to be relinquished, except the pure white, which is always of the best quality, and is the most proper for every sort of dye. Even that only, which is uniformly white throughout, should be retained: for, in many fleeces apparently white, the wool, towards the root, is often stained of a bluish grey colour. The black, brown, grey, and russet coloured fleeces, abound too much in the south country flocks, and are still more prevalent in those of the north. Even the same sheep is sometimes stained of two or more different colours. Such colours run in the blood, and, though they may be discontinued for a generation or two, they again recur. A black lamb is often produced by a ewe and a ram which are white; and the immediate progeny of this lamb will be white likewise, but the next descendant black. These colours, like other radical defects in the constitution of animals, will often miss one generation entirely, but hit the next. Wherever, therefore, a ram or ewe produce a lamb that is black, or any way discoloured, they should be no longer employed in breeding. The wool of a black sheep is always coarser, and even the taste of his flesh ranker, than of one that is white. The black, and other dark colours in a fleece were long ago encouraged, because they were found useful, which is not the case at present. The black wool formed the black freezed cloth called Kelt, which was formerly worn by all the substantial farmers and country people in Scotland.

When mixed with white, it formed a grey cloth. The other coloured fleeces were employed to make cloth of different shades of grey, brown, and russet, and all without the assistance of any dye. For this reason, the dark and party-coloured sheep were accounted more valuable than those which were white. This was a matter of conveniency and advantage, when our country people wore cloth of their own manufacture only, and were strangers to the art of dying. But, as this is no longer necessary, all these motely sheep should be dismissed, and only the pure white breed retained.

DISEASES.

It is certain that sheep are always most diseased upon wet pastures, and those which afford the most luxuriant herbage. They are liable, indeed, to be hurt by many acrid and noxious plants which are peculiar to a wet situation; but rank and succulent grass seems to be no less prejudicial. Much moisture in their food is always detrimental, and they are never so healthy as upon a hard and dry pasture. The *Mercurialis perennis*, Linn. or Dogs mercury, which is a poison to man, is one of the few plants hurtful to sheep, that grow upon dry ground. It is properly, indeed, a native of woods; but, though the woods on the braes of Yarrow are gone, this plant still remains. It shoots very early

in spring, and is known by the shepherds to be very prejudicial at that season to their sheep.

None of our domestic animals is so apt to be hurt by a change of situation and food as the sheep. Any considerable alteration in these articles is generally productive of disease. He cannot therefore be translated from one country to another, but with a great deal of risk. A flock will be healthy in one district, and become diseased in another district of the same country. Even removed only from one farm to another in the neighbourhood, the sheep frequently do not prosper, and that from causes which are not always obvious. The cautious store-master, therefore, when he takes a farm, is always solicitous to purchase the sheep that are upon it, and, for this reason, often pays for them more than their real value.

Breakshaw.

The disease called the Breakshaw, is the most prevalent and destructive among sheep that are kept abroad all the year round upon natural pasture. By abbreviation or corruption it is called the Braxy, and in some places the Sickness.

It takes place most frequently in autumn and the beginning of winter. It seizes and destroys

sound sheep in the course of a few weeks, but sometimes they will linger much longer under the disease. The youngest and the fattest sheep are the most liable to it. When examined after death, their stomach and intestines are found greatly distended with indigested food and water; and the bladder is also full of water, which is never the case in a sound sheep. Every sort of succulent grass is productive of this disease, and is, on that account, termed by the shepherds sickness grass. Such is all grass that springs immediately from the dung of cattle; such likewise is the fresh succulent grass that springs after muir-burning. Of this, the experienced shepherd allows his sheep to eat only a moderate quantity at a time, and that at noon or soon after; but neither in the morning or evening when the dew is upon it. On the other hand, the sheep that are fed upon short, hard, and dry pastures, and on grass of a firm substance, are seldom or never affected with this disease.

With respect to the cause of the disease, it must be noticed—that a sheep requires very little water when in health, that he never drinks at all when fed upon green herbage, and that he naturally voids but little urine. The autumnal growth of grass is soft and succulent, and loaded with moisture, with dew and hoar frost, more than at any other season of the year. In this case the sheep takes in with

his food, a greater quantity of water, than he can expel either by perspiration or urine. Indigestion and repletion take place, which the powers of the animal are not able to overcome, especially in a full and fat habit of body. What is commonly called the rot in sheep, is only this disease prolonged, in an advanced state, and in its last stage; when a degree of putrefaction takes place, not only in the accumulated contents of the stomach and guts, but even in the intestines themselves.

Hogs die more frequently of this disease than aged sheep, and wedders oftener than ewe hogs. It would seem that this happens, because the younger are more voracious than the older sheep; and the wedder hogs are well known by the shepherds to have a keener appetite than the ewe hogs. They are therefore more liable to excess in their food, and to the disease which proceeds from it. This disease, known by the name of the Rot, is remarkably prevalent in England, on the sheep grounds that are apt to be overflowed. It is ascribed to the sand or grit, lodged upon the grass by the waters; but it is occasioned, more probably, by the sudden growth of succulent grass after such floods. It is well known with us, that grass of this kind, which rises from water tathing, is destructive to sheep, by producing the breakshaw and the rot. This practice, therefore, of water tathing, so beneficial on arable

land, and where black cattle are pastured, should be carefully avoided on every sheep farm.

The cure of the breakshaw, like that of other diseases, among some individuals in a flock, is both troublesome and precarious. A remedy cannot be expected, but at the first appearance of the disease. If a sheep is then housed, and kept from all sustenance except a little dry straw or hay, he may be recovered; but it will, in general, be found most expedient, to kill him as soon as the disease is observed. At the commencement of the distemper, his carcase, skin, and wool, are all in good plight, and may be turned to use; but, if it is allowed to run on, they become vitiated and useless. The hurtful effects of the breakshaw will be better obviated by prevention than by any remedies. Where a flock or a farm are subject to it, the sheep, and especially the hogs, should be kept, from the beginning of September till the frosts set in, upon the driest and poorest pasture, and be even stinted in food.

This disease was unknown in the Highlands till the introduction of the southern sheep. It has therefore been ascribed to that breed, but without reason. It is a disease, that, in certain circumstances, pervades the whole race, and in every country. The Highland sheep have always been folded and housed, and preserved from the disease, as sheep would be,

by these means, in any country. But these practices cannot be followed, where sheep farming is carried on to a great extent ; and sheep kept abroad all the year, will be found as liable to the breakshaw in the Highland vallies as in those of the South. This disease, indeed, was found scarcely known among the sheep of the Hebrides, which are never either folded or housed ; but the sheep of these islands are preserved from it, by living on a dry, bare, but healthy pasture, and being seldom in a very corpulent state.

Trembles.

The disease called the Trembles in the south of Scotland, first affects the sheep with a shaking and trembling. He loses the power of his limbs, falls to the ground, and dies, after remaining several days in that helpless state. It prevails only in spring and autumn, or, according to the shepherds, at the rise and fall of the braken* ; as if the disease had some connection with the springing and decay of that plant. It affects, chiefly, the best among the young sheep. Three lambs or hogs die of it, for one sheep of a more advanced age. Above eighty sheep have been known to perish by this disease, upon one farm, in the course of a year ; and it has been the means of

* *Pteris aquilina*, Linn. The female fern.

bringing many a farmer to poverty. It rages sometimes on a farm, while, upon others immediately adjacent, it never appears. Yet, if sheep are brought from grounds where the disease is unknown, and placed on a farm where it prevails, a greater number of them die, than of the native sheep of the farm; a proof that the disease does not run in the blood, which is supposed by some.

It is commonly ascribed to the braken, a plant certainly of a poisonous nature, but sheep are never known to eat of it. The disease also subsists on farms where there are no brakens, as well as on those where they abound. It is conjectured by others, to be owing to weakness in the sheep, and to the effects of severe weather; but it takes place in the stoutest of the flock, and that not only in spring, but in autumn, when they have been well fed, and are in good heart.

No satisfactory cause of this hurtful disease, and what is worse, no effectual cure for it, has yet been discovered; from its resemblance to an ague, Jesuits bark has been given in large quantities, but without any effect. Its resemblance to a palsy, however, is much stronger, and if this is the case, scarce any sufficient remedy can be expected. The best cure is to make the most of the sheep, the first moment the disease is observed, as he never recovers.

Yellows.

When the disease called the Yellows has advanced, the white of the sheep's eye, and the whole skin, when the wool is stripped off, appear of a full yellow colour. It is therefore termed the yellows by our shepherds, and is, in fact, a real jaundice. They ascribe it to the eating of gale *, in wet pastures; but sheep are never seen to browse upon this shrub, and the disease evidently arises from a different cause. There is a species of worm, which inhabits the water, and the leaves of aquatic plants: this animal, or its spawn, is swallowed by the sheep, but it continues to live, and makes its way to the liver, which it perforates and ulcerates. The animal is there found alive, in most of the sheep that die of this disease, and is known in English by the name of the Fluke worm †. When this is the case, it is plain there cannot be any sanguine expectation of a cure; and the sheep should therefore be immediately turned to the best account. This disease likewise in some places, passes, though improperly, by the general name of the Rot.

* *Myrica Gale*, Linn.

† *Fasciola hepatica*, Linn.

Sturdy.

The Sturdy is a disease that sometimes occurs, but is far from being prevalent. It affects but a few individuals, and those, the youngest of the flock, lambs or hogs. When the disease comes to a height, the sheep separates himself from the flock, becomes solitary, neglects his food, appears confused and stupid, and expires in a few days. The head is the seat of the disease, which is a true hydrocephalus. It is sometimes, and may be frequently cured, by an incision through the skull, which is generally very soft, and by which, the water in the head, which is the cause of the disease, is discharged.

Oestrus.

There is another disease, which affects the head of a sheep, and is also called the Sturdy, though it is of a quite different nature. It is occasioned by an insect, a sort of gadfly*, which deposits its eggs, on the forehead of the sheep. The maggots proceeding from these, eat their way through the skin, and perforate the bones of the head. The sheep de-

* *Oestrus ovis*. Linn.

serts the flock, and, without proper care, languishes and dies. This insect is much more frequent in Sweden, in France, and in England, than with us. It is of the same kind with that gadfly called the breez †, which produces in our black cattle the disease of the worm-ill. It deposits its eggs on their back; when these come to life, the maggots penetrate the hide of the ox, and produce large ichorous tubercles on his back. In the mean while, the animal languishes in great pain, and often dies, if no remedy is administered. The black cattle are instinctively aware of this dangerous insect, and fly in great confusion at its appearance, though it is hurtful to them, not by the immediate attack, but by the consequences; for though it neither bites nor stings, yet sensible, as it were, of its pernicious effects, they are more terrified at the sound of its buzz, than they would be at the sight of a lion. It has the same effect upon them in Scotland, as in Italy.

————— *Oestrum graii vocantes,*
Asper, acerba sonans, quo toto exterrita silvis
Diffugiunt armenta.

VIRG.

These two diseases, the one in sheep and the other in black cattle, occasioned by these two spe-

† *Oestrus bovis*. Linn.

cies of gadfly, may be easily cured, if observed in time, and a proper remedy is chosen. All kinds of grease and oil, if rightly applied and repeated, are certain death to every sort of insect, whether in the caterpillar, the aurelia, or the winged state. Such unctuous substances, therefore, afford the most easy and efficacious remedy, especially if combined with sulphur or mercury; but as these diseases are not always known to proceed from insects, various other unsuccessful remedies are often applied.

Cling.

On high and wet grounds, the sheep are sometimes molested with a disease called the cling; they pass black liquid excrements, become suddenly emaciated, and perish. The cause of this disease is not certainly known, but it probably proceeds from their feeding on noxious plants; the easiest and most effectual cure, is immediately to house them on its first appearance, and to feed them on dry provender, straw or hay, and especially oats.

Scab.

This is the only disease in sheep, that is known to be infectious, and is therefore, of all others, the most dangerous. Other diseases affect only some

individuals, but this, if it is not successfully opposed, is capable of exterminating an entire flock. It is occasioned by a minute insect, of the same kind with that which produces the itch in mankind. It irritates, inflames, and ulcerates the skin, spreads gradually, but quickly, over the whole body, and covers it with a scabby scurf. The sheep decays, the carcass, skin, and wool become useless, and the disease soon terminates in death. The insect propagates rapidly and immensely, it passes from one sheep to another, and soon contaminates the whole flock. Like many other insects, it becomes a formidable calamity, not from its real powers, but from its numbers.

The sheep louse or kead *, an insect of a different kind, is much larger, not so prolific, and abounds not in such numbers ; it hurts the skin and health of the sheep, and the itchiness it occasions, forces him to rub off his wool, even in winter and spring ; but this very minute tick †, which is the cause of the scab, does, of itself, eradicate the wool, and substitutes in its place, one continued scab upon the skin.

The disease is but little known, and never makes any considerable progress among sheep that are

* *Pediculus ovis*, Linn.

† *Acarus exulcerans*, Linn.

smear'd. The butter and tar serve as a preventative. The devastation among the sheep in Shetland in the year 1790, arose from the introduction of a few Southern sheep, which had never been smear'd, but labour'd under this disease. Like other infectious distempers, new in a country, it raged at its first appearance, with peculiar virulence, and without opposition; as the sheep in Shetland never are smear'd, and are accustomed to traverse the whole country, without being separated into distinct flocks.

In this distemper, anthelmintics, or remedies powerful in destroying insects and vermin, are chiefly to be depended on. Such are oleaginous substances, sulphur and mercury. Of these, sulphur dissolved in oil, affords the safest, the most inexpensive and efficacious remedy that can be supplied for the cure of the scab in sheep.

The above remarks are founded only on some accidental observations that have occurred concerning the symptoms, the causes, and the cure of diseases in sheep. It is a subject, on which no accurate investigation has ever been bestowed; though from a judicious enquiry, much real utility might be expected. The diseases of black cattle and horses, have reasonably attracted more attention, each individual being sometimes more valuable, than a score, or even scores of sheep. Much more care and expence may, therefore, be profitably laid out,

in the cure of a cow or a horse, than can be bestowed upon a sheep. In consequence of this, the diseases of black cattle and horses, and the proper remedies for them, are much better understood than those of sheep. The great object of a sheep farmer, should rather be to prevent, than to cure the diseases in his flock. From what is said above, it appears, that many of them may be preserved from disease, with a little skill and attention; wherever, indeed, the scab takes place, a radical and general cure must be immediately attempted, and may be effectually accomplished. In the other diseases, which seize only one or a few individuals, the trouble and expence of an uncertain relief, may frequently exceed the profit; yet where any flock becomes unavoidably and considerably diseased, and where it is reasonable to expect a cure, it should certainly be undertaken.

On every extensive sheep farm, a considerable number of sheep, must, from time to time, be affected with the above and other diseases. Many might undoubtedly be recovered that are at present lost by want of sufficient care. For this purpose, on every such farm, an out-house or sheep cot, adjoining to a small spot of inclosed ground, should be set apart as a sort of infirmary. There, the sheep should be received, on the very first appearance of disease; where more attention could be paid, both to the nature of the disease, and the proper method

of cure, than can possibly be given, when they are roaming at large on extensive and distant pastures.

REMARKS ON THE EXTENSION OF SHEEP FARMING IN THE HIGHLANDS.

1. Great numbers of sheep may, and ought to be kept in the Highlands, without diminishing the number of black cattle. Previous to the year 1764, the number of sheep kept upon any farm in the Highlands was inconsiderable. The prevalence of the fox, did everywhere prevent the inhabitants from keeping an extensive flock of sheep. It was at that time computed, that had it not been for the fox, ten times the number of sheep might have been supported upon every farm, without abridging the number of cattle.

This arises from the great difference that takes place in the pasturage of cattle and sheep in a mountainous country. The pasture at great heights cannot be overtaken during summer by black cattle:— These heights they desert entirely during the rest of the year. The sheep would serve to consume this surplus of summer pasture; and being more hardy and easily supported, would subsist during winter on mountainous tracts where black cattle would starve.

Since the year 1764, the fox has been greatly destroyed, and his depredations in many districts are no longer formidable. Wherever this is the case, ten sheep may be kept for one that could be kept in 1764, without diminishing the produce of the country in black cattle at that period. It is also presumed, that in this way, a mountainous farm may be rendered more productive than by a stock entirely composed either of black cattle or sheep.

2. It does not seem expedient or necessary to pasture sheep in the Highlands on any land that has ever been cultivated. Such land should rather be reserved for the pasture of black cattle and the purpose of tillage. There is much reason for enlarging the cultivated land, but none for abridging it. The storemaster may be anxious to have a fold for his sheep upon lands that have been in tillage, but in this he should not be indulged. When such grounds are not in tillage, they should be reserved for the black cattle.

3. The sheep farming in the Highlands ought not to be greatly extended beyond what it was in former years. To render it universal is highly inexpedient, and is, fortunately, impracticable. It is but a small part of such an immense number of sheep that could be consumed in the country. They could not be driven to very distant markets with so much profit as black cattle. Winters of such severity do some-

times occur as to hurt materially the black cattle ; but such winters might prove total destruction to a stock of sheep. Were the Highlands stocked universally with sheep, the quantity of coarse wool would be immense. But the value of wool is very precarious, as it depends on the prosperity or decay of a manufacture ; and the cloathing of mankind is now so considerably altered, by the increase of linen and silk, and especially by the introduction of cotton, as to render any great and national increase in the quantity of wool very unpromising. At any rate, whatever change may be made in the Highlands in the advancement of sheep farming, it certainly ought not to be sudden and universal. Black cattle, the long established, the chief and profitable production of the country, should not be relinquished on precarious grounds.

4. The stocking of new grounds has hitherto been a market for the sheep raised in the Highlands ; but this must have its limits, beyond which it cannot go. At a certain extent it must check itself ; and the inhabitants must have recourse to very distant markets.

5. Wherever the country is depopulated by sheep farms, neither the public nor the people who are expelled can have any satisfactory security, that they shall in future have a residence and employment in the country.

Villages for their reception have been projected, but the formation of these is by no means such an easy matter as is commonly imagined. The erection of a village in the cultivated parts of the kingdom is not such a difficult task. Mechanics, manufacturers, and day labourers may be easily brought together, wherever they can have a convenient dwelling and employment. This very frequently occurs in the South of Scotland; but the case is very different in the Highlands. At the towns and villages, either in the Highlands or their neighbourhood, there is very little demand for the mechanic arts, though they are surrounded by extensive countries, containing great numbers of people. This must occur to an observer in the case of Crief, Callander, Inveraray, Oban, Fort William, Fort Augustus, and Stornaway, but arises from the manners of the Highlands, where every family, and almost every person execute most of the mechanic arts that are necessary for their own accommodation. This renders the formation of a Highland village peculiarly difficult. The Highlands do not afford immediate and profitable employment in any one place to a number of day labourers, mechanics, and manufacturers; and without this, the mere accommodation of a house can, to such persons, be no inducement. When dislodged from their small farms, it has been proposed to convert them into villagers; but no such care has been taken of the people so dispossessed, nor can any one be assured of its being taken in times to come. The

establishment of a village in the Highlands is easy in speculation, but difficult in practice, and can only be done by assigning to each villager an allotment of land.

HORSES.

The horses in the Highlands, and especially in the Islands, are the only aboriginal and unmixed breed now extant in Britain. The first race of horses reared in England, and the South of Scotland, is now unknown, and is probably extinguished by the various breeds introduced from other countries in the course of many ages.

In England, the dray, and the heavy dragoon horse of a large body with coarse heels, are derived from Flemish mares, and either the German or the Sleswick horse. From the Barbary mare, the first running horses were bred; afterwards, the Barb was combined with the Turkish mare; and, latterly, the Barb or the Arabian, with an English mare of an improved strain, give a progeny which excels on the turf. The best road horse, the best hunters, and light carriage horses, have been produced where the dam was English, and the sire Turkish, Barbary, or Spanish. The English mare mends the slenderness

of limbs in the Turk and the Barb, and strengthens the joints of the Spanish jennet.

We are informed by tradition, that Fergus, Lord of Galloway, at a very remote period, brought into that country, a breed of horses, probably from Spain, which came to be in high repute. They were long accounted, by the name of Galloways, the best horses in Scotland. Nothing now remains of them, however, but the name. The race has been debased, and is now in a manner extinguished, by a mixture of Irish, Scots, and English horses. Alexander Stuart, Earl of Marr, grandson to Robert II. is said to have transported a breed of horses from Hungary into Scotland, about the year 1430, which continued for a long time in high estimation*. Near three centuries ago, a breed of grey horses was established in Clydesdale, by the Hamilton family. These were long held in great request, but are now either worn out or have degenerated. For a long time, no gentleman in the West thought himself well mounted, but on a grey horse. It was on the horses of this breed, that the old regimented corps of cavalry, the Scots Greys, was first mounted, and it still retains the colour. At a later period, a different race was introduced in the West, and chiefly in Clydesdale, which still remains. This is

* Hawthornden's Hist. p. 29.

a black compact heavy horse, excellently adapted both for a cart and a carriage, and is by far the most useful breed we have at present in Scotland.

For some time past, our saddle horses have been improved by the introduction of what is called blood, which is ultimately and in fact the blood of the African horse. This horse, imported into Europe from Arabia, Barbary, and Turkey, though of a size unfit for draught or for war, has no doubt very distinguishing and excellent qualities. He approaches nearest to the original and natural horse; as it is only in Africa that the species is indigenous. He may, therefore, be considered, like other animals, as being in the most perfect state in his native climate, or, at least, as being exactly adapted to it; but, like other domesticated animals, he is capable, by culture, of undergoing such alterations in his form, as render him more useful in a different country. The swiftest Arabian that flies over the desert, would be useless in a carriage loaded with two ton weight; and the English waggon horse, capable to draw this enormous load, would make but a clumsy figure in the deserts of Arabia.

The African horse excels not only in good temper, but in energy of spirit, and has a muscular spring and force superior to every other horse of his size. By these properties, with his light body, his long clean limbs, and very wide nostrils, he exceeds

all others in fleetness and in wind. His very bones are of a peculiar structure.—When cut transversely, they are solid like ivory, compared to the soft spongy bone of a dray horse.

But, though this strain highly improves horses for the turf, the field, and the road, it may soon be carried too far in the breed of horses fit for agriculture. In Scotland, we have either nothing, or too little of this blood in our labouring horses; but in many parts of England they have too much. This is observable in Yorkshire, and other sporting countries, where blood, as it is called, has certainly prevailed more than enough. There you see three, four, and even five little blood tits in a plough, where the work might be performed by a couple, or even by a single stout plough horse. In a heavy draught, it is not the spirit, the spring, or the agility, but the mere weight and strength of a horse that must prevail, and are most useful.

Our saddle horses, during the present century, have indeed been improved, but rather in a slow and imperfect way, as it has generally been conducted only by means of stallions. The effectual improvement is to raise, at once, the best and the full breed. The most remarkable instance of this kind, was the stud kept for many years in Nithsdale, by the late Lord Elliock, who was a very skillful breeder. The stud was begun with a bay Ara-

bian horse, and English hunters of a bay colour, of the largest bone, and of the most perfect shape that could be obtained. The breed continued unmixed, and in an improving state, for above fifty years. The horses it produced, were, according to their size and form, excellent for the road, for hunting, for a carriage, or for an officer's regimental horse; and, when three years old, sold from sixty to eighty guineas. Lord Elliock's forenoon airing, with four stone horses of this breed in his chaise, was frequently forty miles and upwards without halting. The breed that affords the best horses for these different important purposes, is highly valuable; and, where opportunity answers, appears to be the most profitable that can be raised in this country.

No sufficient care, however, has as yet been taken of the breed of labouring horses in Scotland. They are, in general, a mixed and mongrel race, and few of them possessed of the properties requisite in a good plough or cart horse. In some particular districts, especially between the Forth and the Clyde, they have indeed been improved; but, in the North, and over all the Highlands and Islands, they stand in need of a radical and complete reformation.

At what period the horse was first introduced into these countries, is uncertain; but there is no appearance, no tradition, nor any reason for think-

ing, that they ever had any breed of horses different from what they have at present. It is conjectured, that the first horses in the Highlands were acquired by the inhabitants in their incursions into the Roman province*. The precise nature of the horses, employed by the Romans in this country, is quite unknown; but they may be presumed to have been from South Britain, Gaul, and Italy, and, of course, widely different from the native breed we find in the Highlands. It is more probable, that the Highland horse, or rather indeed that of the Western and Northern Islands, where he subsists in his greatest purity, was originally introduced from Scandinavia, when the Norwegians and Danes first obtained a footing in these parts of the world. It is precisely the same breed that subsists at present in Norway, the Feroe Isles, and Iceland, and is totally distinct from every thing of horse kind on the continent of Europe, south of the Baltic. In confirmation of this, there is one peculiar variety of the horse in the Highlands that deserves to be noticed. It is there called the eel-backed horse. He is of different colours, light bay, dun, and sometimes cream coloured; but has always a blackish list that runs along the ridge of the back, from the shoulder to the rump, which has a resemblance to an eel stretched out. This very singular character subsists also in

* Macpherson. Fingal. p. 115.

many of the horses of Norway, and is nowhere else known.

The Highland horse is sometimes only nine, and seldom twelve hands high. He is too often short necked, chubby headed, and thick and flat at the withers, forming altogether a bad forehand, though fitted for strength: others of them are hollow backed. The hindhand is generally plump, and of a better shape. He is well set on his limbs, which are clean; the hooves narrow, and are hard like iron. He has rounded lips, small narrow nostrils, and contracted eyes, which have a peculiar sly and sagacious look. Many of them, however, are free from some of the defects in this description, and are of an excellent form. They have great strength in proportion to their size, and a great deal of agility and spirit without being vicious. Scarce any horses can go through so much labour and fatigue upon so little sustenance; and, when well kept, they are almost indefatigable. To become highly useful and profitable, the Highland horse requires only to have his breed carefully preserved, and his size enlarged.

An excellent horse of this kind, taken in a manner wild from the hills, was travelled for three months in a very laborious journey through the Highlands. He was firm, active, and strenuous, yet good tempered and docile, though almost in a state of nature. He had never felt a spur, and

being astonished at such a new attack, he stopt, and returned the kick with his hind foot, which the rider would have received to his cost, had he not suddenly shifted his leg forwards. Having never tasted oats, when they were thrown into the manger at the first inn he came to in the low country, he was alarmed and rushed out of the stable. Yet, though unacquainted with the civilised life of a horse, he possessed all the good qualities of the animal.

Since the year 1745, many South country horses have been brought into the Highlands, but rather for the purpose of immediate use than for a breed. Before that period, there is no account of any alteration having been made in the native breed, but upon one occasion. The Captain of Clanranald, who was killed in the year 1715 at the battle of Sheriff Muir, had been a colonel in the Spanish service. On his return home, not long before that action, he brought with him some Spanish horses, which he settled in his principal island of South Uist. These, in a considerable degree, altered and improved the horses in that and the adjacent islands. Even in the year 1764, not only the form, but the cool fearless temper of the Spanish horse, could be discerned in the horses of that island, especially those in the possession of Clanranald himself, and his cousin Macdonnel of Boysdale. These, at the time, both in figure and dispositions, were thought

the best horses observed in the Highlands; and, though of low stature, were judged more valuable than any other horses of the same size.

The smallness of the horses, forms, at present, one great obstacle to the agriculture of the Highlands. They are, indeed, both active and durable, but have neither size nor strength sufficient for laborious cultivation. To remedy this, it would not be so eligible to introduce any new breed, as to improve that which is already in the country. No horses from England or the South of Scotland, could retain their vigour upon the pasture of the Highland hills, or be able, without injury, to lie abroad upon them throughout the whole year; but the present Highland horses are naturalised to these hardships, and, in spite of them all, or perhaps in consequence of these very hardships, are of better mettle than any other labouring horses either in England or Scotland.

The Highland gentlemen and considerable farmers buy their saddle horses from the South, which is a very hurtful practice. It makes them neglect their own breed, which, with proper management, would be more valuable, and much better adapted to the country, than any horses they could have elsewhere. Nay, were proper attention paid to the native breed, the Highlands would not only be better supplied with horses, but there could not fail

to be a still greater demand for them from the South, as their hardiness and spirit renders them peculiarly valuable for many purposes. With proper care, their figure might be greatly improved, and even rendered beautiful. They might not only be saleable, but be held in such estimation, as to be highly profitable; for horses which excel in their kind, give not merely their value, but a fancy price, which is sometimes very high. Was the breed of horses, in short, properly managed, they would certainly turn out more advantageous to the Highland grazier than cattle.

In any alteration to be made upon the horses in the Highlands, the chief view should be the increase of their size; for, though they have the name, they have not the strength, nor are they capable to perform the work of a horse. It is not blood they want, but bone. The future cultivation and improvement of the country, must depend greatly on the two-horse plough; but, for that purpose, the present horses are quite inadequate. Four of them are necessary to draw the slightest furrow. The utmost care should therefore be taken, to raise them from eleven or twelve to between thirteen and fifteen hands high, in order to render them capable of that valuable piece of labour.

For this end, no horses should be reared, except from individuals of the largest size and of the best

form. Stallions of a superior size have been tried in several places, but with little effect in raising the size of the breed. Many properties may indeed be derived from the male, but bulk and weight are chiefly to be expected from the female. If any foreign blood is to be adopted, that which approaches nearest to the Highland breed, should certainly be chosen. There are some excellent mares of the Galloway kind, which are of sufficient size for the two-horse plough in light soils. These, with the largest and finest Highland horse that could be procured, would probably form the best new strain that can be introduced into the Highlands.

The white, the dun, the cream coloured, and mottled horses in the Highland breed should all be dismissed. The grey colour, which is very prevalent, had better also be dropt. It not only fades, but is generally accompanied with weak sight. There are more horses cast for blindness from the Greys, than from any other regiment in the service; and this weakness of eyes attending the colour, implies something of defect also in the constitution. In every breed of horses, there are qualities to be observed, which seem to accompany the several colours; but the black, bay, and chesnut colours, are, in every strain accounted the best.

MULES.

It is the opinion of some men of sense and research, that the establishment and propagation of mules might be advantageous to the Highlands. A trial for this purpose, has of late been very laudably attempted by a considerable proprietor in the Hebrides. It is observed by the ingenious Mr Penant, that there were few asses in Scotland, and none in the North; so that this may be considered as the first appearance of the animal in the Highlands.

The ass is well known to be a temperate, mild, patient, and indefatigable creature, long-lived, and little liable to diseases; so that he is formed to be a friend and assistant to the poor, as the horse is to the rich. Being a native of the Lybian deserts, he is best fitted for the hotter parts of the globe. In these, his race exists in its greatest perfection, and there, likewise, he is most useful. Though he lives and propagates in the climate of Britain, the breed is far inferior in size, to what it is in the southern parts of Europe; it is inferior, likewise, in energy and spirit. In a hot climate, the ass is full of vigour and agility, but, with us, he is certainly but a slow and sluggish animal. The ass of Spain and Por-

tugal is so superior to that of the northern parts of Europe, that he appears almost as a different species. In these kingdoms, he is fourteen or fifteen, and sometimes even sixteen hands high. Wherever, therefore, the propagation of mules is to be attempted, the ass should be chosen from these countries, where he is of a much larger size, and more vigorous than in the North.

The mule is of two sorts:—The one*, which is the largest and most useful, is procreated by the jack-ass and the mare; and its size depends chiefly on the size of the dam.—The other†, which is produced between the she-ass and the horse, having no properties superior to the former, and being a smaller and less useful animal, is seldom propagated. The mule of the first sort is a persevering durable animal, and easily supported; of great strength compared to his bulk; firm and surefooted; and laborious like the ass, with somewhat of the spirit and agility of the horse. Yet, both the ass and the mule, being capable of enduring, without prejudice, the most inclement heat, are certainly better adapted for the hot than the cold regions of the earth. The horse, the ox, and the sheep, prefer the gramineous plants to all others, and can nowhere be sup-

* *Equus Asinus*. α. *Mulus*, Linn.

† *Equus Asinus*. β. *Hinnus*, Linn.

ported in a prosperous state, except where these plants abound ; but the ass and the mule can live and thrive without grass. They can subsist on a variety of rank vegetables, some of them even poisonous, none of which would be touched by our other domestic animals. In the torrid zone, there is little or no grass ; but the other luxuriant plants which are produced, yield excellent nourishment for the ass and the mule. They are therefore pointed out by nature, to be the most useful beasts for labour in an equinoctial climate. The mule, of late years, has accordingly been introduced into several of the West India islands, where he is found to be of signal advantage. He is there propagated from jack-asses of the largest size, transported from Portugal.

It is a common observation, that few people have ever seen a dead ass. It is, naturally, and must be, a rare occurrence, from the longevity of the animal, its scarcity in this country, and the high value of its skin. Being generally employed by the poorest people, it lives on the poorest, but its most wholesome fare. The coarse weeds by a road side, or on a heap of rubbish, form a more salutary food for the ass than the richest pasture. At a gentleman's seat in the South of Scotland, where a number of asses are always kept on account of their milk, they are subject to diseases, and frequently die, especially when young. Though the case is

singular, the cause is obvious. They are pastured on fields of very rich grass, which quickly fattens all other sorts of cattle ; but this suits not the constitution of the ass. He is much safer, more healthy, and longer lived, in the hands of any poor laborious people, or of vagrants.

It still remains to be decided, what peculiar use can be answered by mules in the Highlands? or wherein can they be superior to the horses of the country? Recourse must be had to them in a hot climate, that is unfriendly to the horse and the ox ; but this is not the case in the North of Scotland. They are of great utility in the rocky and precipitous roads on the Pyrenees, Alps, and Apennines, not only on account of their sure and steady step, but their cool temper and deliberate motions, in places where the impetuosity of a Spanish or Italian horse would be dangerous to the traveller ; but no creature can be better fitted, than the Highland horse, for the worst roads in his country. He is both cautious and vigorous, and manages even the most difficult and dangerous steps, with a degree of address that is surprising to a stranger.

If mules could be raised in the Highlands, of such a size and strength, that two of them would be sufficient for a plough, they would be certainly beneficial. Unless they could answer this purpose, their usefulness is far from being obvious. Nor is

this to be expected, but from the ass of Spain or Portugal, and mares of a much larger breed than that of the Highlands.

GOAT.

The goat is no doubt a very ancient inhabitant of the Highlands, being naturally adapted for a mountainous and rocky country. Till of late years, when the fox came to be hunted, and a price even set on his head, the sheep were few in number, and none could be kept in safety, but what were housed at night ; but the goat being a much stronger and bolder animal, and having his lodging at night in precipices and inaccessible retreats, was secure from the ravages of the fox. Large and numerous flocks of goats were, therefore, every where kept.

Though the goat is accounted an unprofitable article of stock, compared to the sheep, he is not without his advantages in a mountainous country. No quadruped better endures the extremities of heat and cold. On the most stormy hills, he needs no housing, no shelter, no smearing, nor any artificial provender. His tallow is equal to that of the sheep ; his skin gives a better price, and is still more valuable, when dressed with the hair, for the purposes

of knapsacks and holsters. Even the hair, though neglected in the Highlands, was it shorn in due time, and properly sorted, would sell to different artists, for more than the fleece of a sheep on the same pasture. The value of his carcass in the Highlands, is but little, if at all inferior to that of the sheep, nor is he so subject to diseases and mortality. He cannot, however, bring so good a price, when exported out of the country, and must, therefore, in general, give way to the sheep.

The goat is not, on any account, to be permitted, wherever he has access, either to young plantations or natural coppice. He is rather a browsing, than a grasing animal, and crops severely the young shoots of every tree and shrub. A good dry stone dyke, which is the best fence for a plantation or a coppice, is no fence against the goat, so that there is no security, but to expel him entirely from their neighbourhood.

Flocks of goats on account of the milk, as a medicine, will always be kept in many places. On some rocky and abrupt mountains, or where the fox still prevails, it may be still also adviseable to retain him. In these cases, the breed and the culture of the animal are very deserving of notice.

The American goat, though the same species with ours, differs considerably in its habits. It was

settled a good many years ago at Ardmady in Argyllshire, by the late Mr Campbell of Carwhin, who on every occasion, was like a father to his clan and his country. It throve equally with the native goat, and had the singular property of bringing forth young twice a year. The pregnancy of the goat lasts about five months. One kid was produced about the end of February, and a second in the month of August. This uncommon fecundity renders the breed peculiarly valuable; but beside a more numerous progeny, the kid produced in August, is far preferable at table to that which is produced in spring. The season of goat milk also, instead of ending about the 1st of August, may be prolonged in perfection till the 1st of October or later.

Notwithstanding our Levant trade, the Angora goat* has never yet made its appearance in Britain. It is only a variety, indeed, of our European species, but an animal of very different properties, and much superior in value. He forms a favourite flock in Syria and the adjacent countries. The milk and the flesh are much more esteemed than those of the common goat; but his chief excellency consists in the nature of his fleece. This is so fine, that it deserves rather the name of wool, or of a substance indeed superior to wool, rather than of hair. It

* *Capra Hircus*, *β. Angolensis*, Linn.

hangs down almost to the ground, is of a snowy whiteness, and with a lustre resembling silk. It is known by the name of mohair; sometimes, though improperly, by the name of camel's hair; and affords a material for some of the finest manufactures, both of the East and of Europe. This beautiful and beneficial animal was translated, not many years since, from the Levant into Spain, by order of the present King; and from thence, a few individuals have been introduced into France. In both countries, as it was natural to expect, they are found to be as hardy, and as easily reared as the other goats. It is to be regretted, if neither at private or public expence that this valuable domestic animal cannot be obtained for the Highlands; where there is little doubt, he would succeed as well as his kinsman, the common goat. Though to some it should appear extravagant, it may with reason be expected, that he would thrive as well on many of the Highland hills, as on Lebanon, or the mountains of Cyprus and Crete.

SWINE.

The number of Swine in the Highlands is inconsiderable; they are kept but in few places, and in many extensive districts not one of them is to be seen. It is not known at what time they were first

introduced ; but it appears, that the Hebridians were in possession of them, during the days of Columba *, in the sixth century.

This aboriginal breed of swine still subsists in various parts of the Hebrides and Highlands, from the Isle of Man to Caithness, but is scarce to be seen any where else in Britain ; they are in some places called purrs ; they are of the smallest size, neither white nor yellow, but of a uniform gray colour, and shaggy, with long hair and bristles ; they graze on the hill like sheep ; their sole food is herbage and roots, and on these they live the whole year round, without shelter, and without receiving any other sustenance. In autumn, when they are in the best order, their meat is excellent, and without any artificial feeding ; but when driven to the low country, they fatten readily, and rise to a considerable bulk. As they live not merely on grass, but on a variety of plants and of roots, untouched by other cattle, a great number of them might, no doubt, be raised to advantage, on every Highland farm, wherever the land in crop is inclosed. According as the cultivation of potatoes increases, the raising of this sort of live stock, will become more general and more beneficial. At a village in Annandale, in this present year, hogs and bacon, to the amount of 500l.

* Adamnanus. Vita Columbae.

were sold in one market day ; but thirty years ago, there was not a hog for sale in that neighbourhood. This beneficial alteration has been entirely produced by the extended culture of potatoes ; and what has happened in Annandale, may happen anywhere in the Highlands, and especially in those parts bordering on the low country.

The general practice would intimate, that Swine must be kept about a house, have their own apartment or pig sty, and be hand-fed with different sorts of offal and grain. This is all very proper for the distiller, the brewer, the miller, the cottager, and even sometimes for the farmer, where there is no sufficient range for the pasture of hogs ; but in a wild country the case is different.

The hog is one of the few quadrupeds that lives indiscriminately upon vegetables and animals. He devours almost every sort of animal substance, when it offers ; yet plants are his most natural and proper food ; and, as the food of man, he is certainly most eligible, when confined to a vegetable diet. Accordingly, on this diet, and especially on grain, he is capable of being raised to the greatest perfection, if that consists in enormous bulk and fatness. He has naturally, and even upon meagre food, a larger proportion of fat in his composition, than any other animal ; when he is pampered, this fat comes to be excessive. The great object of the pig-fancier, as he

is called, is to produce rather fat than flesh ; but the finest pork, is that which is not overfed, and in which the lean is not annihilated by the fat. It is even thought, that the young hog, which has never tasted any thing but herbage, affords the best and most agreeable meat, at least when used fresh, though it may not, perhaps, be so proper for preserving with salt.

The singular talent in swine, of digging and throwing up the earth, is a great nuisance in cultivated grounds. In wild tracts, it may be rather advantageous than detrimental ; yet in general, it is necessary to restrain them from the practice ; to restrain them with rings in the snout, is a difficult and painful operation. The rings are constantly giving way, and are troublesome to replace. There is another method, not generally known and practised that is more effectual, and less painful to the animal. In the snout of a hog there are two powerful muscles, which terminate in two strong tendons near the nose. It is only by means of these that the animal has so much power in digging and throwing up the earth ; when the pig is about two or three months old, these two tendons may be cut, by a slight incision with a sharp knife, about an inch and an half from the nose, with little pain and no prejudice to the animal ; from thence, he loses the power, and never shows any inclination to dig the earth. Even the wild boar, disabled in this way, has been kept for years in a

park, where he fed only on herbage, along with the deer and the sheep, without ever overturning a handful of earth.

RABBITS.

The rabbit exists in a straggling way in many parts of the Highlands and Islands ; but being scarce any where under proper culture or management, it is of no use, unless when accidentally shot. It is the common gray sort that prevails ; but the black rabbit, planted probably of late years, has the exclusive possession of some small uninhabited islands adjacent to the Isle of Skye.

The advantages that arise from rabbits regularly colonised, are very considerable. They afford, in a country, a great stock of cheap and wholesome provision, from the month of October till March, peculiarly useful, where the inhabitants, during that period, live chiefly on salted meats ; their skin is valuable, and supports the hat manufacture. Wherever they are settled, they improve the pasture and the soil ; and are capable in many situations of affording more profit than the land could otherwise yield.

On the other hand, they are liable to over-run valuable grounds, and to spoil them by their burrowing. They are capable also of being very hurtful, wherever they can have access to corn fields or to young plantations. To confine and circumscribe them, does likewise require sometimes a considerable expence, in the way of inclosure ; these disadvantages, however, may be prevented, by placing them in a right situation ; and much of their utility, indeed, depends on the choice of a proper place for their residence.

An island in a river or the sea, is an eligible situation ; so likewise is any piece of land, nearly surrounded by a river, as water is an impassable barrier to rabbits. If a side or two of the warren lie open to corn fields, they may be sufficiently fenced by a dry stone dyke ; but the most advantageous situation for rabbits, is one which is very frequent in the Hebrides, Orkney, and Shetland ; that is, an island on which cattle are kept, but on which there are no inhabitants. Such small islands are very numerous, and it would be profitable to have every one of them stocked with rabbits ; this would but little infringe on the pasture of the cattle ; but the grass consumed by rabbits turns to more account, than if it was eaten by black cattle or sheep ; and both the sward and the soil are more improved ; besides, many plants untouched by cattle, are eaten by rabbits. Where they have access to the sea shore, they live for a great

part of the year on the sea weeds ; so that whatever profit could be obtained by rabbits on such islands, might be considered as so much gained.

The rabbit-warrens in Scotland are but few in number ; the most considerable are those in East Lothian, in sandy downs or links, on the sea shore. Such tracts are chiefly occupied by hard maritime grasses, which are fed upon by rabbits, though disliked by cattle. It is presumed also, that the rabbit requires a mild maritime climate, and a sandy soil for the purpose of burrowing ; but from some instances, it appears, that a colony of rabbits can be advantageously maintained, at a great distance from the sea, in a high country, and where there is neither sand nor maritime plants.

A small warren was established in Eskdale, above twenty miles from the sea, and about six hundred feet above its level. Ten acres on the banks of the Esk were allotted for the purpose, not in a sandy soil, as is usually the case, but in a field consisting of loam, two or three feet deep, and bottomed with gravel. Some part of this field was arable, and the rest sheep pasture ; it was worth eight shillings the acre, the whole amounting to four pounds. When the warren had subsisted thirty years, the soil was greatly enriched, and as a pasture for cattle was reckoned worth twenty-five shillings the acre ; at that time, the field afforded annually, one hundred and

fifty dozen of rabbits, whose skins sold for six shillings and sixpence per dozen, which amounted to forty-eight pounds fifteen shillings; the place being remote from any market, the carcasses sold only at the rate of two pence each; these, however, amounted to fifteen pounds, and the whole produce of the warren to sixty-three pounds fifteen shillings.

When all the necessary expences were allowed, this was by far the most profitable way in which the ground could have been employed. This estimate was made in the year 1765, since which time the value of land has been greatly augmented, but so also, and in a still greater degree, has the value of rabbits. The same, and even a larger profit is, therefore, to be expected at present from land in a similar situation.

From the above account of this warren, it appears, that in a high part of the country, an acre of outfield land is capable to yield annually fifteen dozen of rabbits. These, at the low price above thirty years ago, amounted to four pounds seven shillings and sixpence of fixed annual produce; but even at present, such land could not afford the same profit either in the pasturage of cattle or in tillage.

We find also, that the raising of rabbits to advantage, is not limited to a sandy soil or the sea shore. An inland, and even a high situation, has two

advantages above a warren in the neighbourhood of the sea. The flesh of the rabbits is more agreeable, by being free from the nauseous taste which they acquire by eating the sea weeds, and their fur is much thicker and finer, by living in a more severe climate.

The only instance of the utility of rabbits that occurred in the Highlands, was in the island of Colonsay. On the north side of that island there are several hills of sand, and an extent of sandy downs which were stocked with rabbits by the late Mr Macneil of Colonsay. In the year 1764, this very barren tract afforded one hundred and thirty dozen of skins, which were sold at Glasgow at the low price of five shillings the dozen; the meat of these rabbits supplied the people of the island with fresh wholesome provision; and the very skins, which brought thirty-two pounds ten shillings, amounted to ten times more than what this piece of sandy desert could otherwise have produced.

In places distant from any considerable market, it is the skin only of the rabbit that can bring money; yet even this is sufficient to render a warren profitable. The price of rabbit skins is of late greatly advanced, and the demand for them is greater than the supply. In one of the most remote parts of Galloway, a warren of no great extent, rents at present for a hundred pounds per annum, though the

carcases are sold in the country so low as fourpence the pair : Was there an opportunity of selling them from sixpence to a shilling the pair, this would make a great additional profit ; and this might certainly be obtained, wherever they are within reach of a market.

The silver grey rabbit is a remarkable variety of the species. It was brought from France into England, many years ago, where it has been propagated to a considerable extent, and in preference to all others ; it is not only a larger animal, but has a more valuable fur, and is equally hardy with the common grey or black sort. Wherever a warren is to be attempted, it is therefore this variety that ought to be chosen for the purpose, and it should even be introduced in those warrens that are already established. The hair of this animal is even applied to a more valuable purpose than the hat manufacture ; it is dressed upon the skin as a fur, and is now exported from England, in this form, to the northern countries, and even to China, with great profit. The ferret is indispensibly necessary in a warren. Without the assistance of this animal, no considerable number of rabbits can be caught, nor can the proprietor be put in possession of his live stock. A few ferrets, however, are sufficient for the purpose, and they are easily maintained and propagated.

By what is said here, it is not meant that the culture of rabbits should be a matter of general concern; but, from the circumstances above adduced, it seems evident, that on some Highland estates, and on some particular farms, the establishment of a warren may be rendered highly profitable.

POULTRY.

As great things are all composed of small; the smallest matters are not to be neglected by the rural economist. The success of a farmer depends much on his attention to little articles; and this attention he may exert, without being either penurious or churlish. It is his business to turn every thing to the best account, even the smallest articles on the farm. Among these, the management of poultry very well deserves his notice. It may be a matter of little or no profit for a considerable farmer to raise poultry for sale, but it is certainly proper that a certain quantity of poultry should be maintained. The mere offal, fit for poultry, is considerable upon every farm. The scattered grain in the stubbles, in the barn yard, from the barn, and even from the dung-hill, should not go to waste. Such a number of poultry ought at least, therefore, to be kept on every

farm, as is sufficient to consume what would otherwise be lost.

The cultivated and the corn countries are the best adapted for poultry; of course, there are but few kept in the Highlands, though they should, and will no doubt increase as cultivation is extended. The common dunghill fowl and the turkey, are natives of the hottest parts of the globe:—Their natural food is the seeds of plants, and especially grain; they cannot, therefore, in our climate, subsist the whole year round in the open air, and on what the fields produce:—They require both the shelter and the food which domestication affords them. But the case is quite otherwise with the goose and the duck. These are natives of our own climate, and can subsist on it with little artificial assistance. Their natural food is herbage, insects, and small vermin, and especially those which the waters produce. On every Highland farm, a great number of these birds may be propagated and maintained at little or no expence. Wherever there is a lake or a river, they can be at no loss for maintenance. With a little care, large flocks of geese and ducks may be reared and preserved at no expence, and become an article of profit to the farmer, and of great conveniency to all his neighbours.

BEES.

The honey and wax collected by bees is so much substantial gain to the country, and all that is not collected, which is perhaps a thousand times more, may be considered as so much lost. The quantity of honey and wax that may be raised in Britain, appears, at least upon paper to be amazing. There can, however, be no doubt that their quantity may be very greatly increased, to the advantage both of individuals and the public. Their importation from foreign countries forms a considerable article of national expenditure, and to encourage the increase of them at home, should therefore be an object of national attention.

The farmer's concern in domesticated animals, extends from the ox to the bee. There are but few bees kept in the Highlands, though the country is well adapted to support them in great numbers. Pasturage is more friendly to bees than cultivated lands; as, from the former, they obtain a much greater quantity of food in the same space, than they can from the latter. The natural is also much more flowery than the artificial pasture. The sea shores form the most favourable situation for bees; not only

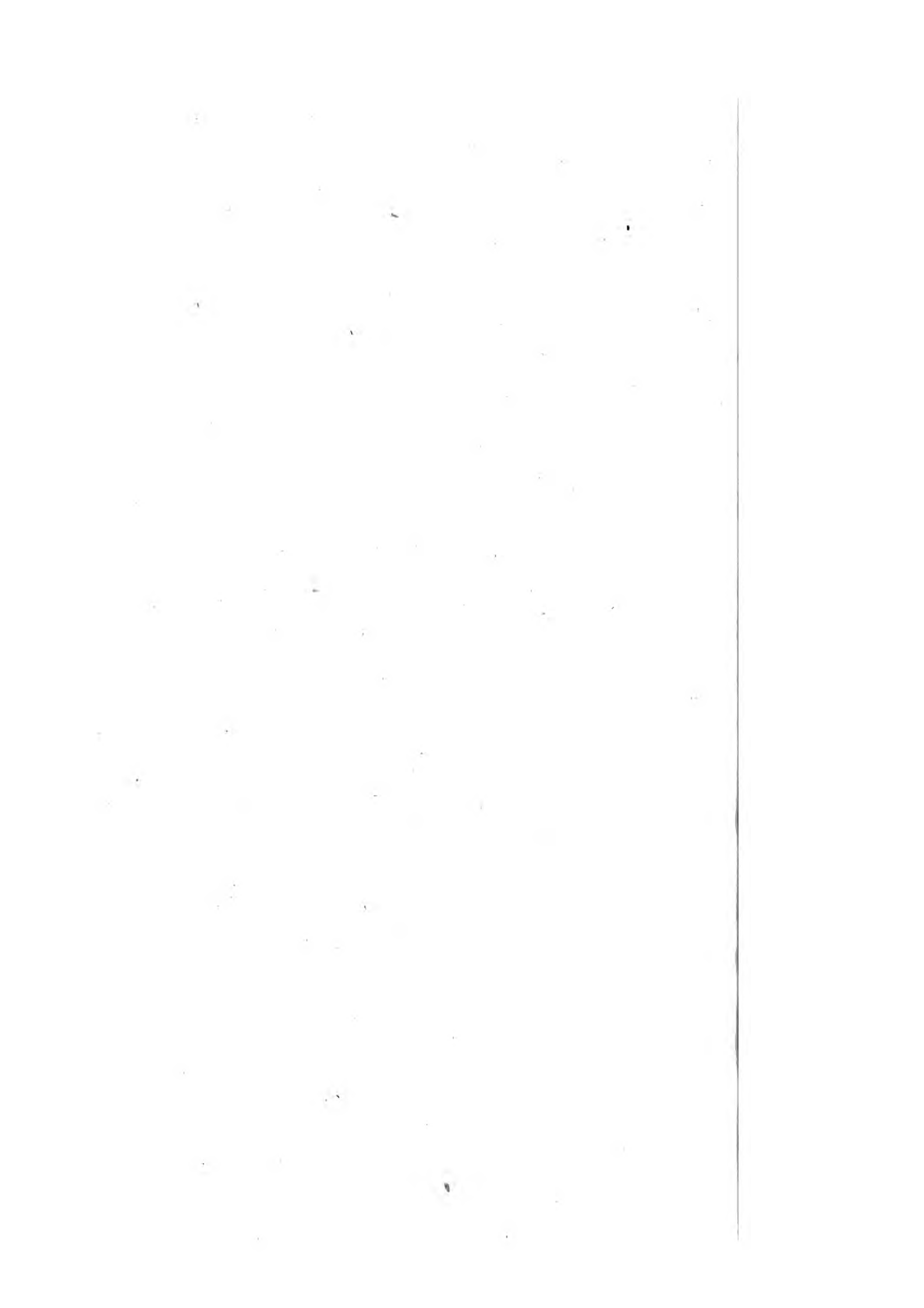
on account of the mildness of the climate, but because of the profusion of maritime plants which come into flower early in the season;—these likewise, are well known to produce honey of the whitest colour, and of the best qualities.

In many of the Islands, and on the west coasts, nothing can exceed the richness of the herbage as a bee pasture, being not merely enameled, but crouded with flowers. In the year 1762, the first beehive was introduced into the Island of Coll, which succeeded as well as could be wished: both in that and the following year, it threw off two early and numerous swarms, and the honey produced was of the finest quality. Neither the winds nor the rains in the West Highlands and Islands, form an insuperable obstacle to the cultivation of bees. They succeed, and with great profit, among the hills in the heart of Tweeddale, where the rains and the winds are as copious, and where the pasture for bees is not equal to that on the shores of the Highlands.

Wherever heather abounds, which is well known to be the case in the Highlands, bees can collect more honey from it during six weeks it is in bloom in autumn, than they could in some other places during the whole season. The shores upon the bays and extended arms of the sea, afford copious pasture for bees during summer; and the heather is almost everywhere at hand, to which they have access, or to

which they can be easily transported, so as to be plentifully supplied during the autumnal season.

In some inland parts of Aberdeenshire, which cannot be supposed to be more friendly to bees than many places in the Highlands, a first swarm sells for twenty shillings, which, in the following season, swarms twice, and frequently three times. A good hive yields ten or twelve Scots pints of honey, which are from forty shillings to three pounds in value. This affords a great profit to the small farmer, and should not be below the notice of the largest proprietor.



SECTION XL.

WOODS AND PLANTATION.



INTRODUCTION.

It appears from many circumstances, that Scotland was anciently very much overgrown with wood. Many places still retain the names of Woodhead, Woodend, Woodfoot, and Woodside, where not a tree is to be seen at present, but which are known to have received their names from considerable tracts of wood in their neighbourhood.

The extensive field called the Burrow Muir, near Edinburgh, was covered with stately and aged oaks in the reign of James IV *. which were all cut down

* Hawthornden's History, p. 218.

during the following reign. At that time, the city of Edinburgh was in a manner rebuilt, and chiefly from this wood. Most of the carpenters in Scotland were collected for the purpose, and had their booths in the neighbourhood of the wood, from which the place is still known by the name of the Wrights houses. The tenements then built, and consisting of four, five, or six floors, were composed entirely of wood. They were long known by the name of the Timber lands, and some of them still remain.

The Caledonian forest, mentioned by Tacitus, seems to have extended for many miles above and below Stirling. From the position of Agricola's first camp, on the north side of the Forth, at Ardoch, he appears to have passed that river at or about Stirling, in the heart of this extensive wood. The remains of the ancient Tor wood, below Stirling, is a remnant of this Caledonian forest, which seems to have comprehended, on the north side of the river, the whole extent of Moss Flanders. Great quantities of large trees, for many miles, lie buried in this moss: many of them have evidently been cut, and probably by the Romans, during the first invasion of the country on the north side of the Forth*.

* Some years ago, a Roman camp kettle, found in this moss, was in the possession of a learned and worthy gentleman in the neighbourhood, Mr Ramsay of Ochtertyre. It

All the peat mosses in Scotland which contain the trunks of trees, have formerly been woods; and from the great number and extent of these mosses, we may judge of the woods that must have existed in the country in ancient times. The formation of a peat moss, however, from a wood, requires the stagnation of water; our deep mosses are accordingly situated, either in a hollow or in a flat part of the country, where there is a subsoil that resists the descent of water; for there are many tracts of Scotland,

was of that kind of Roman brass which is but little affected, and never consumed by rust. It was greenish, indeed, on the surface, but, though extremely thin, was quite unimpaired. This kettle is one of the numerous instances, which show the skill and contrivance of the Romans in every thing relative to the art of war,—the greatest merit of that memorable people. Being ignorant of tin plate, which in modern times is used for a camp kettle, they made use of brass, and adapted it with a great deal of art for the purpose. The circular mouth of this kettle was eighteen inches in diameter. It was two feet one inch in diameter, where widest, and eighteen inches deep, with a handle of brass, which had been broken off. Though a vessel of great capacity, as appears from these dimensions, the brass was so thin as to bend almost like parchment, and the whole kettle so light, that it might have been suspended by a horse hair. It was dug up at the depth of eight feet in the moss, and found lying on the clay, with which the moss is bottomed; which affords a presumption that this Moss Flanders, deep and extensive as it is, has been formed from part of the ancient Caledonian forest, since the time of the Roman invasion.

which have been formerly covered with wood, where no tree nor any peat moss appears at present. These are always dry and shelving grounds, where the water either sinks immediately, or runs off. There is a tract of this kind on the river Annan, now destitute of trees, which, by the tradition of the country, was so woody, not above two centuries ago, that a magpie might have hopped from one tree to another, for ten or twelve miles. The tradition is countenanced by the remaining roots of large oaks still visible in this tract, though in the last stage of decay. But they have all stood upon declivities, and in a dry soil; in consequence of which, no peat moss has ever been formed, either by their growth or their decay.

But, independent of the havock made in woods by the waste of time, and by wars, as a country becomes civilised, and increases in inhabitants, its natural woods must give way to arable fields and pastures. When pasturage takes place, while the woods decay, their reproduction is effectually prevented by the browsing of the cattle. The practice of agriculture, the progress of manufacturer, of trade, and of the various arts, occasion a vast consumption of timber. When these arrive at a certain height, they require a greater supply than can be afforded by the natural woods of a northern climate. This is the present state of Scotland; and to answer the demand, recourse must be had to plantation, and to

the preservation of the coppice, or the remains of former woods. These two articles are now become a most important part of our agrestic and national economy. The observations to be delivered upon them here, are, indeed, immediately calculated for the Highlands and Islands; but they are, for the most part, applicable to Scotland in general, and especially to all the higher and more uncultivated parts of the country.

SOIL.

In the Highlands and Islands there are varieties of soil, fit for raising all the barren trees which afford with us the most useful sorts of timber. The most prevalent is what may be called the mountain soil, consisting of loam, much intermixed with stones and fragments of rock, the ruin of the hill. This is the general soil on the sides, and about the skirts of the mountains, and even in the vallies. Upon this soil, all our forest trees grow well, wherever the exposure is favourable. There are, besides, great tracts of thin moorish soil, so embarrassed with rocks as to be incapable of culture, extensive peat mosses, and, in many of the islands, a great extent of deep sand. Upon these soils, though otherwise very unprofitable, particular species of trees may be raised to great advantage. There are, likewise, almost upon every farm, outfield arable lands of hazely

mould, and infield spots of black fertile soil; but these are too valuable to be applied to the purpose of plantation.

But there are two soils in which these countries are deficient. The one is a wet soft loam, in which all the trees of the poplar kind, the lime, and some others, thrive so remarkably:—the other, a deep holding clay, which is the soil best adapted for the prosperity of the oak. Hence it happens, that, though oak woods are frequent in the Highlands, the oaks are all of the spreading kind. They appear like stunted trees, compared to the tall streight oaks which grow in the deep clay soils of England, or even in the south of Scotland. The tree, however, grows on the hard stony soils in the Highlands, so as to be remarkably beneficial; and its wood, bark, and charcoal, are equal, if not superior in quality, to these products of the oak in other countries.

Different trees affect different soils. In the same climate, a tree will thrive in one soil, and fail in another. The best soil for our native trees is so obvious and generally known, that any observations on the subject would be superfluous: but we are less acquainted with the natural soil of the foreign trees which we cultivate; yet this knowledge is indispensibly requisite in order to plant them to advantage.

In this place, it may only be necessary to take notice of one instance, among many, as an example.

The spruce or pitch fir has been planted above a hundred years in Scotland; but, in most places, in an improper soil, as the natural soil of the tree has either been unknown or disregarded. We hear of vast trees of this sort, growing in Swisserland, Germany, Sweden, and Russia; and the climate of Scotland is certainly as favourable for it as that of any of these countries. It requires but about one hundred years to arrive at its greatest bulk and perfection. We have great numbers of spruce firs in Scotland, which approach nearly to this age, and many which even exceed it; yet we seldom find among them, trees of such a size as is common in the natural woods of the above countries. This is not owing to difference of climate, but to the tree having been generally planted with us in an improper soil. The largest spruce firs in Swisserland and Germany, are at the foot of mountains, where there is a constant supply of moisture, or in swampy grounds. The tree, indeed, covers entire hills, but there, or in any dry soil, it never arrives at so large a size. Professor Gmelin and his company, in traversing Siberia, were often on the verge of great distress for want of water. He came at length to observe, that, wherever there was a wood or a group of pitch fir trees of great height and size, there was always swampy ground and springs. This served

him as a direction to procure water, which never failed ; and should serve as a direction to the planter, where to place the pitch fir. Accordingly, the only large pitch firs we have in Scotland, are a few which have been planted, not from design, but accidentally, in wet ground : such are the lofty pitch firs at Bargaly in Galloway, planted by the side of a river, with their roots extending to its level : such are a few fine trees of the kind, at Castle Menzies in Perthshire, at the foot of a hill, from which they are plentifully supplied with moisture : and such was the noble group of pitch firs at Drumlanerig, situated on a swampy spot oozing with springs ; while, in all the adjoining plantations which were dry, the tree was of an inferior and stunted growth. This is the case of most of the pitch firs we have in Scotland. They have, generally, been placed in too dry a soil, and are therefore inconsiderable trees. It is true, indeed, that, in such a situation, they will make a very handsome appearance for a dozen or twenty years ; but, soon after that time, they dwindle, become shabby, and never swell to the natural size of the tree. This train of remarks shows the great utility of paying due attention to the native soil of the foreign trees which we cultivate.

Another observation may be added here on soil, though it does not indeed so much respect plantation, as the management of grown trees. Any great

alteration in the soil, in which grown trees stand, is generally detrimental. When fruit trees have stood long in a garden or orchard, where the soil was worked or kept red, if it is allowed to go into grass, both their crop and their fruit immediately diminish: when, on the contrary, they have stood long in grass ground and been productive, if the soil is broken up and kept red, they cease to be fruitful, they run to wood, and cannot easily be reclaimed. In forest trees, the case is very remarkable with respect to dryness and wetness of soil. If the roots of a full grown tree in a dry soil, come to be exposed either to running or standing water, the tree immediately declines, and soon perishes: if, on the other hand, when it has grown up, and had either running or standing water within reach of its roots, if the water is removed, the tree decays, and can never again be restored to health. Many particular instances of this remark might be given, in the case of the oak, the ash, and elm, and it is probably applicable to many other trees. It affords this useful caution, that, wherever there are full grown trees, valuable either for their timber or for ornament, any great alteration in their soil, whether from dry to wet, or from wet to dry, should be carefully avoided.

CLIMATE.

Wherever the soil and situation are proper, the climate of the Highlands and Islands is fit for all the trees of northern Europe. Trees, in general, grow better on the western than on the eastern coasts of Scotland. The west is by far more woody than the east coast of the country. On the west coasts, the frosts are less frequent and intense; the prevailing south and south-west winds, though otherwise hurtful, bring them more frequent and abundant rains, so friendly to the growth of trees; and they are in a great measure free from the blasts of the east and north-east, with which the eastern shores are so much distressed. On the western coasts, every plantation will be most prosperous when sheltered from the south-west, and on the eastern shores when screened from the north-east. There is no natural growth of wood, and it is even difficult to raise trees by art, on most of the coasts of Aberdeenshire; but, on the west coast, under the same parallel, and in places as much exposed to the sea, the natural woods are healthy and vigorous.

The climate for trees varies exceedingly, according to the elevation of the place above the sea.

The odds of a few hundred feet makes a great difference in their progress : nor is this owing so much to the increase of cold, as to that of the winds, which becomes more and more prevalent as we ascend in the atmosphere. Wherever trees are to be planted, therefore, at a great height above the sea, the places naturally sheltered must be chosen. Such shelter is everywhere to be found in a mountainous country. There, in every narrow glen and dell, the forest trees will grow vigorously, though they would scarcely live beyond the verge of the shelter which these places afford. The forest trees will not succeed in this country, in any place fully exposed to the winds, at the height of one thousand two hundred feet above the level of the sea ; but planted in a deep glen or gully, they will grow up to afford useful timber, at that, or even at a greater height.

It may be of use, here, to obviate an opinion that prevails among the inhabitants in many parts of the Highlands, and in most of the Islands, “ That “ no wood will grow in their country.” The tracts in which they live, are indeed entirely destitute of trees at present, but it is evident that, formerly, they have been well wooded. This appears from the many considerable spots of coppice that still remain, which would, undoubtedly, arise to be useful timber, were they not perpetually cut down by the inhabitants, or cropt by the cattle. It appears, also, from the numerous peat mosses, the remains

of antient woods, in many of which are found trees of a considerable size. These former woods have long ago been extirpated, by decay, by the cattle, and the consumption of the inhabitants; but there can be no doubt, that, at present, they might be again restored.

For this purpose, let us attend to the climate of the Hebrides and western shores; of which the inhabitants generally entertain an opinion too unfavourable, and especially with respect to the growth of trees.

In the Isle of Man there is a great scarcity of wood, but it is not owing to any defect either in the soil or climate. All the trees that have been planted, thrive as well as those in the opposite country of Galloway. The climate of Man is even more favourable for their growth. The hedges in the bishop's garden were found to be of the Sweet bay*, which grows there vigorously in summer, and remains evergreen and unimpaired in winter. This evidently intimates a greater mildness of climate than is to be found, almost anywhere, upon the main land of Scotland.

In the Isle of Arran, the remains of the old woods, and the trees that have been planted, on

* *Laurus nobilis*, Linn.

the eastern and sheltered side of the island, are fresh and vigorous.

At Kames, at Ascock, and other places in the Isle of Bute, both the forest and fruit trees are of a considerable age and well grown. The extensive plantations at Mountstewart, which were begun only in the year 1718, are equal, if not superior, to those of the same age in the opposite counties of Ayrshire or Renfrew, and contain great quantities of valuable timber. The Oriental plane † grows here almost like a willow, is never hurt in winter, and forms a fine dressed shady tree. It has nowhere been observed with us, of such a fresh and luxuriant growth, except about the town of Kelso, where there is the best soil and the best climate in Scotland.

It must be admitted that, in the islands north of Cantire, the climate is not so favourable; yet, from the following detail of facts, it must appear, that plantations may also be successfully formed in them.

In Ila, Jura, Mull, and Skye, there still remain large tracts of coppice, which prove these islands to have been formerly well stocked with timber. Some pieces of natural wood still continue in Mull and

† *Platanus orientalis*, Linn.

Skye, which are not only of great use to the inhabitants, but to some of the more remote islands, where there is no timber to be found of any kind. One of the most remarkable remnants of these natural woods, is at Dunscaich in the Isle of Skye. It is of considerable extent, and filled with oak, ash, birch, alder, holly, rowan, hazel, and grey willow, of a considerable size. Here, an alder was measured, which was found to be seven feet in circumference, at the height of four feet above ground.

The Island of Rume, consisting of very high land, and which is one of the most tempestuous of all the Hebrides, has formerly been filled with wood. It was the forest of the Macleans of Coll; and, though the wood is now gone, a herd of red deer still remains upon it. The peat mosses in the island contain the trunks of considerable trees; and in the steep gullies, inaccessible to the cattle or the deer, the oak, the ash, the birch, the holly, and the rowan, are still to be seen growing vigorously.

The whole extensive western coasts of the Long Island, exposed to all the rage of the Atlantic, are indeed so unsheltered, as to be unfit for the growth of trees; but on the eastern shores, wherever there is an inlet or arm of the sea, all the indigenous trees grow freely, as in many places in South Uist, Harris, and the Lewes; though this, indeed, is only to

be seen on declivities and precipices, where they are protected from cattle.

At Lochnell, situated upon a promontory on the coast of Lorn, a variety of exotic trees was found, in the year 1771, in a very thriving state. The silver firs were sixty feet high, and between six and seven feet in circumference, four feet above ground; the walnut twenty five feet high, and three feet three inches in girth; the chesnut thirty feet high, and five feet round; the tulip tree* thirty four feet in height, beside the oriental plane, pinaster, and other trees in great vigour, which had all been planted by Sir Duncan Campbell, about thirty six years before.

It is to be regretted, that few examples of plantation can be quoted in the Islands, or on the remote northern coasts; yet it may be of use to take particular notice of the few which occurred.

In the Island of Colonsay, and on the sea-shore, but in the lee of the island, a plantation of ash trees was observed. They were thirty years old, above forty feet high, and as promising trees for useful timber as are commonly to be seen in Scotland.

* *Liliodendron tulipifera*, Linn.

At Armadil in the Isle of Skye, formerly a seat of the Macdonald family, there is a garden of very good fruit trees of a great age. In the plantation around the place, there are many ash trees above one hundred years old, which are not only of a great size, but are still sound and vigorous, though they stand in a situation not remarkably sheltered. A number of exotic trees and shrubs were sent down by the late Sir James Macdonald, and planted in this garden at Armadil. Among these were the following plants:—

Platanus orientalis, Linn. Oriental plane.

Gleditsia triacanthus, Linn. Three thorned acacia.

Cercis siliquastrum, Linn. Judas tree.

Rhamnus paliurus, Linn.

Tamarix gallica, Linn. French tamarisk.

After these and some other foreign trees and shrubs which are accounted tender, had stood three years in Skye, they were found less impaired by the winter, and more vigorous, than they commonly are in the gardens of the South of Scotland.

Flowerdale, the seat of the late Sir Alexander Mackenzie of Gareloch, situated at the extremity of West Ross, is a delightful, though a very distant and most sequestered residence. It occupies a romantic valley, filled with fine grass and corn, amidst

impending mountains, watered with rills and covered with trees. The land-locked arm of the sea below the house, half a mile over, and where ships of any burden may ride, is viewed from the windows, with bold hills on the opposite shore, which are covered from the edge of the water to the top with wood. Here, the old gentleman had the merit of forming many extensive plantations, and the pleasure of living till he saw them arrive at great perfection. It was a pleasant view, even to a stranger, to see his plantations of oak, ash, and Scots fir, creeping up the precipices and steep declivities of the hills, and even beginning to cover their rocky summits. No trees have ever been planted further north, upon the west coast; but, from the appearance of the plantations at this place, there can be no doubt that, in every proper situation, they might be carried on successfully to Cape Wrath, the northern extremity of Britain.

The gales from the sea, if uninterrupted, are, no doubt, in our climate, most unfriendly to the progress of trees. Plantations near the sea-shore, do therefore require the lee side of an island, or to be sheltered from the sea by hills or rising grounds. In such a situation, there needs be no fear of raising useful timber, in all the Hebrides, and on all the western coasts north of Cantyre. The above instances prove that it is not impracticable, and that the opinion of the inhabitants, "that no wood will grow in their

“country,” is an unfortunate and unfounded persuasion.

All trees, indeed, in Scotland, grow best near the level of the sea, except the mountain trees; such are the alder, Scots fir, larch, birch, and rowan. Even these, at a great height, require shelter, to become of a considerable size; but such shelter occurs everywhere in the Highlands. Persons should not, therefore, despair of raising these trees to be useful; and, along with them, our most valuable forest trees, the oak, ash, and Scots elm, in the interior parts of the Highlands, and even at a great height above the sea, provided the place has a tolerable degree of shelter. The town of Leadhills is the highest inhabited place in Scotland; yet the larch, the Scots elm, and the birch, have grown up there to be useful trees, in less than fifty years, though in an exposed situation. The ash trees planted there, near one hundred years ago, by means of a little shelter in a valley, have grown up to be timber of a great size, though placed more than one thousand five hundred feet above the level of the sea.

INFLUENCE OF THE SEA AIR.

It is commonly presumed, though without foundation, that the sea air is prejudicial to the growth of

trees. In the hot, and even in the temperate climates, the trees grow luxuriantly down to the water's edge, and suffer nothing from the sea air. In several maritime places in this country, the apricot and peach, by having a wall interposed between them and the sea, flower early in the spring, and ripen their fruits, though living in the sea air; but, on the unsheltered beach, on the outside of that wall, our hardiest forest trees are blighted, and stunted in their growth. The mere strength of wind, whether it blows from land or water, is destructive to vegetation, and that even in the most genial climate. By a West Indian hurricane, the whole vegetable luxuriance of the islands is blasted in a night. It is not, therefore, by the sea air, but by the strength and frequency of the winds, upon an exposed coast, that trees are hurt and destroyed. If they are exposed to the spray, that likewise may prove prejudicial; but, in all the land-locked bays and arms of the sea, on the West of Scotland, where the shores are screened from violent winds, the growth of trees, even by the seaside, is as fresh and vigorous as in other places.—Some trees, indeed, thrive much better than others, when exposed to the air and gales of the sea; such as the yew, the plane, and the white beam, on our shores, and the Norway maple on the shores of Scandinavia. One yew tree, which grew on a sea cliff, in the small stormy island of Bernera, near the Sound of Mull, when cut into logs, loaded a large

six-oared boat, and afforded timber sufficient to form a fine stair-case in the house of Lochnell.

SCARCITY OF WOOD.

An abundance of wood is indispensibly necessary for the accommodation, prosperity, and improvement of a country. Wherever it is scarce, the houses of the inhabitants must be mean, and perhaps destitute of fuel; their instruments of husbandry imperfect; all their agrestic and mechanical operations defective; and their whole manner of living incommodious. In short, a scarcity of wood puts a stop to the progress of all the useful arts of life.

The Hebrides and many Highland districts, are subjected to all the inconveniencies and hardships of this situation. In some places, indeed, on the main land, there are considerable woods, sufficient, not only for the use of the neighbourhood, but for exportation, or for consumption by manufactures. Yet, from these woods, other districts that have no timber, are so detached by their distance and the want of roads, that they can have no benefit from them; but, to render wood sufficiently useful for the purposes of a country, it is necessary that it should be immediately at hand.

The Islands, in general, are destitute of wood, and lie remote from those parts of the main land which afford it. In some, not a tree, nor any shrub is to be seen, except the grey and the Hebridian willow, which are eaten down by the cattle as fast as they spring up; so that a considerable island affords not what would be sufficient to make a wicker basket. The inhabitants have to undertake a dangerous voyage, from thirty to seventy miles, before they can build a barn, make a plough, or even procure a flail, or the handle of a spade. To carry timber in open boats, from such a distance, and through a tempestuous sea, is a task so troublesome, expensive, and dangerous, that it can only be undertaken from hard necessity. This want of timber distresses the people, in their houses, in their husbandry, and in every art. Industry can never flourish where there is such a scarcity of wood. The Hebridians can only be reproached for want of industry, by those who are inattentive to the disadvantages of their situation. In some places, they have little wood but what they obtain from shipwrecks; and with this, indeed, they are but too well supplied. The unfortunate sufferers are sure of being treated with more humanity than, perhaps, anywhere else in the world; but, when the event happens, the materials of the ship become a very convenient windfall; and many of the houses are accordingly constructed with what has been ship timber.

From the above statement, it is evident that this deplorable want of timber, in many districts of the Highlands and Islands, proceeds not from any defect, either of soil or climate. The want may be everywhere sufficiently supplied by means of plantation. The first object in planting trees is, indeed, the accommodation and improvement of the country; but this is not the only motive to induce proprietors in the Highlands to form plantations. The demand for timber, though very considerable, both in England and Scotland, for above one hundred years past, has of late become greater and greater, and must continue to increase. The usefulness of a Highland wood, is not now confined to mere domestic and agrestic purposes, but is high priced and profitable, either for exportation or for the support of manufactures in the country.

About seventy years ago, an iron furnace was established at Bonaw in Lorn, and afterwards another in the district of Argyll. By the demand for charcoal at these places, and the exportation of oak-bark, the gentlemen of the country first became sensible of the value of their woods. Accordingly, more care has been taken of the woods in these parts of Argyllshire than anywhere else in the Highlands.—They are regularly cut, and carefully fenced and preserved, much to the advantage of many estates.

A manufacturer at Glasgow, at one time, purchased wood from three estates in that country, to the amount of above seven thousand pounds. The woods on the estate of Ardnamurchan, are well known to have exceeded every person's estimation of their value. The fir wood, on one side of Loch Arkeg, on the Lochiel estate, is judged capable of affording four or five hundred pounds of stated annual income, though very distant from the sea, and of very difficult access to the shore. The fir woods in Straglash, bring a considerable revenue to their proprietor, Mr Chisholme, though the timber must be carried ten or twelve miles on horses backs, and in bad roads to the sea. The Carron company, many years ago, purchased a wood on the estate of Glenmoriston, on the north side of Loch Ness, for the purpose of charcoal.—For this wood they paid nine hundred pounds, though it was distant eight computed miles of very bad road from water carriage on Loch Ness, and was to be transported from thence to Carron.

Beside these instances, the woods in the high parts of Aberdeenshire, Banfshire, and Moray, which are still much more remote from the sea, show the great value of timber, even in the most inland parts of the country. But on the west coast, which is peculiarly favourable for the growth of trees, all the maritime tracts incapable of culture, and which form a great proportion of the country, can never surely

be occupied with so much advantage to the proprietors and the public, as in the way of plantation.

RISE AND PROGRESS OF PLANTATION IN SCOTLAND:

As the Romans had compleat possession of South Britain, and were fully settled in the country for near four hundred years, it is probable that many trees were then introduced into England, from the other parts of the empire on the continent. Among this number are perhaps the following:

- Fagus sylvatica*, Linn. Beech.
 — *castanea*, Linn. Chesnut.
Pinus abies, Linn. Pitch fir.
Juglans regia, Linn. Walnut.
Ulmus atinia. English elm.
Tilia europaea, Linn. Lime.
Sambucus nigra, Linn. Elder.
Acer Pseudo-platanus, Linn. Plane.
Populus nigra, Linn. Black poplar.
 — *alba*, Linn. White poplar.
Buxus sempervirens, Linn. Box tree.
Salix alba, Linn. White willow.
 — *viminalis*, Linn. Osier.
 — *phloragna*, Tinebark willow*.

* *Salix folio amygdalino utrinque aurito, corticem abjiciens.* Raj. syn. 3. p. 448. n. 10.

Though these trees are commonly reputed natives of England, there are reasons for suspecting them all to be of foreign extraction. They appear not anywhere in the North of England, like native plants; and, it is certain, that not one of them is indigenous in Scotland. They have all, indeed, been introduced, and some of them prosper with us to such a degree, that, in the course of years, they may come to have the same wild appearance that they have acquired in some parts of England. They have certainly subsisted for ages in that country; but, from the departure of the Romans, till the fifteenth century, near a thousand years, it is not likely that any foreign trees were established in England. If these trees, therefore, were introduced, which is highly probable, it would appear to have been during the Roman aera.

The first trees planted by art in Scotland, were those of foreign growth, and especially the fruit bearing trees. Long before the Reformation, various orchard fruits, brought probably from France, were cultivated in the gardens, at the religious houses in Scotland*. Some of these fruit trees, planted per-

* Many of our best orchard fruits at present, are known to have been derived from the gardens of the abbeys and monasteries. Such as the Grey achan, Swan egg, Muirfowl egg, Longueville, and Green pear of the yair; and of apples, the Arbroath pippin, Grey Ledington, Transparent apple, Thorle

haps but a little before the Reformation, still remain. A few exotic barren trees were likewise propagated, such as the elder and the plane; and of a later date, the beech and the chesnut; but none of our native trees were planted, such as the fir, oak, ash, elm, and birch, till about the beginning of the last century.

The first exotic tree of the barren kind planted in Scotland, seems to have been the elder. Though a slow growing and long lived tree, many generations of it have succeeded each other in this country. Elder trees of a large size, and very ancient date, still appear, not only about old castles, but about the most considerable and oldest farm houses. It was very generally planted, and for a very useful and peculiar purpose. The wood of the elder being accounted, in old times, preferable to every other sort for the making of arrows*. The plane, in point of antiquity, appears to be the next. When it was first introduced, is uncertain; but it seems not only to

apple, Moncrieff pippin, and others. These are all excellent fruits, and peculiarly valuable, as they ripen thoroughly in our northern climate. Some of them are still known and cultivated in France.

* Peter of Crescentia, the only naturalist of his aera, whose book was written before the year 1418, and who was not inferior to his predecessor, Pliny, remarks, "Ex ligno sambuci fiunt optimae sagittae. Lib. V. De Sambuco.

have been planted, but to have been propagated by seeds and suckers, for several generations before any other forest tree was introduced into Scotland. The wood of this tree, in old times, must have been of great value in the hands of the turner; and for that purpose chiefly it seems to have been cultivated. It is better adapted for the wooden bowls, dishes, platters, and other domestic utensils, which were universally in use, than the wood of any native tree in the country. These, however, appear to have been the only two barren trees planted in Scotland, till towards the middle of the seventeenth century.

A few chesnuts and beeches were first planted in gardens, not long before the middle of the seventeenth century, some of which have remained till our own times. Such was the chesnut at Finhaven; another at Levenside in Dunbartonshire, which was thrown down by the hurricane anno 1739; and two or three which were alive and vigorous at Kinfawns, in Perthshire, in the year 1761. Such was the great beech at Taymouth, overturned by a storm some years ago; the beech at Oxenford, and that at Newbottle, in Mid-Lothian; and another at Ormiston, in East Lothian, which still remain.

From what information can be obtained, the other exotic forest trees were first planted in Scotland, at or about the following periods and at the following places.

	Year.	Place.
Lime	1664	Taymouth
White willow	1678	Prestonfield
Silver and Pitch fir	1682	Inveraray
Maple	1682	Inveraray
Walnut	1690	Kinross
Hornbeam	1692	Drumlanerig
Black poplar	1696	Hamilton
Laburnum	1705	Panmure
Horse chesnut	1709	New Posso
Oriental plane	1710	Holyroodhouse
Flowering ash. <i>Fraxinus</i>		
<i>ornus</i> , Linn.	1712	Bargaly
Weymouth pine	1725	Dunkeld
Larch	1727	Dunkeld
Evergreen oak	1730	Newhails
Balm of Gilead fir. <i>Pinus</i>		
<i>balsamea</i> , Linn.	1732	Arbigland
Deciduous cypress. <i>Cu-</i>		
<i>pressus disticha</i> , Linn.	1733	Loudoun
Spanish oak. <i>Quercus Ae-</i>		
<i>gilops</i> , Linn. ?	1734	Newhails
English elm	1736	Dalmahoy
Norway maple. <i>Acer pla-</i>		
<i>tanoides</i> , Linn.	1738	Mountstewart
Tinebark willow. <i>Salix phlo-</i>		
<i>ragna</i>	1739	Newhails
Cedar of Lebanon.	1740	Hoptoun.
Carolina Bird cherry	1743	Hoptoun
Hungarian nut	1744	Carmichael

	Year.	Place.
Amerina willow. <i>Salix</i> <i>amerina</i>	1746	Mellerstain.
White Newfoundland spruce <i>Pinus Canadensis</i> , Linn.	1759	New Posso
Sugar maple. <i>Acer saccha-</i> <i>rinum</i> , Linn.	1754	New Posso
White and blue American ash. Long leaved Ame- rican pine. Snake barked maple, and Black Ame- rican Larch, also the Pa- per birch	1763	
Black American birch. <i>Be-</i> <i>tula nigra</i> , Linn.	1765	Elliock
Lombardy poplar	1766	New Posso
Balsam poplar	1770	Leith

Though some of the above trees were raised in Scotland in the seventeenth century, it was only in gardens and pleasure grounds. The formation of a wood, or of any considerable body of planted trees, and especially those of our own climate, did not take place till after the beginning of the last century. This task was first planned and executed by Thomas earl of Haddington, who may be considered as the father of plantation in Scotland. He began his plantations at Tynningham, in the year 1705. Binning wood, which is of great extent, and at present so beautiful and so valuable, was only begun to be

inclosed in the year 1707. The earl's Treatise on Forest Trees, was first printed but a little before his death, in the year 1733.

The next considerable planter in Scotland, was Archibald duke of Argyll, who, among his other great qualifications, was remarkable for his skill and zeal in the raising and management of trees. His taste for plantation was adopted by a number of his intimate friends:—Among these were the duke of Athol, the earls of Bute, Loudoun, Hyndford, and Panmure, Sir James Nasmyth, Mr Fletcher of Salton, Sir Archibald Grant, and others; by whose exertions and example, plantation became very general in Scotland, between the years 1730 and 1760.

Public nurseries came to be established in several places, without which, plantation never can proceed to any great extent. The most considerable of these was that of old Mr Dickson, at Hassendean Burn, in Teviotdale. For many years, he not only sold great quantities of nursery, but was himself an undertaker in forming plantations. These he executed to a great extent, over all the South of Scotland, in a very sufficient manner, and at a very moderate price. Some years before his death, being asked whether he could make any near computation, of the number of trees he had raised;—he was at the pains to go over his books from the commencement of his business, and found that he had sold, from

his nurseries, forest trees sufficient to plant thirty-eight thousand Scots acres. Many of these trees were, indeed, disposed of to England, but by far the greater part was planted in Scotland, and chiefly under his own direction.

The establishment of such public nurseries, is indispensibly requisite for the progress of plantation. The raising of the trees from seeds, can seldom be done by any proprietor to a great extent.—Many gentlemen have not the opportunity for it; and even though they have, they cannot raise the forest trees to a proper age for planting, so cheap as they can purchase them from a public nursery. One such nursery at least, ought to be formed at every county town in Scotland, and at the most convenient place in every extensive district of the Highlands. If this cannot otherwise be obtained, qualified persons should be induced to undertake it by public encouragement. The county expence necessary for the purpose, would be but a trifle, compared to the extensive benefit resulting from it. Many proprietors, and even farmers, would plant trees, if they had easy access to nursery, who otherwise would never think of it.

Wherever a nursery is established, it is of great moment that the nurseryman should be qualified and disposed to be an undertaker for the planting of grounds; to plant them at a certain rate by the

acre, though this indeed must vary according to the distance of the place, and the nature and number of the trees to be planted, and to be bound to uphold them till after the second or third year. This would render the most extensive plantation a very easy business, which, in any other way, must be a very troublesome task to a proprietor; he would then have nothing to care for but the inclosing of the ground, and might depend on its being planted to his mind, in the most proper manner, and at a much cheaper rate than could otherwise be done.

FENCES.

In forming plantations, the chief expence everywhere consists in fencing the ground. If they are not sufficiently fenced, they had better never be attempted. Whatever the fence is, it must not only be sufficient at first, but must be upheld an effectual protection for a considerable number of years. A single gap in the fence may, in the course of a few months or weeks, become the ruin of an extensive plantation; in short, neither profit nor pleasure are to be expected from any plantation that is not effectually secured against the inroads of cattle.

In England, and in the South of Scotland, many considerable plantations are reared, merely by the assistance of hedge and ditch; but there are few

parts of the Highlands where this would be advisable or even practicable. The hedge and ditch would themselves require a fence sufficient for a plantation, to defend them against Highland cattle. In some places in the South, small plantations are also secured by a pale of wood, constructed in different ways; but this, for the same reason, would be very ineffectual. From the rocky nature of the country, and the nature of the cattle, the planter must have recourse to other methods of inclosure.

The most sufficient and eligible, is the dry stone dyke, six quarters high, with a snap of eighteen inches. This is an effectual bar, both against cattle and sheep, but is, indeed, expensive for the purpose of plantation; especially where the stones must be quarried, or led from a distance. This is seldom the case, however, in the Highlands; in most places, fittest for plantation, a dyke may be built without quarrying; it may be formed from stones and loose blocks of rock on the surface of the earth, and within a few yards of the line of the dyke. In such a situation, both quarrying and carriage are saved, and with tolerable skill and proper instruments, a strong fence may be formed at a very moderate expence. Neither should much labour be bestowed in lessening the size of the stones, or in reducing them to a nice building shape. If the dyke is sufficiently high and firm, there is no call for its being accurately pinned, or of a polished form. The larger the

stones are, the better, each being from twenty to above a hundred pounds weight; only, it must be a double dyke, with sufficient band.

The next method of inclosure is by means of a single or faced dyke; this is much less expensive than the former, but it can only be executed in a particular situation. It consists of a single pile of stones, built up along a face of earth, four, five, or six feet high; it answers well wherever there is a proper declivity; and few plantations will be formed in the Highlands, where this sort of fence may not be used in some places, being a wall but of single stones it should not be kept perpendicular. It must have a considerable degree of what the workmen call batter; that is, it must be inclined at an angle towards the hill; it should also be constructed with as large stones as possible, and with a projecting cope-stone. This sort of fence is known in several parts of the Highlands, but seldom executed with proper workmanship, or in a sufficient manner. Some of the oak woods in upper Lorn, which have been recently cut, are well protected, however, with a dyke of this kind.

Another fence for plantations, is the earthen dyke, which has been used successfully in many parts of the south; in some places in the Highlands and Islands, earthen dykes of a considerable height are formed, to protect the crops of corn. Such as are

sufficient for this purpose, would also be sufficient to defend plantations ; but though they may serve as a fence for a little time, they are very perishable, and require to be repaired from year to year. The dykes of this kind, used for defending the arable fields, are, in a manner, rebuilt every season, after the crops are sown ; but an earthen dyke, fit for inclosing a plantation, would require to be more substantial and durable ; and where the want of stone, or other circumstances render it necessary, there is no doubt such a dyke may be formed as will answer the purpose. In building a dyke of this kind, the toughest and most tenacious turf should be chosen and used when it is in the wettest state ; the dyke should be at least three feet broad at the base, four and an half feet high, and fifteen inches broad at the top. If these dimensions can be increased, so much the better, and especially the height, as the earth is so apt to subside ; but a dyke of these dimensions will form a pretty good fence, especially wherever there is a fall or declivity on the outside, which is the most advantageous situation for an earthen dyke ; where this is wanting, it may be strengthened by a ditch on the outside ; where more height is requisite, it may be supplied by a cock fence of wood, fifteen or twenty inches high, fixed on the top of the dyke, and inclining outwards ; this, for the time, would be a sufficient fence, both against cattle and sheep, but it is a fence that requires constant attention and frequent repair.

These three methods of inclosure now described, may be used to advantage, according to the situation of the place, and the judgement of the planter ; but in any extensive plantation formed in the Highlands, it will be generally found proper and economical to make use of all the three. In some parts to form the double, in some the single, and in others, the earthen dyke, according to the disposition of the ground, and the conveniency of the materials for inclosure.

There is another way of defending plantations, without any inclosure at all, which has been successfully practised in some fir plantations in the north. This is done by erecting cottages, at proper distances, upon the skirts of the plantation. The inhabitants of these houses have the plantation in charge, and act as so many herdsmen. By overlooking its boundaries, they have been found sufficient to defend it against the encroachments of the neighbouring cattle. This employment does not prevent their following the usual occupations of cottagers ; and where this is the case, a number of such persons, may, no doubt, be retained in the Highlands, at a very small expence. The practice is chiefly applicable to a plantation of great extent, where inclosure would be either impracticable or highly expensive. Its expediency must also depend on a variety of other circumstances ; such as the conveniency of labour, for the persons who inhabit the cottages, and the dispo-

sitions of the neighbouring tenants and conterminous heritors.

In the two following situations, which are very frequent in the Highlands and Islands, plantations may be formed at a very small expence for inclosure.

The first is where rivers or rivulets run between steep and precipitous banks. Such banks are incapable of culture, they are useless for pasture, being too steep and abrupt to be accessible to cattle, and are therefore at present, of no value whatever. Deep glens and gullies of this kind, naturally fenced on one, or both sides, by precipices, are most eligible places for raising trees; both on account of the shelter they afford, and as they can be planted at little or no expence for inclosing. In many cases nothing more is wanting than to secure the two narrow passages at the entrance and exit of the rivulet.

The other situation is in the case of peninsulas and promontories, which are for more than two, or even three of their sides, surrounded by the sea. The shores are so broken and indented by arms of the sea, and by creeks and inlets, that such a situation very frequently occurs. All that is necessary in this case, is a fence drawn across the isthmus, or neck of the promontory. In many instances, this

fence would be of no great extent, yet would inclose a considerable space, neither cultivated nor capable of culture, but which might be planted to great advantage.

Wherever plantations are formed, not only the expence, but the execution of the work, must generally fall upon the proprietor. In few cases can the tenant be called upon to take any share in the cost; he may indeed execute some parts of the work at a cheaper rate, than can be done by persons at a distance; yet there is at least one case, in which it is his interest to bear a considerable part of the expence.

In the South of Scotland, a plantation formed for the protection of sheep, during the storms of winter, is called a stell. This is so necessary, and so much wanted in many places, that the farmer is willing to be at half of the expence, in establishing such a plantation. An opportunity of this sort, may now probably occur, in many parts of the Highlands which are pastured with sheep; wherever a tenant wishes to defray half the expence of such a plantation, the proposal should certainly meet with the hearty concurrence of the proprietor. It is the interest of both, that it should be as large as is necessary for the purpose, and that it should be carefully nursed and preserved. The evergreen trees are the most proper for this use, and of these, the Scots fir is to be pre-

ferred ; but amongst the firs, a proportion of grey wood may be interspersed. The best form of a stell, is a four sided plantation, and each side of the figure of a half moon. In this way, a large flock of sheep may have shelter, from whatever quarter the storm comes ; and after eight or ten years, they may not only be screened by the plantation, but admitted into it without prejudice.

Though the case cannot be expected to be general, it sometimes happens, that tenants are disposed of their good will to plant trees ; wherever this occurs, they certainly should meet with every encouragement from their landlord. The trees should be furnished gratis, from his own, or from other nurseries. Any considerable expence for inclosure should be defrayed. In this article, the tenant, with little cost, may execute what would stand the proprietor a good deal of money ; even in preserving with care any trees that are planted, the tenant, though he should do nothing more, has a great deal of merit, and deserves a suitable acknowledgment. If he is willing both to inclose and to plant, either upon his own charges, or in conjunction with his landlord, this requires particular stipulations between them, which must vary exceedingly, according to different circumstances. A proposal of this kind from a tenant, deserves well to be embraced, and to be rewarded, either by a compensation in money, or by

securing to him his just share in the conveniency and emolument of the trees, when they are grown up.

There is another opportunity for plantation, and without any expence of inclosure, which is afforded, in some degree, upon every estate in Scotland ; “ that
“ is, to plant with forest trees, all the gardens upon
“ the estate, whether possessed by farmers or cot-
“ tagers.” These gardens are always of good soil, and sufficiently inclosed ; they may be planted round with the best forest trees, without any prejudice. The oak, ash, elm, beech, and plane, are the fittest for the purpose ; stout plants of these kinds should be chosen, from two to four feet high, and placed from six to twelve feet distant. The effect of this measure, though hitherto practised only in an accidental and imperfect way, is visible in every part of the country. In the garden, at many farm houses, or what was formerly the garden, there are trees to be seen of considerable value ; with a little care, their number might be greatly increased, and their value upon an estate rendered very important ; on a well peopled estate, a great quantity of timber may thus be raised, at little or no expence. Though a matter of less consideration, the face of a bare country might thereby also be much ornamented, and rendered woody and pleasant to the eye. The opportunities of planting in this way, would be greatly enlarged, were the gardens more numerous, and of a larger size than at present, which they certainly ought to

be. The farmer's garden should be from a rood to an acre; and that of the cottager, from the eighth of an acre to a rood; beside other and more considerable advantages, these gardens might be rendered so many valuable plantations; though they are not large, they might be numerous; and the trees planted in them, having a good soil, and abundance of room, would produce larger and better timber than can be expected on uncultivated land. Every garden at a farm house, or a cottage, unoccupied in this way, may be considered as a plantation lost to the estate.

PLANTATION IN GENERAL.

NURSERY.

The directions for raising forest trees in the nursery, are well known to most gardeners, and are copiously detailed, in many common books on gardening; it would be therefore unnecessary to enlarge upon them here. One observation, however, may be made, in order to obviate an erroneous opinion that is commonly held concerning nursery ground.

It is usually presumed, that the soil of a nursery should be of a poor quality; and upon this general

principle, that trees, removed from a bad to a good soil will thrive; but when changed from a rich to a poor soil, they dwindle and decay; this reason, though very specious, is certainly not well founded; for, the prosperity of trees, and of all plants, depends on the number and vigour of their roots; in a poor soil, their roots can never be either numerous or vigorous, and of course the plants must be weak. In a fertile soil, the roots are more copious and luxuriant, and the plants are stronger; let the planter therefore determine, whether he chuses to fill his plantation with strong or with weak plants.

The success or failure of a tree depends much on its strength or weakness when it is young. The young tree that has plenty of strong roots, let it be planted where you will, always succeeds better than a tree whose roots are weak and scanty. Much depends on the original stamina, or constitution of the plant; a puny seedling will never, in any soil, make a vigorous tree. No food nor regimen can rear a dwarf into a giant. In a nursery, some plants will be strong and others weak in the same bed; and the difference always proceeds from their having sufficient or deficient roots. The plants that are well rooted will make good trees in any tolerable soil, which those that are ill furnished with roots will never do in any soil whatever. All the weak seedlings in a nursery, ought, therefore, without any hesitation, to be thrown away.

The seedling firs are to be had in great quantities in the natural woods in the north ; they can indeed be easily obtained, but they should be carefully avoided for the purpose of plantation. When they are transplanted, at one, two, or three years old, even into a garden, they never thrive, but most of them die away. This is owing to the poverty of their roots, the consequence of their being bred in a poor soil. They rise in a matted turf of grass spread over peat earth, or a lean gravel ; their roots, are, therefore, so slender, and so destitute of fibres, that the plants cannot succeed, even when transplanted into a fertile soil. In like manner, the natural seedlings of other forest trees, are sometimes brought from the woods, especially those of the ash and birch ; but they never have roots, like plants of the same age, raised in a nursery, nor do they ever produce vigorous trees ; if such seedlings are to be used at all, they should be kept at least two years in nursery ground of a good soil, before they are planted in the place where they are to remain. These instances, and the above reasons, show the fallacy of the prevailing and hurtful opinion “ that forest trees “ are the better for being raised in a nursery of a “ poor soil.”

It may also be remarked, with respect to the nursery, that the seeds of all the forest trees should be chosen from the most vigorous trees growing in the best soil and climate. An attention to this rule

is most requisite in the case of the oak and beech. The acorns from Hamilton park afford better trees than those taken from stunted oaks in a high part of the country. The difference is still more remarkable between the best Scots acorns and those brought from the South of England ; when both were sown in contiguous beds it was found that the plants raised from the English acorns, were equal in hardiness, and grew as much both in height and thickness, in two years, as those raised from the Scots acorns did in three. The use of the Scots acorns should therefore be laid aside ; and the case is still stronger with respect to the beech. Though that tree grows well in Scotland, yet being the native of a more southern climate, its seeds are never so large, nor so well ripened as in England ; the plants produced from them, are, of course, comparatively feeble, and never equal to the plants raised from English beech mast.

SITUATION OF PLANTATIONS.

In forming plantations in our climate, shelter is every where to be more regarded than soil ; the most sheltered places, indeed, generally have the best soil for trees ; but even though they have not, they are still to be preferred. Plantations are formed about the seats of noblemen and gentlemen, for convenience and ornament ; and upon their estates, as shelter to houses and inclosures. To raise trees for these

purposes, they may be planted, without respect either to soil or situation ; the best soil may be sacrificed, or the most unfavourable situation encountered ; but the case is different in a plantation that is to be formed, merely with a view to profit arising from the wood.

In this case it may almost be admitted as an axiom " that no cultivated ground should be planted, " nor any that has ever been turned by the plough " or the spade." In some parts of England, arable land may be profitably employed in plantation ; but in Scotland, the proportion of arable land being much less, it is too valuable to be applied to the purpose ; this is peculiarly the condition of the Highlands. There, the great object should be, to enlarge, not to diminish the quantity of cultivated land. No temptation should make either the proprietors or the people encroach upon it. The arable land in the Highlands is inconsiderable, and therefore valuable ; but the waste and uncultivated land is of vast extent and of little value ; and it is this only that should be appropriated for plantation.

In every plantation, regard must be had to the prevailing winds of the place. Over the greater part of Scotland, the prevailing winds blow from within two or three points of south-west. It is from that quarter, that not only our most frequent, but our most violent winds proceed. Wherever trees, therefore,

stand exposed, they lean away to the north-east; and no tree can thrive perfectly, that bends from the wind. In a stormy situation, these winds prevent even the growth of branches on the south-west side; the branches all proceed from the north-east side, and form sometimes the appearance only of half a tree. Hence, likewise, the trees in our peat mosses, anciently overthrown by the winds, are generally found with their heads lying to the north-east. For these reasons, the north and east are always to be preferred to the south and west exposures upon a hill, for the purpose of raising trees. It is also an additional inducement, that our hills, in general, are of a deeper and better soil on the north and east, than on the south and west sides.

Places fully exposed to the south-west winds, and especially if situated at a great height above the sea, are therefore very unpromising for plantation. To plant in them either single trees or a few rows, can be of no use. Large timber can never be raised upon them; but, where there is a call for it, even such places are not to be relinquished. If a great extent of this kind is filled thick with trees, they gradually create shelter, and will come, even by a slow growth, to afford wood which may be useful for many purposes. A plantation so situated, should be always begun by a broad belt, or large body of Scots firs placed to the windward. By means of such a screen,

the other forest trees will be brought to grow well, where, without it, they never would succeed.

In a very large plantation, with variety of ground, the trees must be planted in every exposure. A great body of wood comes soon to protect itself; but in lesser and thin plantations, the trees ought to be carefully placed, with a view to shelter. This is highly requisite in small groups, in all stripes or belts, in avenues, or wherever there is a single, or but a few rows of trees, by the sides of high roads, lanes, or inclosures.

If a belt of wood extends from the south-west to the north-east, its narrow front is then exposed to the prevailing winds. Though it may be only twenty or thirty feet wide, the trees successively shelter one another, from the front to the rear of the line. By means of this shelter, they will get up and thrive; but, if the flank or long side of the belt is exposed to the south-west, the trees are left shelterless, and never will make such progress.

In small plantations, the trees of the quickest growth, those that are most hardy, most bushy, and of the least value, should always be placed on the windward side; such are the Scots, pitch, and silver firs; the plane, larch, and horse chesnut; the birch, rowan, alder, and some sorts of willows: the more valuable, durable, or less hardy trees, should be

planted to the leeward; as the oak, Scots and English elm, ash, beech, chesnut, and walnut. In like manner, where there is to be a single, or a few rows of trees, on each side of an avenue, high road, or lane, it will be always found advantageous, to plant the first class of trees on the windward, and the latter on the lee side.

In an extensive plantation, where there is variety of soil and exposure, the trees should by no means be planted indiscriminately, but each sort in the situation that is most proper for it. On this subject, few general rules can be given, but what are liable to exceptions; yet the following hints may be useful to the planter.

Oak—Deserves the preference to every other tree, in a clay soil; should be planted wherever the soil is deepest, as in vallies, and at the bottom of hills; by the side of slow running brooks, or of ditches where water stagnates; ought to be the prevailing tree in all the carse countries; also wherever brakens grow.

Ash—To be planted on dry banks, in glens and gullies, in places encumbered with large loose stones, and in all rocky places, wherever there is shelter; but the largest trees will always be, where they have running water within reach of their roots. There is no situation too high or cold for it, if it has shelter;

but, without shelter, it never makes a considerable tree at a great height, even though standing in a good soil.

Scots and English Elm—To be placed in deep and moist soil; in the coarsest loam, provided it is deep; in spots overgrown with rushes, sprets, and gale. The Scots may be planted at a much greater height than the English elm; but, at a low station, and in a good soil, the English greatly outstrips the Scots elm in growth, and should always be preferred.

Beech.—The chalky soil, of which there is none in Scotland, is the most natural and proper for this tree. On that account, it is most luxuriant with us, wherever it grows upon limestone; but it is capable to form timber of a great size, even upon a thin dry soil, bearing short heather; also in stony soils on the sides of hills; but not more than eight hundred feet above the sea.

Plane—In the most exposed situations, where there is tolerable soil. It braves the blast better than any other tree; does not bend from the wind; to be preferred in unsheltered places on the sea-shore.

Chesnut—In soft moist soils, intermixed with stones, on the sides of hills; over deep banks of

gravel, by the sides of rivers : though among the largest of all our trees, in a swampy soil it becomes a dwarf.

Walnut—On deep dry loam ; as near the level of the sea as possible ; on dry hanging banks, where there is depth of soil.

Horse Chesnut—Though an Asiatic tree, it is hardy, and can withstand a great deal of wind without being waved ; succeeds in dry, sandy and gravelly soils.

Lime—Affects soft sludgy soil, sleetly shores, and banks by the side of tide rivers. In such places it forms a great tree ; but, in thin dry soils, its growth is much interrupted by suckers.

Maple—Dry water-born soil by the sides of brooks, or wherever the soil is bottomed with a dry gravel ; also, in rocky places, on declivities.

Scots Fir—On the thinnest and driest soils ; on the poorest exposed moorish ground, overgrown with rein-deer moss ; wherever there is short heather, growing above gravel or sand ; sandy links on the sea-shore ; likewise in mossy soil, less than two feet in depth, but bottomed rather with gravel than

clay ; may be planted to the height of one thousand four hundred feet above the sea.

Larch.—Few trees grow in a greater variety of soils ; but, being an alpine tree, it delights in a hilly station, in moisture, and in the shoad, rubbish, or ruin of a mountain—that is, in a moist soil of coarse loam, filled with stones and gravel ; at a sufficient height above the sea, it thrives even in the poorest sand and leanest gravel ; it makes not equal progress, near the level of the sea, even in the richest soils. From the quickness of its growth, it will not continue streight, nor make a fine tree in our climate, without a degree of shelter ; but, even when wind-waved and bent, it will grow, and afford a good trunk of timber ; grows better in deep moss, than even the Scots fir, spruce fir, or birch ; may be planted wherever there is shelter, to the height of one thousand eight hundred feet above the level of the sea.

Spruce Fir—In shallow, wet, and weeping soils ; at wallees, or well-eyes, and places abounding in springs ; swampy grounds covered with sprets and gale ; in deep moist sand ; by the side of lochs, pools, and standing waters ; but never to be planted in a dry soil.

Silver Fir—Where there is rank heather on a dry soil ; or where there is a thick turf of deers

hair, ling, or of wire bent. This tree and the spruce should never be planted on a declivity, but where the surface is level or nearly so.

Balsam Fir—Coarse wet boggy grounds, where there is peat earth; does not succeed nor last in a dry soil, but becomes diseased, forming tubercles of the balsam under the outer bark.

Pinaster—Loose lean gravel; blowing sand, and sandy downs on the sea-shore. In some places it may be of use to create shelter, but its wood is the worst of all the pine kind.

Birch—Being an alpine tree, it should be planted only at a great height, where better trees would fail; wet mossy soil. It grows higher on our exposed mountains, than any other tree except the rowan; and will thrive, where the Scots fir would make no progress. At a great height it grows well, even on the driest declivity.

Black Poplar—In all boggy places, at a low station, especially if bottomed with clay; by the side of deep stagnant ditches, in sea inks, sea sleet, and deep moist sand; but not in deep moss. It is not known to thrive at any great height above the sea.

Abele—In bogs where more valuable trees cannot be raised ; at a great height, thrives well though in a dry soil ; in all deep sand, even though it blows at the surface.

Aspen—In coarse bogs ; in the immediate neighbourhood either of running or standing water. Like other mountain and alpine trees, it does not require such a wet soil, at a high station, as it does near the level of the sea.

Alder—In the wettest places, and even at a great height ; in deep moss, at a low station, if bottomed with clay ; in sea inks and sleechy places near flood-mark ; also in bogs covered with the *Sphagnum palustre*.

Tree Willow—In the wettest meadows and bogs ; by the immediate side of rivers, burns, and standing waters ; sea inks, and maritime ditches ; also, in blowing sand, and wherever the sea bent grows.

Holly—Wet gravelly grounds ; but not more than five hundred feet above the sea.—The north side of hills is to be preferred.

Rowan—It grows vigorously at a greater height above the sea, than any other native tree of Scotland ; it should, therefore, be reserved for the most elevated and stormy situations ; grows in the driest

rocky places, but makes the largest tree when near any mountain rill.

Laburnum—Is an alpine tree, and thrives in coarse wet mountain soil; will grow well with little or no shelter, and can withstand much bad weather.

Yew—In the shade of rocks and precipices, especially near the sea-shore. No timber is planted in Scotland that gives so high a price as that of yew and laburnum.

Elder—Deep clay or loamy soil, and not far above the level of the sea. To ripen its berries, or to make a large tree, it requires our best climate.

The twenty-eight trees of the above catalogue, are the most profitable that can be chosen. It may not, perhaps, be eligible to plant them all, nor even many of them in the same plantation, especially where there is little variety of ground; but they afford a great choice. There are trees among them which are suited to every diversity of soil, climate, and exposure, to be found in Scotland. The most unfavourable situations in which certain trees will grow, are here particularly noted. In tracts which enjoy a good soil and climate, most of the above trees will come to perfection; but it is of great im-

portance to raise useful wood in the most unprofitable places.

TRANSPLANTING.

In England a plantation is often formed by sowing the seeds of the trees designed to compose it; but as this requires arable ground, the practice is inapplicable to Scotland, where there is so much wild land fit for plantation, but incapable of culture.

Some planters are at the pains and expence of eradicating the natural turf with the spade before the young trees are planted, and of keeping the ground red, with the spade and hoe for a few years. By this practice, they no doubt greatly accelerate the growth, and increase the vigour of their trees, but it is too laborious and expensive, in a plantation of great extent.

Others form pits on the ground to be planted, which may be done advantageously, and at a moderate expence. This method is necessary, wherever the trees to be planted are of a large size. The pits may be from two to four feet diameter, and eighteen inches deep; the natural sward and superficial soil being always turned to the bottom of the pit. These pits should be filled with strong plants, from two to six feet high, or upwards, and of the most valuable

forest trees. It is only upon these, that so much labour should be bestowed. But this degree of care will secure their success; few of them will fail; they may be, therefore, planted at a greater distance, and a much smaller number will serve to fill the ground.

The most common method, however, and the most expedient in an extensive plantation, is to plant the trees with the cut of a spade. The trees in this way, must not be of a large size; they may be from six to fifteen inches high. The cut is to be made as deep as the spade will go; it should be crossed by another, and the tree planted in the centre of the cross.

But, in many cases, a plantation may be successfully reared from the seeds, without the aid of a nursery. Wherever this will answer, it is not only the easiest and the cheapest mode of plantation, but produces the best trees. The trees to be chosen for this purpose, are those which have large seeds, and which form a strong plant the first year: Such are the oak, beech, ash, chesnut, walnut, plane, and horse chesnut; but the seeds of these trees require to be planted in pits. Each pit should be formed, by taking off with the flaugther spade one large oval turf, about a foot wide, and fifteen inches long. It should be so thick as to destroy the roots of the sward, and prevent the springing of the grass. If

the pit is dug and worked with a spade, it will be so much labour well bestowed. It is usual to place three seeds in each of these pits ; but if the seeds are sound, it is better to plant only one. Where three young trees rise in so small a space, they hurt one another, if suffered to remain ; and the superfluous ones, by want of attention, are seldom removed in due time. In forming the pit, the turf taken off should be placed upside down, on the south side. This prevents the grass and herbage from shading and obstructing the growth of the young tree when it rises. To form a plantation in this way, does by no means delay its progress so much as one might imagine. The transplanting of young trees, is, for two or three years, a great impediment to their growth. The plants raised from seeds on the ground where they are to remain, are freed from this interruption. In eight or ten years they will surpass in growth, the plants which have been three or four years in the nursery, and form, at the long run, more vigorous and larger trees.

The transplanting of a young tree diminishes the length, but increases the number of roots. For this reason, a tree that has been once or oftener transplanted in the nursery, will transplant again more successfully than one of the same age that never was moved ; the latter having fewer feeding roots near home. It would appear, that a disposition to transplant kindly, may even be improved in a tree

by cultivation,—such is the power of habit even in plants. The lime, which has long run wild in the woods in England, when brought from thence, is very apt to fail, either by roots or layers; whereas, the Dutch lime, which is habituated to cultivation, always succeeds. In like manner, the Strawberry, raspberry, and honeysuckle from the woods, are more difficult to propagate, and oftener fail than plants of the same species which have been immemorably perpetuated in our gardens.

In transplanting a tree of any kind, the roots should never be folded or twisted, and seldom, indeed, even cut, provided there is room to have them sufficiently spread; but if that is wanting, it is far better to cut than to fold or twist them.

All young trees should be planted as shallow as possible; no deeper than what is necessary to preserve them from immoderate drought, and from being wind-waved. The roots next the surface multiply fastest, and afford the most nourishment; and it is better they should be at liberty to descend, if they chuse it, than to be forced to ascend.

A long tap root with few fibres, as in the oak, holly, and other trees, should always be cut at first transplanting; but the leading shoot ought ever to be preserved entire. The fewer roots and the fewer

branches the tree is deprived of, it will have the better chance to succeed.

On ground bearing only short heather or poor pasture, seedling firs may be planted to most advantage; but wherever there is rank heather, or a luxuriant crop of herbage, transplanted firs, three or four years old, become necessary.

With a view to raise a plantation of grey timber, it has been a frequent practice to fill the ground, at the same time, with Scots firs. These are intended, as it is commonly expressed, to serve as nurses to the perdifol trees; but, like careless nurses, they generally overlay the child. It is hard upon a person to cut down thriving young trees of his own planting. The firs are scarcely ever removed in due time; and if they are not, they either choak, or draw up the oaks, ashes, and elms, to be slender naked poles, which can never be timber. Such trees may, no doubt, be greatly advanced in their growth by an intermixture of firs, provided the planter has attention and courage to cut down the firs before they become hurtful. This must be before they are of any greater use than to serve as a dead fence to a young hedge.

Others have formed a plantation of firs, and after three or four years, the ground being then sup-

posed to be sheltered, it has been filled up with grey timber; but this is by no means an adviseable practice; for the firs being then come to their briskest growth, must shade and overlay by their tops, and extenuate by their roots, any young weak perdidol trees that may be planted among them.

The larch is so rapid in its growth, that when planted with grey timber trees of the same size, it outstrips them so much, that it soon shades them, and hurts their progress: it comes also to be deprived of the shelter they would afford; and its tall waving tops are often bent and blasted. To prevent this, it should not be planted at the same time with these trees, but introduced into the plantation after they have got three or four years growth a-head; the whole will then come on with a more equal progress.

STOLE TIMBER.

There is a material difference between the forest trees which send forth suckers, which stole or spring again from the root after being cut, and those which do not. It is a distinction which the planter should always keep in view; and, according to this distinction, they may be classed as follows.

List of Trees which either spring not at all from the root, or but in a feeble way, after they are cut.

Beech,	Pinaster,	Walnut,
Scots fir,	Larch,	White willow,
Spruce fir,	Horse chesnut,	Laburnum,
Silver fir,	Black poplar,	Elder.
Balsam fir,		

The trees of this class, which do not stole, are confined, as it were, to one generation. They afford but a temporary wood, which must terminate with the trees that are planted. This is the case with our old fir plantations which have been cut; and it will be the case with all our larch plantations when cut, where they have not been intermixed with other trees. The ground is then left bare, as in its original state, and worse:—Encumbered with trunks, and interwoven with roots, which cannot be grubbed up, and which would take half a century to decay, it is left unfit either for culture or plantation. It must be allowed, indeed, that where fir trees have stood from forty to eighty years on the poorest soil, when they come to be removed, the soil is deepened and meliorated, and capable of yielding much better pasture than it did before.

*List of Trees which spring vigorously from the root,
after having been cut.*

Oak,	Chesnut,	Lime,	Rowan,
Ash,	Plane,	Alder,	Holly,
Scots Elm,	Maple,	Abele,	Yew.
English Elm,	Birch,	Aspen,	

The trees of this class, on the other hand, or those which spring from the root, afford a permanent wood, that will continue for centuries to produce many generations of trees. Such are the oak woods in the North of England and West of Scotland which are cut every twenty years as coppice, with so much profit. The trees of this class are, therefore, to be considered as the most valuable, and capable of affording a permanent article of rent upon an estate, which the trees of the other class cannot. The trees which spring from the roots of those that have been cut, are always numerous. If the whole are permitted to grow, they form a vast quantity of brushwood; but were they carefully thinned and managed, they would afford at a proper age, a much greater quantity of useful timber than could be obtained from single trees of the same age, on the same extent of ground. The stole from an oak root is often to be seen fit for ship timber; but the great demand for oak bark and charcoal, renders it more profit-

able to cut all such stole wood, while yet but in coppice.

It appears, however, in general, that in forming a wood, the trees which stole, and those which do not, may be properly and profitably intermixed. Oaks, whether intended for standards, or to be cut as coppice, require to be planted, and to be kept at a great distance ; they may, therefore, be safely interspersed with the trees which do not stole, such as the beech, Scots fir, black poplar, and especially the larch. A wood composed chiefly of oak, properly intermixed with ash and Scots elm, and interspersed with larch and Scots fir, is, perhaps, in a proper soil and climate, the most convenient and profitable that can as yet be devised in our country.

The trees which stole, though the most valuable, do frequently make but a shabby appearance on a poor soil ; when planted at three or four years old, they will continue indeed to live, but do not prosper. In such a soil, they will rise up to be five or six feet high, but so hide-bound, and with such a stunted appearance, that it is evident they never can make good trees. In this case recourse should be had to their property of springing from the root. After standing three, four, or more years, they should be cut over near the ground ; the shoot, proceeding from the root the ensuing year, will be strong and vigorous ; it will give rise to a healthy free growing tree, which never

could have been obtained from the old stem. So great is the difference in the effect of the sap when it flows in young and in old wood; wherever this practice is followed, the trees should be cut over immediately on the fall of the leaf; that the bud which is to form the future tree, may have time to advance before the following spring.

HEDGE ROWS.

The planting of hedge-row trees, having been the general practice in England, it took place with us, upon the introduction of hedges, soon after the middle of the seventeenth century. The first hedges in Scotland were planted in several places by Cromwell's garrison soldiers; particularly, on the high road near Tranent in East Lothian, where some of the old trunks of hedges, planted by them, still remain.

Objections having been raised of late against the planting of trees along with a hedge, the practice, in many places, has been discontinued. It is urged, that such trees destroy the hedge; that they hurt the adjacent ground by their shade and roots; that they prevent the drying of corn in harvest; and that they are injurious to the high roads by keeping them wet.

But in opposition to these objections the following remarks may be made :—

It never happens that a hedge is either destroyed,^a or rendered unserviceable, by a hedge-row of trees, provided the hedge and the trees are properly managed; in every part of England, we see trees of great bulk and age, growing in the very line of the hedge, which still continues a sufficient fence. At Tynningham, in East Lothian, oaks may be seen fit for ship timber, growing in hedges still firm and fenceable, though planted about the beginning of the last century. In many other places, we have hedges of a later date, which still continue to be good fences, though filled with hedge-rows of valuable trees. The hawthorn, that hardy and most useful shrub, can bear a great deal of shade, and thrive, though immediately contiguous to a large tree.

The trees to be chosen for a hedge-row, are those which are not remarkable, either for spreading heads or spreading roots; if such trees are selected, neither the arable nor grass-ground, immediately adjacent, can receive any material injury, either from their shade or their roots.

It is true, that in a small inclosure of flat ground, surrounded by tall trees, the corn will be thereby rendered later, and will not be so quickly dried in harvest. This is the case in the low grounds of

Yorkshire, and other parts of England; yet these bad effects are only felt, where the inclosures are very small, from one to not above four acres in extent, and situated in a dead flat; but the case is very different in Scotland, where the inclosures are from four to forty acres, consisting of very unequal and hilly ground. In this situation, even the tallest hedge-row, can have no such bad effects upon the corn crop.

Hedge-rows may be detrimental to high roads, in a level country, where there is little wind, and a soft deep soil; but there are few tracts in Scotland of this description; our made roads are apt to suffer more from winds than from wetness, and are most durable, where they are in some degree sheltered; wherever they are exposed, every gale of wind, as soon as they are dry, strips them to the bone, and soon renders a new cover of materials necessary. The protection afforded by hedge-rows to all travellers, in a hilly and stormy country, is likewise no small consideration.

It does not appear, therefore, that the above objections against hedge-rows, can, with reason, be admitted; especially, as on the other hand, their advantages are obvious and important.

They not only ornament the country, but they improve the climate. The shelter they afford, pro-

notes an early spring, both of grass and corn, they are a safeguard against shaking winds, and a great protection to cattle, both in the summer heats and in the winter storms ; their shelter is not confined to the field in which they grow, but extends to the neighbouring country. They yield a great quantity of wood, without the expence of inclosure for the purpose, and without occupying cultivated soil ; though the hedge-rows in Scotland, are neither of old standing nor very general ; yet, in many places, they now afford a most seasonable supply of timber for country uses. As the scarcity and the price of wood advance, their utility must continue greatly to increase.

But to prevent the inconveniencies which may arise from hedge-rows, and to secure the advantages they are capable to yield, the following observations may deserve the notice of the planter :

It is requisite, first of all, to determine what trees are to be chosen for the purpose, and what are to be rejected.

All the evergreen trees, especially the firs and pines, are to be avoided, on account of their extensive branches, and perpetual shade, so unfriendly to the growth of a hedge. The yew is, perhaps, the only exception ; as it is a tree of a very slow and

moderate growth, bears pruning without prejudice, and affords the most valuable timber.

The trees, which throw out a profusion of suckers, or a luxuriant growth of stems, when cut, are also improper; such as the lime, alder, abele, and aspen. A hedge will thrive, though immediately contiguous to a large tree, but must be destroyed by a growth of suckers from its root.

The ash, though valuable, is not to be chosen for a hedge-row; its roots, which are remarkably copious, keep near the surface, spread far and wide, and demolish both the hedge and the adjacent soil; neither is the beech or Scots elm eligible, as they spread too much, both with their roots and branches. If they are to be used at all, they require to be attentively pruned.

The most proper trees for a hedge-row, are the following: oak, English elm, larch, chesnut, horse-chesnut, plane, birch, walnut, yew, laburnum, rowan, and elder; and in wet soils, the black poplar, with the white and grey willow.

Some of these trees are of a much smaller size than others, of a slower growth, and afford the most solid and valuable timber; such are the walnut, yew, laburnum, rowan, and elder; these should, therefore, be placed, alternately, in a hedge-row, with the trees

of a larger growth. This will prove beneficial, both to the growth of the trees, and the growth of the hedge.

The trees may be planted about fifteen feet from each other. It is not necessary to have them more distant, and to plant them closer may be hurtful; they should by no means be placed in the line of the hedge, but about three feet distant from it. The interval is not lost, as the hedge, when it comes to be a sufficient fence, must occupy that space. The trees also should be of the largest size, fit for planting; from two to six feet high, and upwards, and carefully pitted. As they advance in growth, it is necessary to form them with a good trunk, and gradually to deprive them of all their lower branches that may interfere with the hedge.

A lazy bed of potatoes, is the best preparation, both for planting a hedge, and a hedge-row of trees.

WILLOWS.

The cultivation of willows is every where useful and advantageous, but especially in such a country as the Highlands; they are of a quicker growth than any other trees; they can be raised in the wettest and worst soils; they answer so many useful purposes

in agrestic and domestic economy, that they justly claim the attention of every planter.

Their Utility.

The willows, from their great utility, are more cultivated in every European country than they are with us; yet they are nowhere more requisite, being most beneficial, wherever there is a deficiency of timber, which is certainly the case with the most of Scotland. The uses to which their wood and their shoots and branches are applied are very numerous.

Their wood is light, soft, tough, of a smooth polish, and easily wrought. It is very durable, wherever it is kept perfectly dry or constantly wet. It is fit for much of the finishing and furniture of a farm house; and is capable also of the finest workmanship in the hands of artists. It is preferred by the turner for various purposes, for platters, dishes, bowls, shoe-makers lasts, and heels of shoes. It is also the best wood for the cordiners cutting board, and for clogs; being light and tough, it is excellently adapted for ladders and hay rakes; and by its softness and smoothness of surface, it is the best wood for whetting the steel instruments of some mechanics.

As it is the wood of an aquatic tree, it has lately been found to be of more value than any other in the water wheels of mills. A gentleman, some time ago, finding his meadow grounds encumbered with a great quantity of old willow trees, gave them up to the neighbourhood for fire wood ; but he soon afterwards came to know, that he might have had two shillings a foot for all these trees, by being employed in mill machinery.

To have a command of willows upon a farm is very convenient for stake and reiss, bar folds, and other temporary fences ; also for the construction of cruives and fish yards. The shoots of two or three years growth are raised very profitably for hoops. The annual shoots of some willows, serve for all the coarser sorts of wicker work, as hurdles, creels, hampers, and for the sewing of thatch, likewise for covers to the great glass bottles which contain mineral acids, which now occasion a considerable demand. The annual shoots of others, are equally useful for the different sorts of white work, as cradles, chairs, baskets, and cages. The manufacture of these articles, has of late become so enlarged, that there are not willows raised in Scotland sufficient to support it. Considerable quantities are, therefore, imported from England.

The willows in the Hebrides even supply the use of ropes. A traveller, there, has rode during

the day with a bridle made of them, and been at anchor in a vessel at night, whose tackle and cable were made of twisted willows, and these, indeed, not of the best kind for the purpose; yet, in both cases, they were formed with a great deal of art and industry, considering the materials.

In the islands of Colonsay, Coll, and Tirey, the people tan the hides of their black cattle, with the bark of the grey willow. When a wood is cut in Dumfries-shire, the bark of the apple-leaved willow is sold to the tanners, along with the oak bark, though at an inferior price. The barks of all the willows are of a very styptic nature: they are all capable of dying black, and therefore capable of being a tan; they should certainly then be all used in tannery. Though they are not of such strength, or so valuable as oak bark; yet, in some degree, they can answer the same purpose in many cases, and deserve to be brought into use, especially as the bark of the oak is becoming every year more scarce and high priced.

There are several willows, that are better adapted than any other plants, for strengthening the banks of rivers, and for restraining their hurtful encroachments. The foliage of the willows is a more acceptable food to cattle, than that of any other trees. They are accordingly browsed on with avidity, both by black cattle and horses, especially in autumn. In some northern countries, their leaves are collect-

ed and preserved for dry forage in winter. Most of the willows yield a profusion of the earliest, and consequently the most seasonable and valuable pasture for bees. All the willows afford the sweetest fuel of any kind of wood. They give the clearest fire, and emit the least smoke. This is well known in many parts of England, where the annual lop of willows from pollards, forms a principal part of their fire-wood. The same practice should certainly obtain in several parts of Scotland, which are situated at a very expensive distance both from coal and peat.

The species of willows native in the Highlands, are very numerous, but few of them are valuable; and yet even these meaner sorts are of considerable utility. In the Hebrides, where there is so great a scarcity of every thing of tree kind, there is not a twig even of the meanest willow, but what is turned by the inhabitants to some useful purpose; but the willows that deserve most to be cultivated, are not indigenous in the Highlands, nor indeed in Britain. These require to be introduced into the country: their introduction also is an easy operation, as they are so readily propagated by cuttings; and, were they raised to a sufficient extent, they would be a matter of great convenience and emolument to the inhabitants.

The willow tribe is of two different sorts: the one contains those of a large growth, which are capable to afford a timber tree; the other consists of those which are of a much inferior size, and are, in general, fit only for the various kinds of wicker work. It may be of use here, to give a short account of the nature and properties of the willows of each sort, which deserve most to be cultivated, not only in the Highlands, but in the other parts of Scotland.

The willows that grow up to be timber trees, may first be noticed. It is not fine old red oak, ash, and elm, that can immediately supply the want of timber in the Highlands—but a quick growth of plain coarse wood, sufficient for country uses. This can best be supplied, by the Scots fir, larch, birch, alder, the poplars, and especially by the willows.

Salix alba, Linn. White willow, Tree willow,
Mast willow, Huntington willow.

This species forms the largest tree of all the willow kind. In twenty-eight years, it has been known to rise fifty-eight feet in height, with a large trunk; but, though a quick grower, it is short-lived; it does not remain in vigour much above forty years. A tree of this sort, and about that age, at Prestonfield near Edinburgh, was seventy feet

high, and thirteen feet in circumference, four feet above ground. We have no tree that affords so much wood in so short a space of time; it is therefore said, "that it will buy the horse, before the oak buys the saddle." The wood is white, soft, and takes a very smooth polish; beside other uses, it is, by these qualities, very proper for the turner. When kept as a pollard, it yields, annually, a luxuriant growth fit for firewood, each tree affording several faggots. To this purpose it is applied at Huntington, and other parts of England where fewel is scarce. It may be also profitably cultivated as a basket willow. The vitriol work at Burntisland, requires willows to the amount of about seventy pounds a year for baskets, which are made of what is called green work, or of strong thick shoots with the bark. Such willows are taken for this use as can be procured; but the white willow is preferred, wherever it springs annually from the root, after being cut.

Salix rubra. The red saugh.

This tree is very little known, scarcely, indeed, even to botanists, and has never been cultivated, though it well deserves cultivation. It is probably native in some parts of the Highlands, though it has not yet been observed; but it is very frequent in the old natural woods of Nithsdale, Annandale, and other places in the South.

The wood of this tree is remarkably red, but so, likewise, in some degree, is the wood of the apple-leaved and goat willow, when they grow up to be aged trees. Each of these is therefore called sometimes the red saugh, by our country people, who cannot be supposed to be very expert in distinguishing the species of willows. The name of red saugh, however, is more generally and properly applied by them to this species, than to any other; not merely on account of the redness of its wood, but because its inner bark and blea are of a beautiful flesh-red colour. This peculiar colour is very striking to the eye, when the tree is cut, and is the reason why it has very properly obtained the name of the red saugh.

The wood of this tree, with respect to colour, hardness, toughness, and durability, is preferable to that of any other willow; it is, therefore, of all the willows, the most eligible to plant for timber: though of a quick growth, like the other trees of its kind, it is remarkable for abounding in red wood. A tree cut down at Elliöck in Nithsdale, under thirty feet high, measured three feet and a half in circumference, four feet above ground; but the whole of this trunk was red wood, excepting about one inch and the blea. Sir James Johnstone, of Westerhall, had a large dining table, made from a tree of this species in Eskdale, which afforded a plank of red wood sixteen inches broad; it was

finely clouded, exactly of a mahogany colour, and scarcely to be distinguished by the eye from that wood.

Salix fragilis, Linn. Crack willow.

The young shoots and branches of this tree are so brittle, as to be unfit for basket work ; on which account it is called the Crack willow : but it quickly grows up to be a large tree, the wood of which, for some purposes, is preferable to that of the white willow ; it is native in many parts of the Highlands, and may be therefore easily procured. Some full grown trees of this sort, were observed on the shores of Lochiel in Lochaber. It is often to be seen four, five, and even six feet in circumference, at the height of four feet above ground,

Salix malifolia *.

The leaf of this willow was first compared, by the old botanist Clusius, to the leaf of the apple tree, to which it bears a very near resemblance. For this reason, it is generally known, among our country people, by the name of the Apple-leaved willow. It is frequent in our natural woods, and is often introduced into plantations. In the mountain gullies

* *Salix caprea*, var. *α*. Linn.

of Annandale and Nithsdale, it is to be seen growing at a height, from one thousand two hundred to one thousand five hundred feet above the level of the sea. It is of a much larger growth, however, in the low parts of the country. There were formerly some fine trees of it at Drumlanerig. When it grows up to be of a large size, it contains a considerable proportion of red wood of an excellent quality. It was pointed out by the Earl of Traquair, growing in his wood of Plora in Tweeddale, as the timber of which the farmers in the neighbourhood made their best furniture.

It thrives better in a dry soil than almost any other willow, and will grow well from cuttings, even on the top of a dry bank. Its charcoal is remarkably smooth, and does most readily catch fire; for which property, it is preferred to that of other trees, in the manufacture of gun-powder; in the art of drawing, it is also esteemed by painters above every other sort of charcoal.

Salix caprea *. Goat willow, Grey willow.

This is common in most parts of Scotland, and passes usually by the name of the Grey willow. There are two other species, however, which go by

* *Salix caprea*, var. β . Linn.

the same name among the country people; but they are of much inferior growth, and seldom arrive at the size of a tree. This is the only one, having the name of grey willow, that deserves to be planted for timber; it grows up to be a considerable tree; its wood is preferable by far to that of the white willow; and is peculiarly valuable for every purpose, where it is requisite for wood to be kept constantly wet.

Salix polygamia.

This willow has been forty or fifty years in Scotland, but has been confined only to a few gardens, and not propagated to the extent it deserves. It forms a considerable tree, but not being of so quick a growth as the other willows, its wood is harder. When in flower, it is very ornamental, and the most beautiful plant of its kind; its foliage which is of a bright green, and its large bifid catkins of a golden colour, render it very conspicuous. It is very singular in being polygamious; having male catkins on one plant, and catkins containing both male and female flowers on another.

The Earl of Loudon formed, at Loudon Castle in Ayrshire, the most extensive collection of willows that has been made in this country, which he interspersed in his extensive plantations. Wherever he went, during his long military services, he sent home

every valuable sort of tree that occurred. All the willows he found cultivated in England, Ireland, Holland, Flanders, and Germany, as also in America and Portugal, where he commanded, were translated to Loudon : among these, was this remarkable species, but, unfortunately, he could not with certainty recollect the country from which it was brought.

Salix concolor.

This is another of the willows that was first brought into Scotland by Lord Loudon, but it is uncertain in what country it is native. It is very hardy, of a luxuriant growth, and promises to make a large tree. When cut over, its shoots are so tall and thick, as to be well adapted for hoops, after the second or third year's growth. It is to be had, as yet, only in few places, but well deserves to be propagated. In all the other willows, there is a great difference in the colour of the upper and under side of the leaf ; but, in this species, the colour on both sides is nearly the same.

Salix amerina. Poplar willow, Cane willow.

The young shoots and branches of this willow, are, in winter, white and smooth like those of the poplar, with a varnish resembling that of a cane. It is sometimes, therefore, called the poplar, and

sometimes the cane willow. It seems to be a native of the southern parts of Europe, and is probably the *Salix amerina* of Pliny. It has for many years been cultivated in this country, but chiefly as a basket willow. It has seldom, therefore, been allowed to grow up, though it is capable of arriving at a large size. There are many fine trees of this sort, though but young, in the plantations by the side of the Eden, at Mellerstane in Berwickshire. The bright green foliage, and shining bark of this tree, render it a great ornament to wet grounds.

Salix phloragna *. Tinebark willow.

This was first brought into Scotland, from abroad, by Lord Loudon, and has since been propagated in several places. It appears to be a tree of the South of Europe, and retains its leaves till the 1st of December. When cut over, it affords a great crop of luxuriant shoots, fit for green wicker work, or for white work, where the rods are required to be of a large size. At New Hailes, in Mid-Lothian, it has been observed to yield shoots ten feet long in one season; but when allowed to grow up, it forms a considerable tree, which has this remarkable proper-

* It is certainly the species mentioned by Mr Ray, *Raj. syn.* 3. p. 448. n. 10. But though a triandrious willow, it appears to be different from the *Salix triandra*, Linn.

ty; that its outward bark is annually ruptured and thrown off. It has therefore been called by our gardeners, the Tinebark willow; and, for the same reason, the name of *phloragna* is applied to it.

These nine species of willows now described, are the best that can be recommended to the planter for the sake of their timber. They well deserve his care, wherever there is a scarcity of wood for the common country uses, as they afford the most expeditious supply in the easiest manner, and on the most unprofitable soils.

But there is another important purpose to which willow timber may be applied, and for which, it certainly ought to be raised in considerable quantities in the Highlands, and that is, for the manufacture of herring barrels. It is a great drawback on the profits and prosperity of the fishery, that a herring barrel cannot be made up till the staves are brought from America, the hoops from Holland, then manufactured at some port in the South of Scotland, or in England; and after all this, carried to the seat of the fishery. But though this has always been the custom, it is by no means necessary; the countries which surround the fishing stations do either already afford, or in a few years may be made to afford, the two necessary materials for a herring barrel—staves and hoops. It is not at all requisite that a herring

barrel should be formed only of oak, or of any other hard and durable timber ; for its use is confined to within a year or eighteen months, and it is kept all the time in a state of good preservation, in a ship or in a warehouse. Any soft and inferior wood is sufficient for the purpose, provided it is water proof, takes a good joint, and communicates no bad qualities to the contents. In Norway, many of the herring barrels are formed of fir ; and in Sweden, of ash timber. Some years ago, when a wood was cut in the head of Annandale, the undertaker found great advantage in the sale of his birch and willow timber. This was by its manufacture into staves for the herring fishery in the Isle of Man. The trial was much to the profit of both parties concerned, though the staves were subjected to a carriage of above thirty miles, before they reached the sea. From these instances, it appears, that wherever there is a command in the Highlands, of ash, birch, or even of fir timber, it should be applied to the same purpose ; and that where these cannot be had, willow timber ought to be raised, expressly to answer the demand of the fishery.

As the method of propagating willows is so easy, and so generally known, it is needless, in this place, to be particular on the article of their culture ; yet, the two following directions may be noticed, as they are not so generally understood and practised.

1. In all the willows, with but a single exception *, there is a male and a female plant in each species; the one bearing male, and the other female flowers. These two plants, though extremely similar in all other things, are remarkably different with respect to their stature. The male is always of a more slender, a less vigorous growth than the female; and this points out an important rule to be observed in their cultivation.

Among the arboreous willows, the female always becomes the most considerable tree. In the same number of years, and in the same situation, it will sometimes afford one third of wood more than the male. Wherever, therefore, willows are to be planted for timber, the cuttings ought to be scrupulously taken from a female plant, and those from the male carefully avoided.

The same rule should be observed in planting willows for coarse wicker work, as the female always affords the thickest and strongest shoots.

This ought always to be particularly adverted to in the willows that are intended for hoops. The growth of the common hoop willow with us, is much

* *Salix hermaphroditica*, Linn.

inferior to what it is in Holland. This may arise from a difference in soil and climate, but perhaps also, in part, from the difference of growth in the male and female plants. The Dutch having cultivated this willow to a great extent, for centuries, as an article of commerce, it is probable that their experience would lead them to prefer the female for the raising of hoops.

2. Cuttings of willows are sometimes planted of a considerable height; from one, to five or six feet above ground: this is done in order to train them into an immediate fence. When planted of such a height, they may be made, indeed, to answer this purpose; but will never, in that way, produce a tree of considerable growth. Such a tall willow cutting, becomes only, in time, a stunted trunk, with a profusion of short branches. To raise a willow to its full size, the cuttings, when planted, should not have above one or two buds above the surface of the ground. If a number of shoots proceed from the cutting, only the strongest one should be preserved, and the rest cut off. The shoot preserved will form the trunk of the intended tree, and soon arrive at a great size, if kept free from suckers and branches near the root.

The strongest shoots are to be chosen for these cuttings, which ought to consist of wood that is two

two years old. They may be about ten inches long, but not above one inch should remain above the ground. It may also be noticed, that where willow cuttings are to be planted for raising trees, it is much easier and better to place them at first where they are to stand, than to raise them in a nursery, and afterwards to transplant them.

Having thus far described the willows that are the most proper to be planted for the sake of their timber, it may next be of use to take notice of those that are the best adapted for hoops, and the various sorts of wicker work.

Salix viminalis, Linn. The osier, The hoop willow.

This willow is not a native of Scotland, but having been brought at a remote period from Holland and cultivated, is now generally spread over the country. It never forms a considerable tree, but it is the only species used for hoops, and is the best for that purpose of any that have yet been tried. It often makes a shoot of between eight and ten feet the first year. The third year, this shoot is of sufficient thickness for the hoop of a herring barrel; but in Holland, it is often cut for that use after the second years growth.

It is a surprising instance of inattention, that the hoops of this sort, for our herring fishery, are still brought from Holland; as they might be raised in abundance, and with great profit, in our own bogs. It is a shrub that ought to be extensively cultivated in the countries in the neighbourhood of the fishery; yet, in these countries, it was nowhere observed, but in one place in the Isle of Skye. That venerable gentleman, Macdonald of Kingsborough, had endeavoured to form a hedge of it, near his house; but though very ineffectual for this purpose, it was evident, from the growth of the osier at that place, that it might be successfully cultivated for hoops, in Skye and the neighbouring countries.

Salix vitellina, Linn. Orange willow, Whip-cord willow.

It is called the orange willow, from the remarkable yellow colour of its bark; and the whip-cord willow, because its shoots are so tough and flexible, that they can be wrapt round the finger like a whip-cord. On account of this property, it is one of the best willows for fine basket work. It shoots up in a few years to the height of twenty-five feet and upwards; but though it grows tall, it does not form a thick trunk, and is therefore less proper than other sorts for timber.

Salix amnicola *. Water willow.

This shrub grows in most counties in Scotland, and over the most of northern Europe, by the side of rivulets, and is generally known among the country people, by the name of water willow. It is often cultivated in gardens and nursery grounds for fine basket work. Its shoots are, indeed, very slender and flexible, but when deprived of the bark, do soon acquire a dusky yellowish colour: for this reason, it is less eligible for white work, than several other sorts.

Salix Helix †. Rose willow.

This is so nearly allied to the former species, that, by some, it is considered only as a variety. It is not, however, a native of our northern countries, but of Greece, and the southern parts of Europe. It is a shrub of a much more vigorous growth, and far preferable to the former, for fine basket work. It is accordingly much cultivated in England, as it ought to be with us, though it is as yet to be seen only in a few gardens. The extremity of its shoots is sometimes so affected by an insect, that the leaves alter their manner of growth, and spread in the form

* *Salix Helix*, Linn.

† *Salix purpurea*, Linn. It is this species, and not the former, that is the *helix* of the Greeks.

of a rose ; from which, it has obtained the name of the Rose willow.

Salix Americana.

This willow was brought from America by Lord Loudoun, and promises, on cultivation, to excel all the others, for the finest sorts of basket work. Its shoots are of a sufficient length, extremely slender and pliant, of very equal thickness, and of a pure white colour. Though an American shrub, it stands the severity of our winters without prejudice*.

These five species of willow now enumerated, with the Tinebark and Poplar willows formerly mentioned, are the most proper for all sorts of wicker work, whether coarse or fine.

The grounds cultivated with willows in the South of England, or the Osier Holts, as they are called, where the willows are annually cut for basket work, produce a crop that is generally worth from ten to fifteen pounds the acre. This can afford a higher

* The *Salix Aegyptiaca*, Linn. which grows on the banks of the Nile, was also brought by the same nobleman from America, where he found it native. But in our climate, its young shoots, like those of other American trees, are all frosted in winter. The same was found to be the case with this tree translated from Egypt.

rent than the best land can give, in corn or grass; but it is peculiarly advantageous, that this high rent can be obtained from lands which are otherwise of small value:—From grounds liable to inundation, or from bogs and morasses by the side of lakes and rivers.

The willows raised in Scotland for wicker work, not being equal to the demand, the profit upon their cultivation may be still larger. The very coarsest willows can be sold for one shilling the bundle. This contains as many rods as can be surrounded and fastened by a belt or cord a yard long. A Scots acre might be made to produce six hundred of such bundles annually, which would be a crop of thirty pounds in value; but allowing only four hundred bundles, this would be twenty pounds, which is six or seven times more than the land necessary for willows could any otherwise yield. This valuable crop likewise, is procured at little or no expence; the buyers of willows being glad to cut them, and carry them off the ground.

COPPICE.

In many parts of the Highlands and Islands, great quantities of timber might be raised, without the

trouble and expence of plantation. There might still be plenty of natural wood, was it but permitted to grow. In many places, the vestiges of former woods yet remain; the forest trees are still to be seen vegetating from large old roots; but what they shoot forth in summer, is eaten down and destroyed by the cattle in winter.

The native trees which form this low sort of coppice are the following: Oak, ash, elm, birch, alder, holly, yew, rowan*, hazel, white beam †, goat willow, apple leaved willow, grey willow ‡, crack willow, bay leaved willow ||, hagberry §, water elder ¶, and the white and black thorn. These have evidently formed, in many places, extensive woods, though now nearly obliterated; but it may be safely presumed, that the soil and climate which formerly produced such woods, may produce them again.

The Hebrides, though now very destitute of trees, and rashly supposed even incapable to produce them, are full of these appearances of former woods. Such

* *Sorbus aucuparia*, Linn.

† *Crataegus Aria*, Linn.

‡ *Salix aurita*, Linn.

|| *Salix pentandra*, Linn.

§ *Prunus padus*, Linn.

¶ *Viburnum opulus*, Linn.

vestiges are to be observed, even in some of the smaller islands, which are no doubt less fitted than the larger ones for the production of timber.

The small Island of Sanda, on the coast of Cantire, is still covered with dispersed coppice, as also with tutsan *, and the great hairy wood rush †, which are plants whose natural situation is under the shade of trees. Colonsay, though only about eight miles long, and three broad, and without any high ground to serve for shelter, has still upon it many spots of coppice; even most of the arable land seems formerly to have been covered with wood. The harebells, or wild blue hyacinth ‡, is naturally an inhabitant of woods; but large patches of this plant, render the corn fields in Colonsay very beautiful in the month of June, though the trees that formerly shaded them are gone.

In the Island of Ila, above two hundred acres of coppice were observed in different places; most of it, indeed, consisted but of mere bushes springing from old roots. The ash seemed to thrive best, which is, indeed, the most useful wood for the country. Some trees of this sort, which had accidentally escaped the ravages of the cattle, were above thirty

* *Hypericum androsaemum*, Linn.

† *Juncus umbratilis*. *Juncus sylvaticus*, Huds.

‡ *Hyacinthus non-scriptus*, Linn.

feet high, and fresh and vigorous. The Isle of Mull has anciently been filled with woods: It abounds in excellent soil and shelter, both for the preservation of coppice, and for plantation. Beside many others, one extensive tract lies quite across the island, from Arros to Loch-na-Gaul, which, notwithstanding the the immemorial devastations of the cattle and the deer, is still covered with a luxuriant coppice. The preservation of the whole, or any considerable part of this tract, would be a matter of great emolument to the island.

In the Isle of Skye, on the north side of the bay of Oransay, there is a tract of about one hundred and fifty acres, with a great deal of coppice upon it, and the remains of some very large trees of ash, birch, alder, and rowan, but all the young growth miserably stunted by the browsing of cattle. Adjacent to Mackinnon's old castle, there are also about two hundred acres of coppice, chiefly of ash and birch; but all open, and so eaten down by the cattle, that not a plant of them has been suffered to arrive at a tree. Between Muggestote and Kingsborough, there is a tract of small hills and vallies, of above one thousand acres, where no plough or spade has ever been. This would be an excellent subject for plantation, as it inclines naturally to run to wood, which is evident from the remains of coppice upon it, consisting of birch, hazel, and other trees. The extensive moor adjacent to the church

of Portree, is bordered on one side by the remains of an old wood, which occupies above three hundred acres. It consists chiefly of birch, alder, hazel, haggberry, and water elder, but scarcely contains any thing that can be called a tree; and, in its present state, can never turn to any account. This heath, however, is of a good woodland soil, and might be successfully planted with Scots fir, larch, and oak, for which it is well adapted. Though at present quite unprofitable, it might, in twenty years, be converted into the most valuable tract in the island, considering the high price of wood, and the great scarcity of it in that country, for every domestic purpose. If the proprietor, Lord Macdonald, prosecute his design, of erecting an extensive village at Portree, the establishment of this plantation would be one of the most effectual means of advancing its prosperity.

It would be unnecessary to describe any other of the coppices that were observed in the islands; or those upon the main-land, which are still more numerous and extensive. From Cantire to Assint, there is not a parish, nor, indeed, any considerable estate, in which such coppices, the ruins of former woods, are not to be seen. To recover them from their present useless state, and to improve them, both to private and public advantage, is the design of the following observations:

FENCING.

To restore a piece of coppice, and to make it profitable, the first thing to be done, is to fence it compleatly against cattle. This is the chief expence, but, indeed, without this, every thing else would be done in vain. For this purpose, the same methods are to be observed, which have already been mentioned concerning the inclosure of young plantations. But it may be noticed, that in many parts of the West coasts, and in the Islands, there are extensive tracts of coppice, which are for one, two, or even three fourths of their whole boundary, fenced by the sea. To inclose such tracts, would be the least expensive, and they are therefore to be chosen in preference to others.

CUTTING.

As it is only stole timber that is to be expected from the growth of coppice, whenever it is sufficiently fenced, the next thing to be done, is to cut the whole close by the ground. The former young growth having been much browsed by cattle, is generally so stunted and dwarfish, that no free growing tree can be expected from it; but after inclosure, and when all this stunted growth is cut away, there will then

proceed from the old roots, healthy and robust shoots, that, in due time, will form good stole timber. If there are in the coppice any shoots that, in spite of the cattle, have got up above the height of a man, and promise to thrive, these should be preserved.

When the coppice is thus fenced and cut over, all cattle must be carefully excluded. They should not be suffered to enter it, even at any period of its growth, during twenty years or upwards. No pruning or thinning whatever should be admitted: every thing that springs from the old roots should be allowed to grow,—all the weak and deformed, as well as the more vigorous shoots. It is not their shape and size, but their mere quantity that is to be regarded. The weakest shoot of the oak, in the course of twenty years, can afford both charcoal and bark. These are the two profitable products of a coppice; and they will always be in the largest quantity, when the coppice is allowed to grow as nature dictates, and without any restraint. But though all the shoots that spring are permitted to grow, there will always be some much more vigorous than others. It will generally be expedient, in cutting the coppice for bark and charcoal, to reserve a proper number of the most luxuriant saplings. These will form valuable timber, in much less time than could be obtained by planting young trees, and without any prejudice to the coppice. The pur

chasers of coppice wood for bark and charcoal, are generally averse, indeed, to this practice; but it is certainly the interest of the proprietor, and of the country, not to indulge them in this aversion.

PLANTING THE VACUITIES.

The old roots from which the coppice springs, are always dispersed very irregularly over the ground. They sometimes stand at a less, and sometimes at a greater distance from each other; but they are never so close and compacted, as to be without considerable vacuities among them. This points out an obvious and important improvement upon such coppice grounds.

When the coppice is inclosed and cut over, all these intervals may be planted, with a certain prospect of success. They are upon land that naturally runs to wood, and which has already produced considerable trees. In these intervals, therefore, the future prosperity of trees adapted to the soil and situation, cannot be questioned. As the oak and the ash are the two most useful trees that prevail in a Highland coppice, all the vacant spaces may be safely filled up with them; but wherever these two trees naturally prevail, the Scots fir and larch will likewise prosper. They do not, indeed, spring from the root like the oak and ash, but they are of a

quicker growth, and will much sooner afford a supply of wood for the uses of the country. About twenty-five years ago, an old stunted oak coppice, in the head of Annandale, was managed in this way: It is now full of fresh vigorous oaks, which promise to be considerable trees; and the larches which were planted in the vacuities of the coppice, though it would be still a pity to cut them, are of a size sufficient for many of the purposes for which wood is required upon a farm. It was found in this instance, as it will be in others, that the young growth of the coppice, which is always luxuriant, instead of incumbering the young trees which are planted in the vacant spaces, affords them that shelter which is so necessary in every high or exposed situation.

By this treatment of coppice, the natural woods in the Highlands, might be effectually and advantageously restored. They have been suffered to run to waste and decay, when wood was not of that value which it bears at present; but the exigencies of the present times, and the future prosperity of the country, require their being fostered and renewed. The annual growth of natural wood, sufficient for the use of the country, is cut off by the cattle; by browsing on coppice, the black cattle, sheep, goats, and deer, do certainly destroy wood, to the amount of many thousand pounds sterling annually, and that without adding any thing material to their subsistence.

The chief obstacle to the above management of coppice ground, is the expence of inclosure ; but the money laid out, while beneficial to the public, can scarcely be employed with more advantage to an estate, or to a family ; besides, every piece of wood preserved by this method, would not merely be advantageous to the property on which it is placed, but to all the neighbouring proprietors and inhabitants. An honorary premium would be well bestowed “ to those proprietors who sufficiently “ inclosed the most considerable extent of coppice “ ground.”

Land is not to be planted, nor a new plantation formed, merely for the production of coppice. It is the stole wood only, which the ground naturally yields, that is to be trained for that purpose, or what springs from plantations of stoloniferous trees, after they are cut.

The young trees, or saplings, in a coppice of twenty, or twenty-four years growth, are, no doubt, applicable to many useful purposes in the country ; but the chief profit, from any extensive coppice, during that period, must arise from the charcoal and bark.

CHARCOAL.

All kinds of wood may serve for charcoal, but there are some sorts much more valuable than others.

The charcoal of the oak is of a good quality, and most generally used.

That from the sloe or black thorn, is the most durable of any, but is rarely to be had in considerable quantity.

The white thorn and hazel, being hard woods, their charcoal is not inferior to that of the oak.

The charcoal of the ash soon takes fire, but it is the soonest consumed.

Though holly makes the best fire-wood, its charcoal is of an inferior quality.

The birch charcoal is of less value than any of the former, and that of the alder inferior to it.

The charcoal of the apple-leaved willow, is preferable to any of the above, for gun-powder, because it takes fire more suddenly*.

* The charcoal best suited for gun powder, can bring a much higher price than for any other use ; that of the Cornus

The charcoal of the Scots fir is worst of all, in-
somuch, that twelve bags of fir charcoal, sell for
twenty-six shillings, when twelve of the same bags of
oak charcoal, sell for thirty-six shillings.

Oak wood, if properly burnt, charrs to about one-
sixth of its original weight.

In Sweden, the wood is not burnt till it is to a
considerable degree dried. It is cut in spring, before
the rise of the sap, and is not burnt till autumn; but
the English practice of cutting in summer, seems to
be more reasonable, which proceeds upon this
maxim, that the greener the wood is, the weightier
and more lasting is the coal that is made from it.

They have lately, however, in Sweden, made an
improvement in the manufacture of charcoal, that
deserves attention; they have found, that it is better
to place the wood of a charcoal pile, in a horizontal,
than in a vertical or oblique position, which is the
practice with us. The charr obtained in the former

sanguinea, Linn. or female dogwood, is of such acknowledged
superiority, that the shrub might, no doubt, be planted with
profit, for this purpose; but as it is probable, that the pro-
perty extends to other sorts of dogwood, another species of a
larger growth would be more eligible; such as the *Cornus alba*,
Linn. a hardy native of North America and of Siberia, which
grows up with us to be a tree, while the female dogwood re-
mains only a shrub.

way, is harder, heavier, more powerful, and in larger quantity, than in the latter. This seems to be reasonable, because it is obtained by a slower and more smothered heat*.

The value of a coppice for charcoal and bark, depends much upon its nearness to the sea. The west coast of Scotland, from Arbigland point to Cape Wrath, with its curvatures, and exclusive of the Islands, extends above twelve hundred miles. On that extensive line of coast, there are few parishes but what contain remains of coppice, which might be recovered and trained by the above methods, and rendered highly profitable by being in the neighbourhood of water carriage.

The profit is found to be considerable, even in an inland situation. Some years ago, when a coppice in the South of Scotland was cut for charcoal and bark, nine miles from the sea, the charcoal was put up in bags, two feet in diameter, and four feet six inches long. The cutting and peeling of twelve of these bags cost four shillings and sixpence; the burning, four shillings and sixpence, and the carriage for nine miles, six shillings; these twelve bags, at the place of embarkation, sold for thirty-six shillings. The proprietor, therefore, had a guinea upon

* Saederhielm. Mem. de Stockholm, p. 480.

them of neat profit; notwithstanding the great deduction for carriage, from which a coppice adjacent to the sea is exempted.

We are informed by Buffon *, that the coppice in France requires a growth of eighteen years to be fit for charcoal. In the North of England, the coppice is usually cut at the expiration of twenty years; but on the bleak coasts of the west of Scotland, it will generally require two, if not four years more, to be equally ripe.

One gentleman in Westmoreland has, upon his hills in that country, seven hundred acres of coppice, chiefly oak, but in some parts very thin. It is cut in hags, each hag, at the expiration of twenty years. The whole produces a stated annual rent of about fourteen hundred pounds, or about forty shillings the acre; but the land which would otherwise be only an indifferent sheep pasture, could not bring above a crown an acre. This certainly is a high encouragement to all the proprietors on the West coasts of Scotland, to preserve and improve the coppice upon their estates. Their coppice is usually upon hills and grounds incapable of tillage, which can never in any other way be rendered so profitable.

* Buffon. Min. 2. p. 417.

BARK.

But though it is thus usual, both in England and Scotland, to cut coppice for charcoal and bark, after a growth of about twenty years ; yet, in some situations, it would probably be found more advantageous to observe a different period.

No wood can be profitably cut for charcoal that is capable of bringing the most moderate price for any other purpose. An oak, whose trunk is about eight feet high, and twenty-four inches in circumference at the root, may contain two cubic feet of wood, which in most places will be worth three shillings ; and a stone of bark, in value above one shilling. The bark of the branches will fully defray the charge of cutting and barking the whole. In a soil and situation, where the oak grows freely, a great number of the saplings in a coppice, will be nearly of these dimensions, when thirty-six years old. Those which are of an inferior size, and not saleable as wood, are still worthy of their place for charcoal and bark ; but where the stole trees of the above dimensions are sufficiently numerous, and can bring the above price, at the age of thirty-six years ; this appears to be the most profitable period for cutting a coppice of oak. When the trees are younger, the bark being succulent, shrinks very much in drying ;

if they are older, the bark becomes dead on the outside, to a great thickness, which diminishes its value.

In the coppices which are cut in the South of Scotland; and in the Highlands, the proportion between the value of the bark and charcoal, varies considerably. This depends on the proportion of oak which the coppice contains; but in general, the bark amounts to two, and the charcoal only to one-third of the value of the whole. This shows the superior value of the oak, to that of every other tree, in the cultivation of coppice.

The bark of the oak is justly preferred in tannery; but it is certain, that the barks of some other trees approach to it in value; such as the rowan, birch, alder, apple-leaved willow, and, it is likely, all the other species of willows; some of our native shrubs also, with all their stems, branches and leaves, which are remarkably styptic, might certainly be tried, with great prospect of success; such as the gale, heather, and especially the bear-berry*. We have now experienced the great extension of the leather manufacture, and the great diminution of oak bark; every other bark, therefore, at all suited for

* *Arbutus uva ursi*. Linn. Scot. Stone Berry.

the purpose, should be brought into use. The value of coppice would be greatly advanced, if, beside the above trees, the bark of the ash, elm, hazel, and white thorn, could be rendered serviceable as a tan.

BIRCH OIL.

There is a peculiar property in the bark of the birch tree, which well deserves to be noticed in this place. In winter and spring, the buds of the birch are covered with a gum of a very agreeable smell; when the young leaves expand, they are in some degree besmeared with this clammy substance, which gives them that fragrance so generally admired. This gummy matter is highly inflammable. The bark of the tree is so replete with it, that when dried, it is capable of burning like a taper.

This glutinous, odoriferous, and inflammable substance, is extracted by the Germans and Russians, from the bark of the birch, in the form of an oil. This oil they employ in the tannery of their finest leather, to which it communicates that odour, or indeed rather perfume, which to most people is highly agreeable. From a near resemblance in the smell, this foreign leather is commonly supposed to be tanned with cedar wood.

This is not, however, a modern, but a very ancient invention. Pliny* informs us, that the Gauls extracted a bitumen from the birch tree, which was certainly nothing else but the substance here described. It is inflammable and odoriferous, and though extracted in the form of an oil, can be inspissated; it would, therefore, naturally bear the name of a bitumen, with that ancient writer.

The extraction of this oil from the bark, is performed by distillation, as it is called, *per descensum*: an unexpensive and simple process, in which some of our common people might almost be sufficiently instructed in a day. The great abundance of birch wood, in many parts of the north, where it is of little value, and the large quantities, which are annually cut, afford a favourable opportunity of making trial of the manufacture of birch oil, which well deserves to be set on foot and encouraged by a premium from the public †.

* *Bitumen ex betula Galli excoquant.* Plin. lib. 16. cap. 18.

† This oil, beside the use it is of, in the art of tannery, is well known to be a most powerful vermifuge. In Lithuania and Courland, it is an effectual remedy for destroying the itch and vermin in cattle. If it could be obtained cheap enough, it would probably be preferable, both to butter and tar, in the smearing of sheep.

MANAGEMENT OF PLANTATIONS AND COPPICE.

THINNING.

The necessary operation of thinning plantations, is generally either neglected altogether, or not executed till it is too late ; for some years young trees, by standing thick, advance each others growth ; but whenever they come to approach so near as to shade one another, their lower branches must dwindle, and they must rise up with slender naked stems that never can be timber. It is not the want of air, nor the want of nourishment from the soil, but the mere want of light that is the cause of this general calamity in our crowded plantations.

If a plantation is to be thinned, with a view to form full-dressed and ornamental trees, or even trees of the largest size, they must be kept from approaching one another, even to the most advanced period of their growth ; but this is by no means requisite to produce a profitable crop of timber ; all our forest trees are capable to afford valuable timber, even though they encroach considerably on one another. The great point is to keep them distant, while they

are yet young. After they come to have a trunk fit for use, their branches may interfere without detriment. Trees from one to two feet in diameter, are often to be seen standing very close together. Such trees are of a most useful size, and will generally answer the chief object of the planter, which is to produce, in a given time, the greatest value of timber that the land can afford.

The young trees in a plantation, though of the same age, and standing on the same soil, will often differ exceedingly in their degree of growth. When this is the case, after four or five years, the weak trees ought all to be removed. Those again, which are of a luxuriant growth, even though they are too near each other, provided they stand free on one side, should be reserved; they may indeed disfigure one another in their progress, and yet continue the luxuriance of their growth, and form valuable trunks.

In thinning a plantation, the pines, firs, larch, and other trees to be removed, which spring not from the root, may be safely cut over, as the putrefaction of their stumps and roots will even favour the progress of the remaining trees; but where trees which stole are to be removed, they should be rooted up. If they are only cut over, they will but spring more vigorously, fill the soil with their roots, and injure the growth of the trees which are intended to be fostered. It often happens, that in thinning a plan-

tation, many thriving perdidfol trees, from five to twelve feet in height, require to be dismissed, but these may be transplanted to other places, with great advantage.

To form good trees, they ought to be kept as free of underwood as possible. If a growth of underwood is at all to be permitted, the oak is to be preferred to every other tree ; for though it should not turn out to be timber, it will always be worth its place for bark and charcoal ; where there is a demand for hoops, the hazel and the osier form a profitable underwood.

Wherever a young tree that stoles, is of a stunted appearance, even though it has stood from four to ten years, or even longer, it should be without reluctance cut over near the ground. The young shoot that succeeds, will make a much better tree, and in less time, than ever could be obtained from the old stem. This operation is best performed, immediately after the fall of the leaf, that the young bud, the embryo of the future tree may have time to form during winter and spring. Such stunted trees are considered by some, as hide-bound, who therefore slit the bark, from the ground, upwards to the branches. If this is to be done at all, it should be just when the leaves begin to expand, when the callos begins to be formed ; but no great advantage has ever been observed to arise from the practice. It is

certainly much better to cut all such trees over by the ground, and trust to a new growth.

IVY.

Though ivy makes a picturesque and beautiful appearance upon a tree, especially in winter, it never fails to impair the growth, and to prove the destruction of the tree*. It may be observed to have occasioned the loss of much valuable timber in our natural woods; but it is a loss easily prevented. The fibres by which ivy adheres to a tree, are not roots, but mere clasps. It receives all its nourishment from the soil, but none from the trunk of the tree; when the stem, therefore, is cut over close by the ground, the whole ivy that covers the tree perishes; but as it springs again, the operation requires to be often repeated. In the case of any valuable tree, it is better to root up the ivy than to cut it.

HONEYSUCKLE.

Honeysuckle, likewise, though one of the greatest ornaments of our woods, obstructs the progress, and proves the death of many a fine tree. The force

* *Edera necare arbores certum est.* Plin. Hist. Nat. lib. 16. cap. 44.

with which its spiral stems compress the trunk of a tree, is truly surprising ; wherever they touch, they stop its growth, and adhere so close, as to be immersed sometimes in the trunk, and half covered by the growth of the adjacent parts. When it is not wished to preserve honeysuckle as an ornament, it should, therefore, like ivy, be cut over, or rather indeed rooted up, wherever it encounters a forest tree.

To some standard fruit trees, honeysuckle indeed may be applied, with great advantage ; these, when even of a considerable age, do sometimes continue to run so much to wood, and especially towards the heart of the tree, that it remains quite unfruitful. To plant a vigorous honeysuckle at the foot of such a tree, is an easy effectual remedy, and much better than any pruning. The honeysuckle grows up, occupies the heart of the tree, checks its luxuriance, directs its vegetation towards the extremities, and renders it fruitful. A large apple tree of the above description, above fifty years old, and which had always been barren, was rendered, by this practice, extremely fruitful. When this end is answered, which will happen in a few years, the honeysuckle should then be removed before it becomes injurious.

STANDARDS.

When a coppice is cut for charcoal and bark, it is usual to leave a number of the young trees uncut, which are called standards. These are intended to continue their growth, and to become timber. They have often, however, proved so unsuccessful, that many proprietors have given up the practice of leaving any standards on the ground.

It is urged against the practice, that when these young trees are left without the shelter which they formerly had, from the surrounding coppice, they never succeed. That they often fail is certain; but their failure is never owing to this cause.

In some cases, the choice of a certain number of standards, has been left to the undertaker, who purchases and cuts the coppice on his own account. As it is not his interest to leave the most bulky and thriving trees, a certain number of slender and feeble saplings only are allowed to remain. In other cases, where the proprietor determines what standards are to be left, the tallest are generally chosen, though mere poles, with few branches.

It is not surprising that, in these cases, the standards never come to be trees of any value; but it

would be quite otherwise if they were properly selected.

Wherever a coppice is cut, the proprietors should retain a certain number of the young trees, perhaps from twenty to forty upon an acre. These should be chosen by himself, and their value at the time, would be but a trifle compared to the whole value of the coppice. His choice should be in favour, not of the tallest, but of the young trees that are of the thickest stem, that are most vigorous, and that are branched nearest to the ground. There can be no doubt, that such trees will come to be useful timber, wherever coppice prevails. Standard trees of this sort, now of great value, are to be seen in the West of Scotland, some of which have stood after the coppice was twice, and some after it was thrice cut. In this way a coppice may be trained to be a permanent wood with valuable trees, while the underwood, especially if it is oak, may be periodically and profitably cut, between every eighteen and twenty-four years.

PRUNING.

All pruning diminishes the growth of a tree. The loss of every branch, and even of every leaf, is an obstruction to its progress; yet the utility of the practice is well known for the production of fruit,

and it is sometimes also expedient in the management of forest trees.

The mere growth of a tree, and the formation of its seeds, are two processes in vegetation, that do in some degree oppose each other. When a tree is very fruitful in seeds, its growth is abridged; if, on the other hand, it is luxuriant in its growth, its disposition to bear seeds is diminished. In order to render it fruitful, its luxuriance must therefore be restrained. The necessary practice of pruning fruit trees, is all founded on this principle.

But in a forest tree, the case is quite different. It is not the formation of fruit or of seeds, but the production of the greatest quantity of the most useful timber, that is the object of the planter. The luxuriance of the tree must therefore be encouraged, and never checked, but for strong and obvious reasons.

The chief and most important reason for pruning a forest tree, is to form a clean trunk of sufficient height. Was it not for this, the pruning knife should scarcely ever approach it; but, for this purpose, some inferior branches must generally be taken off; yet, as the tree receives a check in its growth by the removal of every branch, one, or a few branches only, should be removed at a time. This pruning ought to be performed as soon as the

tree is in sufficient vigour to bear it; for, the larger the branches grow, the more the danger increases in taking them away.

When trees are left to themselves, they are often deprived of their lower branches by underwood, by being too much crowded together, or by the browsing of cattle. In these ways the branches are usually demolished when young, but in too great quantity; the tree of course, rises up indeed with a clear stem, but of too great a length, and so slender and feeble, as never to make a healthy or a considerable tree.

It is held by some, that the side boughs of a tree rob the head, and restrain its growth; and this persuasion carried into practice by planters, is the ruin of many a fine tree. The branches are inconsiderately lopped off, in order to make way for the top, whereas the very reverse is true. The leading shoot will always be most vigorous when the branches are most healthy and numerous; but when the branches are few and weak, the top shoot will always be proportionably stunted in its growth.

The height of trunk in a full grown tree needs not be great, in order to answer most of the purposes to which timber is applied.—If it is eight or ten feet high, it is sufficient for most uses; and to that height, the tree should be kept free of branches.

To check the growth of the tree as little as possible, the branches to be taken away should be removed gradually ; one, or a few at a time, and while they are yet young, not exceeding, at the utmost, the size of a man's wrist. Little profit is to be expected from training a forest tree with a much taller trunk. The May-pole never turns out timber. The annual increase of wood is much greater, where the clear trunk is of a moderate height, than where it is tall.

No tree should be suffered to get up with a forked stem. Wherever this takes place, the weaker shoot ought to be cut off, and the sooner the better. By neglecting this rule, the value of many large trees has been greatly diminished ; for the same quantity of wood in a single stem, is more than triple in value to what it would be if divided into two.

Whatever young branch is taken off a forest tree, let it be cut close to the trunk and smooth ; the sooner is the wound overgrown, and the less liable it is to throw out wild shoots. If such shoots appear, or reappear after being removed, let them be rubbed off when young ; by repeating this, the tree will soon come to have a clean stem, of the height that is desired.

It is apprehended by some, that by cutting close to the trunk, admission is given to rain between the

wood and bark, and that a cavity is thereby formed in the trunk, which holds rain and occasions putrefaction; but these are mere ideal dangers that can never take place in cutting the branches of a young tree close by the trunk, at the proper season.

The practice of converting branches into stumps by cutting them at the distance of some inches or feet from the trunk*, can never serve to form a clear stem, which is the most important end in pruning a forest tree. It is a practice that serves but to convert a young tree into a bush; and to disfigure and impede the growth of one that is advanced. It is imagined by some, that the stump dies away without being prejudicial, which is a fallacy; it may sometimes, indeed, rot, and be the cause of rottenness; but it generally buds, and produces a rank growth of wild shoots. These never can be of any use. They do more powerfully attract the sap than the bough that was cut, and diminish the progress of the stem. They are in all respects worse than the branch that was abridged; for, if the branches of a tree are left to themselves, their natural effort, when not counteracted, is to nourish and elevate the stem.

* It is an old practice recommended by Sir Hugh Platt, which has ever since been often followed.

SEASON OF PRUNING.

The most important article on the subject of pruning, is the season at which the operation should be performed; for, upon this, the good or bad effects of the practice do greatly depend. Wherever a tree is cut, it is the immediate exertion of nature to heal the wound; and this exertion is aided or obstructed, according to the season in which the wound is made.

We see the amputations in some trees, heal in a very kindly manner; while those in trees of the same kind, and of the same age, heal not at all, or very imperfectly. This difference chiefly arises from the different seasons in which the amputations have been made.

A wound in a tree is healed in a manner very similar to the fracture of a bone in an animal. In both cases, the wound or fracture is healed by a callus which nature supplies for the purpose. This callus in a tree, is produced by a sap, which, at a certain season, moves between the wood and bark. It is of this sap that the blea, or outermost ligneous circle is formed between the bark and the circle of the former year. The recent callus and the blea,

are the same substance, and produced at the same time.

It has been found by repeated experiments, which need not be related here, that the callus is formed, and only formed, while the tree is in leaf. The safest time then, for wounding a tree by pruning, is when the callus just begins to be formed, or when nature is just ready to heal the wound. This happens when the tree vernates, or when the young leaves first disclose themselves, and the callus continues to increase till near the fall of the leaf.

It must therefore appear, that the best season for pruning a forest tree is immediately before its veneration; that is, immediately before the disclosure of the leaves,*: those which are soonest in leaf, as the plane, elm, and birch, to be pruned in March; those which are later, as the lime, chesnut, horse

* The exact time of the veneration, or leafing of a tree, seems to be best determined by the following rule:—The young leaves are contained in the bud, which consists of a scaly cover called the Hybernaculum. When they shoot forth so far, as to be of an equal length with the hybernaculum, the tree may be then said to vernate. This precise period is to be chosen in preference to all others, for the pruning of a forest tree. The operation may be safely performed for some days, or even a few days sooner, but should not be postponed after this period.

chesnut, and poplars, to be pruned in April; and the latest of all, such as the oak, ash, and beech, not till the month of May is advanced.

It is commonly objected against pruning in spring or early in summer—that the sap is in motion, and the tree is apt to bleed; but it is only few of our forest trees that bleed copiously. The most remarkable are the plane and the birch; and yet it has been found, that the bleeding of these trees, upon incision or amputation in the spring, instead of retarding, has rather promoted their growth; but to obviate any fears that may arise from this objection, it must be noticed—that the season here recommended for pruning the different forest trees, between the end of March and the end of May, is the season when their sap ceases to flow. The running of the sap, in all these trees, is stopt, when the time of vernalion arrives and the leaves are disclosed; and it is then that the formation of the callus begins.

The late excellent Sir James Nasmyth, whose experience and skill in the management of forest trees are well known, pruned them long in autumn and during winter, but not to his satisfaction. He declined pruning them in spring, or early in summer, from the generally received opinion, that the trees were thereby hurt, being the bleeding season. He fixed, therefore, on the time between the sum-

mer and autumnal shoot, that is, about the 1st of August; a better season indeed than either autumn or winter; and, by this rule, trained his extensive plantations for many years. He found, however, that the callus formed after that time, was sparing and defective, and, therefore, had recourse, with much success, to the pruning of his trees when the callus is first formed, or when the leaves begin to expand.

If a tree is wounded by pruning late in autumn or early in winter, the wound receives no healing aid till the tree is in leaf. During this long interval, the wound is exposed to the vicissitudes of heat and cold, and of dryness and moisture. During these vicissitudes, the wood and bark contract and dilate unequally. In consequence of this they separate, and a fissure takes place between them which admits the rain. When the tree comes to be in leaf the callus is formed, not at the rim of the wound, but considerably below it, within this fissure; and all the bark above the callus is left to rot, but the case is quite different if the wound is made when the tree is just coming into leaf; the callus is then immediately formed between the wood and the bark; the interstice between them, which is the most dangerous part of the wound, is in a few weeks completely filled up, and all rain and moisture effectually excluded.

PRUNING OF EVERGREEN TREES.

Though the evergreen trees continue in leaf all the year round, their vernal, the formation of the callus, and their annual growth, do all commence about the same season observed by the deciduous trees, and are therefore to be pruned at the same time.

The trees of the fir and pine kind, and among these the larch, seldom need to be divested of any of their branches in order to form a proper trunk, as they naturally rise up with a straight stem; but, for another reason, they require to be attentively pruned; and that is, to free them of all the branches that do spontaneously decay, and which would go on to rot. All such branches are to be pruned close to the stem; the wound will be healed by the callus, -as in the deciduous trees, and the solidity of the wood preserved. The loose knots in pine and fir timber, are well known to render many fine planks unserviceable. These loose knots proceed from branches that have rotted away of themselves, or that have been made to rot, by being cut at some distance from the trunk. The rottenness of the branch and knot, indeed, is not always communicated to the tree: the tree often grows over the decayed knot, which is

embalmed in rosin ; but it continues loose, and greatly impairs the value of the wood.

When pines and firs lose none of their branches by rottenness, but retain them all till they become timber trees, the wood has then no knots of any kind, but beautiful concentric circles, at the juncture of each branch ; the finest timber, therefore, in these trees, will always be produced, when they never have required any pruning at all. Wherever it is necessary to prune them, one needs not be alarmed at the appearance of their resinous juice : this is but the proper or peculiar sap of the tree, and not that nutritive sap, of which the callus and the wood are formed.

QUALITIES OF TIMBER.

ANNUAL INCREASE OF WOOD.

The wood of a tree is increased by an annual circle, formed on the outside of the wood of the preceding year. This annual ligneous circle is produced by a sap, which moves between the wood and the bark, from the disclosure till the fall of the leaf. It is of a different breadth, not only in different species of trees, but also in differ-

ent individuals of the same species, according to the soil and situation in which they are placed. Its breadth varies considerably, even in the same tree, according to different seasons, and the different periods of its growth. From these causes, the ligneous circles in trees, vary from one sixteenth of an inch to half an inch in breadth; but, whether they are broad or narrow, they are generally so palpable, that the age of the tree can be pretty accurately ascertained by their number. The alburnum or the last ligneous circle formed in a tree, is termed the Blea; but this name is often extended by mechanics to the circles or wood of several preceding years.

RED AND WHITE WOOD.

When a full grown tree is cut, the wood appears to be of two different kinds: they are different in colour, and very different indeed in quality. The interior part of the trunk is of a darker colour, and generally reddish; from whence it has obtained the name of the Red wood: in the oak tree, it is well known by the name of the Heart of oak. This red wood is always the heaviest, the hardest, the most compact and durable. On the other hand, the exterior part of the trunk is always of a fainter colour, generally whitish, and hence it is termed the white wood. This is lighter, less solid, softer, more perishable, and in every respect inferior to the red

wood. The stumps of trees left in the ground after cutting, are found decayed and rotten at the sides, while the red wood, in the centre of the trunk, remains solid and sound.

The trees of the same species, and even of the same age, vary exceedingly in the proportion of red and white wood which they contain. It is evident, that the white wood is gradually converted into red, and that the conversion proceeds from the centre towards the circumference of the trunk; but this change, carried on in the body of a tree, is a very obscure process in vegetation, nor has its cause ever been ascertained. The following observations, so far as they go, may serve, however, to throw some light upon it.

Though it is asserted by Lewenhoeck* and others, that a tree of the quickest growth gives the strongest timber. The assertion may be safely questioned, and even contradicted: the reddest, hardest and strongest wood, appears to be produced in largest quantity, by a slow than by a rapid growth. To give one instance among many that might be adduced:—Laburnum trees were planted at the same time, towards the end of the seventeenth century, at Panmure in Forfar-shire, and at Woodhouselee in Mid-

* Lewenhoeck. Philos. Trans. anno 1694.

Lothian. Some of these trees were cut at both places, when seventy years old, and the wood of both was wrought by the same cabinet-maker in Edinburgh. The Panmure trees, being placed in a low country and in a rich soil, were of a large size, had broad ligneous circles, and had been of a quick growth: the Woodhouselee trees, growing at a great height above the sea, and in a poorer soil, were of a much slower growth; they were much smaller, and the ligneous circles not near so broad: accordingly, the cabinet-maker found them to consist of much harder and stronger wood than the Panmure timber, and was obliged to work them with steel tools and files of a superior temper.

The firs in the Highlands, which grow at the greatest height above the sea, do always contain the largest proportion of red wood. One fir tree, cut in Glen Etive, in Argyllshire, and which grew very high on the mountain, was examined, and found to be three feet three inches in diameter. In this large trunk there was no less than three feet of red wood, which is a much larger proportion than is to be found in any fir growing in the low parts of the country.

The trees, likewise, which grow upon hard rocky ground, do always abound in red wood. In the great amphitheatre of mountains and woods at the head of the river Leven, in Argyllshire, the trees

grow in many places upon rocks where there is scarcely the appearance of any soil. Here, one fir cut in such a situation, afforded a deal of sixteen inches; but of this breadth, there was not quite one inch of white wood; all the rest was red, and of the finest quality. In the same woods, and in the same rocky situation, a Scots elm was cut, which gave a plank of twenty-six inches. In this, there were no less than twenty-four inches of red wood, of a deeper colour, of a harder substance, and of a finer polish, than what is usual to be observed in that tree.

On the other hand, the trees which grow in a low situation, in a rich soil, or upon deep wet mossy ground, have always a less quantity of red wood. A fir, in the above woods, growing in a deep mossy soil, when cut, was found to be twenty-two inches in diameter, with only six inches of red wood, though of fifty-two years growth. Another, growing in the same situation, which gave a deal of eight inches, had scarcely any red wood in it at all.

All stunted and knotty trees have more red wood in them than those of the same age which grow freely. When a tree is cut longitudinally, the red wood appears most abundant at the juncture of considerable branches, and especially wherever the trunk happens to be forked. A large hagberry had scarcely any red wood near the root, but a great deal of

red wood appeared above the height of three feet, after it had forked into a double stem.

Wherever the oak and Scots fir spread at the top, with a flat head, they always contain more red wood than the trees which rise up with a streight and tall stem. This has been so often observed, that it may be recommended as a rule in the selection and purchase of the oak and Scots fir, and probably also of other trees. It may be thus useful, on many occasions, to have a near guess of the quantity of red wood in a tree before it is cut, as upon this its real value entirely depends.

It appears from these remarks, that slow growth, whether proceeding from a high situation, or poverty of soil, is peculiarly favourable to the formation of red wood in a tree; and that a forked stem, but especially, that a spreading head has the same effect.

CENTRE OF TREES.

The centre of a tree is that point in the heart of the trunk, around which the ligneous circles have been formed, and from which, as from a centre, the vascular rays, as they are termed, diverge to the circumference. It is that spot which was occupied by

the pith when the tree was young ; but though it is the centre of the circles, it is seldom the centre of the trunk in a large tree, and the circles themselves are generally eccentric.

The vegetation in the trunk of a tree is briskest on the south side, merely from the superior action of heat in that quarter. The circle of wood annually formed, is therefore broader on the south, than on the north side ; consequently, in a number of years, the central point in the trunk, comes to be further removed from the south, than from the north side of the tree.

The stump of an oak cut at Lochwood, in Anandale, was found to be one hundred and sixty years old, for that was the number of the ligneous circles ; it measured from south to north, three feet four inches in diameter ; but only two feet seven inches from east to west. The central point of the tree was two feet from the south, but only fourteen inches from the north side ; eighteen inches from the west, but only fourteen from the east. Hence, the mild influences of the south and west are evident, compared to those of the north and east. In consequence of these, the ligneous circles are broader, and the growth of wood larger, on the south and west, than on the north and east sides of a tree.

The central point in a tree, however, may be situated nearer to one side than another, from other causes ; as in the following case :—

The stump of an oak, at the Lochwood, nearly of the same age with the former, was found to be of the following dimensions :—It was two feet eleven inches in diameter from east to west, but only two feet one inch from south to north. The central point in the trunk, was equidistant from south and north ; but was two feet five inches distant from the east side, and only six inches from the west. The reason of this singular growth was obvious, from the situation of the tree. It was placed in a low part of the wood, sheltered both from south and north : it stood at the foot of a hill, with steep ground, of a thin hard dry soil to the west ; but on the east, it had a deep rich moist soil, the edge of a swamp. Hence, the superior growth and progress of the trunk towards the east side.

It appears, therefore, that the quality of the wood, on the opposite sides of the same tree, is, in most cases, essentially different. The best wood will always be found on that side of the tree which lies nearest to the central point. This is generally the north side, which, being of a slower growth, will always be found harder and more solid, capable of a better polish, and more durable than that on the

south ; and, therefore, preferable for many purposes, and of more value.

SEASON OF FELLING TIMBER.

It is certain that the duration and value of timber must greatly depend on the season of cutting it ; yet, in this matter, there have been different opinions, both in ancient and modern times ; and, in consequence of these, different practices have been followed.

Pliny* informs us, concerning the oak, that when cut in the spring, it is liable to be worm eaten, which is not the case when cut in winter ; and that if it is felled at any other season, it is apt, likewise, both to warp and chink.

What was written before the year 1418, by an intelligent observer of nature †, concerning the poplar, is well known to be true in Lancashire, where the wood of that tree is much used ; that though durable and valuable when cut in winter, it is perishable, and almost useless, when cut in summer.

* Hist. Nat. Lib. xvi.

† Peter of Crescentia, Hist. Edit. 1548. Lib. v.

Lewenhoeck*, on the other hand, from his microscopical observations upon timber, presumed, that it was more durable when cut in summer, than in winter;—an opinion which has had many advocates in its favour.

Many carpenters prefer the cutting of wood in winter; because, say they, it lasts longer, by having more sap in its body. The practice is good, but the reason is certainly bad. Others of them affirm, that felling in April and May is best; because the sap is then detached from the body of the tree to the branches; here, both the practice and the reason are bad.

The expediency of felling every sort of tree when in its driest state, is warranted both by reason and much experience; but it is commonly, though erroneously presumed, that this is the case during all the time that the trees are not in leaf. Trees are generally felled in their leafless state, but seldom so early in the season as is necessary.

To cut our perdifol trees to most advantage, it ought to be done as soon as possible after the fall of the leaf; for it is then that they are in their most sapless state. The vegetation of one season is no

* Philos. Trans. An. 1694.

sooner concluded, than that of the following season begins. Soon after the leaves are gone, the sap is again in motion; and during open weather, continues to move and increase during the whole of winter and early spring:—This is evident from the vegetation and increase of the buds and catkins upon our trees during that season. They do not, therefore, consult the quality of the timber, who think it soon enough if their trees are felled before they are in leaf; for all our trees are in full sap a considerable time before the leaves are disclosed.

The sap in some forest trees rises, indeed, much sooner after the fall of the leaf than in others; and, on this account, they ought to be cut more early in winter:—Such are the plane, birch, alder, horse chestnut, lime, all the poplars, and others. The sap ascends much later in the oak, ash, and beech, and these trees may therefore be felled with safety later in the season; yet, if opportunity offers, the sooner the better after they are quite defoliated.

The sap begins to appear in the plane, within a few weeks after its leaves are fallen; and against Christmas, is in such quantity as to run upon an incision.—This tree ought, therefore, to be cut immediately upon the fall of the leaf. The usual delay of cutting it till the end of winter, or till spring is advanced, when it is replete with sap, is probably

the reason why the wood is so perishable, and liable to be worm' eaten.

Though the evergreen trees remain in leaf the year round, their annual growth is concluded in autumn, about the same time with that of the peridifols. It is then that their wood is left in the driest state; and to obtain it of the best quality, it ought to be cut at the same season.

At whatever season a tree is felled, it ought to be stript of the bark as soon as possible. Though not in use, this may be safely considered as a most salutary practice for improving the quality of the timber. While the bark remains, not only the sap in the trunk is retained, but all external moisture is imbibed; for though the bark of a tree receives moisture readily, it gives it out slowly. If a large tree felled in autumn retains its bark, it buds, and pushes forth leaves and branches in the spring. The vegetation in the tree is continued, though it ought to be entirely stopped; which is effectually done by depriving it of the bark. Besides, when a tree remains long cut before it is used, the wood becomes sooner decayed and putrid with the bark, than without it.

BARKING OF TREES BEFORE FELLING.

To divest trees of their bark, a considerable time before they are felled, is the best and most expeditious way of seasoning the timber, and unquestionably renders it solid, hard, and durable. Some years ago, this was considered by Buffon, and other academicians in France, as a new discovery made in that country ; but the practice was recommended in the last century, by Dr Plot, in his Natural History of Staffordshire, and has ever since been followed in some degree, in that county, and other parts of England. It was known even to the ancients and recommended by them. The cutting off the bark round a tree, while it is yet standing, is mentioned by Pliny, as the means of rendering the wood more firm and lasting. With the same view, but by a method less effectual, Vitruvius* advises the cutting of timber trees half through to the pith, and to suffer them to stand in that situation, till they dry ; but his reasons for the practice are not satisfactory, nor can we suppose that a tree is to be dried by this operation.

On the 1st of July, 1760, an ash tree, eighteen inches in diameter, at Prestonfield, near Edinburgh,

* Vitruv, Architect. Amst. 1649. p. 33.

was stript of its bark, twelve feet high; but on the upper part of the trunk, and on all the branches, the bark was allowed to remain; the tree was cut down in January 1762, and the wood carefully examined on one of the first days of the month of July. It was then found, not only to be compleatly seasoned, but of such uncommon hardness as to ring upon a stroke, and to require tools of a better temper than what are sufficient to work the ash timber that is commonly used; but the upper part of the trunk, that had still retained the bark, was moist, soft, and unseasoned. Hence appears the influence of the bark, to retard the drying, and to prevent the seasoning of wood. It may not always be practicable for the purchasers of wood, to have the trees barked for a year or two before they are cut down; but all have the opportunity of barking them immediately after they are cut, which ought certainly to be done, if it is desired to have the timber expeditiously and thoroughly seasoned.

This practice seems to be peculiarly useful in the case of planted Scots fir, the wood of which is frequently so soft and spongy, as to be of no duration and of little value. In the month of February, two firs at Moffat, of forty years growth, and of thirty inches in girth, had their trunks compleatly stript of the bark, and were allowed to stand till April in the following year. They were

then cut down, and though they contained little red wood, their white wood was more compact and harder, than most part of the foreign fir that is commonly used.

The quality of oak timber, though more to be regarded, than that of any other wood, is greatly injured, from the season in which it is usually cut; this is in the beginning of summer, when the sap flows plentifully between wood and bark, and makes the bark separate readily from the wood; but to obtain the bark easily, the wood is essentially hurt, by being cut at that season. This, indeed, is of no importance in the wood or branches that are to be used for charcoal; but it is much to be regretted, that oak timber for ship building, or other important uses should be felled at that season. To prevent this, the above observations suggest an easy and effectual remedy. Wherever there is an oak fit for timber, let its branches be lopt off, and its trunk stript of the bark, at the usual summer season; but let the tree stand, at least till winter, or rather till the following year, before it is cut. There is reason to think, that in this way, the quality of the timber, instead of being injured, will be rather improved.

DURATION OF TIMBER.

The different sorts of wood vary much in their degrees of durability; and it would be useful if they could be arranged by a scale, according to this property; but for that purpose, there is not, as yet, sufficient information upon the subject. The hot climates, where vegetation is most rapid and luxuriant, do certainly afford a variety of woods, which are harder, heavier, and more incorruptible, than any that are produced in the temperate or colder parts of the earth. Several sorts of iron wood, which are known, and ebony and mahogany, with which we are still better acquainted, are instances of this. After much enquiry, these woods have never been seen to be either worm-eaten, or palpably decayed.

Of our European trees, some of those which are evergreen, and have not a resinous sap, afford the most durable wood*. Such are the cypress, box, yew, olive, and juniper; next to these are the oak, larch, cork tree, walnut, and chesnut. We are informed by Pliny †, that the gates of the temple of

* Plin. Hist. lib. 16. cap. 40.

+ Plin. Hist. ibid.

Diana at Ephesus, were of cypress wood *, and remained near four hundred years, without being in the least impaired. We have but few instances, in our own country, of the duration of any particular sorts of wood, for a great length of time. The most remarkable case that has occurred to the writer, is an instance of the oak. In the house of Mr Brisbane of Brisbane, in Ayrshire, there is a large oak chair, of a very singular form, and of curious workmanship. It has upon it the date of the year 1357, and the arms and initials of his ancestor who lived at that period. This piece of oak then, has lasted upwards of four hundred years, and having always been kept dry, in the best apartment of a dwelling-house, is, to this day, perfectly sound and unimpaired. But oak is by no means so durable in a wet or in a moist state; though the most durable wood for ship-building that Europe affords, the oaken timbers in a ship, though they may still have a good deal of bone, are much affected and decayed towards the surface, in the course of thirty or forty years. It is observed by Pliny, that oak rots in sea water. As the water of the ocean contains more putrescent matter, and is itself more prone to putrefaction, it is reasonable to think, that neither the oak, nor any other sort of timber, will remain in it so long in an uncorrupted state as in fresh water.

* *Cupressus sempervirens*. Linn.

All wood is most perishable when it is kept alternately dry and wet. Those parts in a ship that are between wind and water, are always the first that decay. On the other hand, wood is most durable, wherever it is kept either entirely dry or wet. The black poplar, though not accounted a durable wood, remains firm for a great length of time in a dry situation. A beam of this timber, which had remained for above one hundred years in a house in Lancashire, was found quite fresh, and with this inscription upon it :—

Lay me thus, and lay me dry,
I the heart of oak defy.

From which we are not to conclude that the poplar, in any situation, is equal in durability to the oak; but that when kept constantly dry, it is a wood that can last sound and useful for above a century.

The wood of aquatic trees seems to be the most remarkable for durability under water. The excellency of willow timber is now pretty well known in all the parts of mill machinery that are kept constantly wet. Where stakes were to be driven into marshy places, the Romans preferred the alder to every other wood*. Some years ago, the dam-head

* Plin. Hist. lib. 16. cap. 40.

upon the Tweed at Peebles, had a breach made in it, by an extraordinary flood ; an accident which had never been known to happen before. This structure was formed at a period so remote, as not to be exactly known, but, with some reason, was referred to the reign of Alexander the III, in the thirteenth century. The wooden beams, at the bottom of this dam-head, being then exposed to view, were found to be of alder, which was entire and fresh, like new cut timber. From this property, the wood of the alder was used by the Romans for water pipes. With us, it is seldom, if at all, applied to this purpose, though it may be safely presumed to be preferable to any of the other sorts of timber employed in this way.

PRESERVATION OF TIMBER.

The preservation of timber, for any great length of time, and its real utility, depend much on its being properly seasoned before it is applied to use. If it is used before it is sufficiently seasoned, it is not only more apt to decay, but to contract, with a force not to be resisted, to warp, to chink, and to become soon unserviceable*.

* The Victory man of war was built in a hurry, after the battle of Blenheim, of unseasoned timber ; she therefore passed in the Navy, by the name of the Green Bough ; and

The slower that wood is dried, it will always be of a better quality. If it is intended to last, it should be exposed to no heat, greater than that of the atmosphere. The sun heat, even in our climate, is sometimes more than enough. The shade, with a free circulation of dry air, forms the best, though not the most expeditious situation for the seasoning of timber; but the proper preparation of timber, by freeing it of all its superfluous and useless moisture, is a more tedious process than is commonly imagined. It has been found, upon trial, that an oak beam, nine inches square, placed in the shade, requires no less than seven years, to be thoroughly dried*.

Though it is necessary for the preservation of timber, that it should be fully seasoned, yet that important end will be frustrated, if the timber is over-dried. By the drying of timber, its dimensions indeed are a little altered, but its weight is greatly diminished. Oak, when completely seasoned, loses near one-third of its weight †. After being thus far dried in the shade, if it is long exposed to a hot sun, its

though a most magnificent, was never accounted a trusty ship. Her loss proved a national disaster, which was ascribed by the most skillful seamen to this original defect.

* Sauri. *Precis d'Hist. Nat.* tom. 2. p. 223.

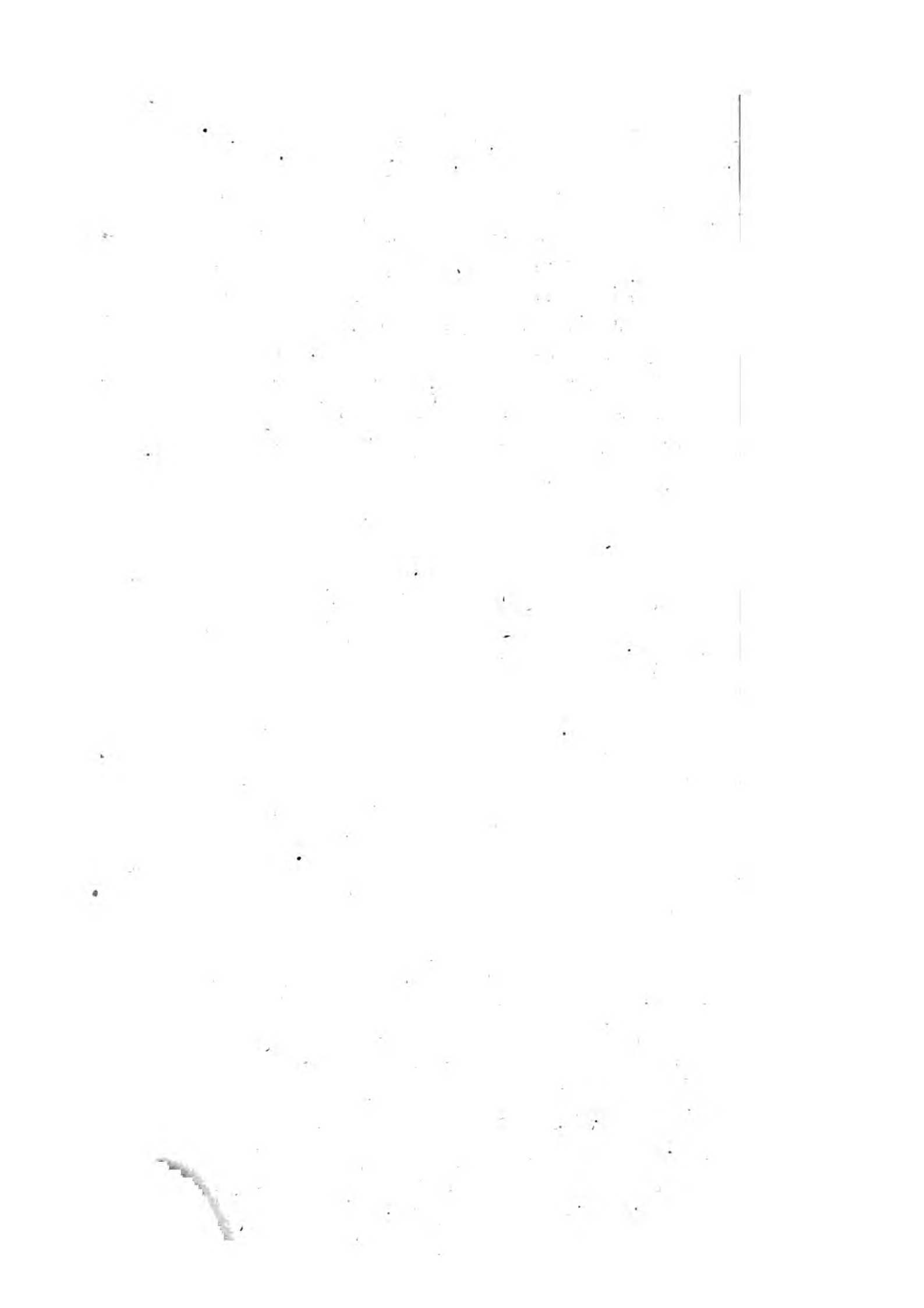
† Sauri. *ibid.*

weight is still further diminished ; but by this diminution, its quality is impaired. It is probable that the durability and other qualities of every sort of wood, are considerably hurt, by drying off above one-third of its weight. When wood is recently cut, it imbibes but little water ; when thoroughly seasoned it imbibes more ; but when over dried, it absorbs water, and even the moisture of the air like a sponge, and becomes thereby much more perishable.

The scarcity of ship timbers of a proper shape, led to the practice of giving them the requisite form, by means of artificial heat ; about the year 1722, Captain Cumberland invented the method of bending ship timber with a sand heat*. As it was a commodious practice, it prevailed for a long time ; but being attended with all the bad consequences of over dried wood, it fell gradually into disuse. For many years, the same end was obtained in ship-building, by means of boiling water. This, likewise, is an easy and expeditious method of giving to timber the shape that is required ; but at the expence of its fidelity and durability, the two great properties of timber in a ship. It is well known, that the bending of hoops, boards, or planks, with boiling water, renders them afterwards, pervious to moisture, and whenever

* *Philos. Trans.* vol. 32. p. 75.

they are dry, extremely brittle. The boiling heat must dissolve the natural gluten of the timber, and render it perishable. An experienced Admiral, who after fifty-six years service, and of these, only seven years ashore, had seen so much of the bad consequences of moulding ship timber with boiling water, as to declare, that it threatened the ruin of the British Navy. The expression might be too strong, but in a certain degree, undoubtedly warrantable.



SECTION XII.



P O L I C E.

COMMONS.

IN many places, there are considerable commons in the Highlands; but though equally hurtful in their effects, they are in their constitution different from those in the low countries. A commony in the Highlands, is allotted to the tenants and dependents of a proprietor, who can, at his pleasure, divest them of the privilege; but in the lowlands, villagers generally have a right to the common, by means of a feu charter; or it jointly belongs to a number of neighbouring heritors. The commons in the Highlands, as well as in the Lowlands, especially in the border

counties, arose from the benefit which a proprietor anciently found, in collecting as many people as possible, upon his estate. He established a village to procure hands for war, as a proprietor at present does, to procure hands for industry; for that purpose, the designation of a common, was the most easy and effectual expedient.

The division of a common, where there are many interfering rights, forms a troublesome and expensive process in law. Notwithstanding this, the interest of the individuals concerned, and the general good of the country, have produced the division of many. In the Highlands, the division of a common is a much easier task, being generally at the disposal of a single proprietor. The same good effects must occur in the Highlands, which have again and again been experienced in the Lowlands, from the division of a common. The people are rendered more careful and industrious, in being restricted to their own private concern, or their own plot of ground, than in being partially engaged in the interest of a starving community. The cultivation of the soil, is much advanced, the breed of cattle much mended, and the whole produce of the ground greatly enlarged by the division of every common.

ROADS.

Good roads are the first and introductory improvement to all other improvements in every country. Their formation and repair create an expence that is incumbent upon the public ; and, on this principle, the statute service was appointed, though in the present times, it is very inadequate for the purpose. The great roads through the Highlands, made at the expence of government, have been most beneficial to the country ; but good bye-roads are absolutely necessary for its further improvement. They are necessary, not only in every district and parish, but even upon every estate, and on every farm. An easy conveyance for the bulky articles that are necessary for life, and the agrestic economy of the country, is indispensibly requisite : such are corn, fuel, straw, hay, manure, stone, and wood. These can only be conveyed to advantage, upon roads that will admit of carriages ; a good cart road, ought, therefore, to be formed, wherever there is a call for it. This is an easier piece of work in the Highlands, than in many other places, as the surface of the country is hard and dry, and the materials for a good road, are every where at hand.

The gentlemen in every county, ought to unite their endeavours for this purpose ; to exact punc-

tually the statute service appointed by law; and also, to excite and encourage their tenants to the formation and improvement of roads, so necessary for their mutual interest. Every farm, if possible, should be rendered accessible to carts. While the above heavy articles of carriage, can only be transported from place to place on horseback or on sledges, no thorough improvement of the country can be expected. A bye-road sixteen feet wide, is all that is necessary for use. In some places, this might be too expensive; but where there are no precipices nor declivities, a private road of eight feet, is sufficient for all the purposes of one, or of a few adjacent farms.

PACKET BOATS.

The improvement of every country must depend much on its communication with others. The progress of the North of Scotland must be chiefly advanced by its intercourse with the southern and more cultivated parts of the kingdom; this intercourse should therefore be promoted by every means. The West Highlands and Islands, by their great distance, and by bad roads and ferries, are almost inaccessible from the south, for the purposes of general improvement. Their intercourse, in all bulky articles, must be by water, and chiefly with the ports in the Clyde. This purpose is imperfectly answered

by a few of their own open boats, which venture to sail round the Mull of Cantire in summer ; or by accidental conveyance, at other seasons of the year, by means of vessels passing through the islands ; but the inhabitants have never been sufficiently accommodated with opportunities of access to the south.

Regular packet boats should be employed. One small vessel has gone for some time between Clyde and the Lewes ; but several, and of some burden, are requisite, for which there might, no doubt, be found sufficient employment. If a high freight was at first necessary, the inhabitants could well afford to give it. Beside their cattle, they have many articles of export which they cannot readily get off their hands for want of proper conveyance, which discourages their industry. They are also debarred from receiving those articles of import which would be of great benefit. They can export from most places, kelp, fish, potatoes, salted beef, wool, fish oil, linen yarn and cloth, skins, feathers and other articles. The imports they stand in need of, are seed-corn, salt, and casks, fishing tackle, flax, lint-seed, wood, iron, hemp, cordage, garden and grass seeds, and farming utensils. Regular packets to serve as public carriers of these articles to and from the remote Highlands and Islands, would be of the greatest advantage ; to call at stated times at all the considerable islands and harbours, and there to

receive and deliver the goods that are necessary for the trade and accommodation of the inhabitants. A regular intercourse of this kind would quickly increase the articles of exportation, and, of course, the prosperity of the country.

POSTAGE.

Before the year 1756, there was no post-office in the Hebrides, nor in all the West Highlands, beyond the Chain. That countries of such extent, with such numbers of people, and capable of being so important, should be left without the convenience of postage, was truly deplorable; it was not only hard on the inhabitants, who had all of them relations or friends engaged in the service of the army or navy, but this disadvantage was alone sufficient to confine these countries to their original state, and to quash every intention towards their improvement in agriculture, manufacture, or fishery.

A post-office was erected at Stornoway, in the Lewes, in the year 1756, and afterwards one in the Isle of Skye. Another was established with some difficulty in the Sound of Ila, in the year 1767, which soon evinced the propriety of the proposal, by adding immediately a profitable article to that branch of the revenue. In the year 1772, a post-office was established in Appin, but not till a gentleman of pro-

perty gave security for making good any deficiency that might happen. For some years it barely supported the expence, but by the increase of correspondence, it made a clear return to the revenue, in 1790, of about seventy-four pounds sterling; others, however, are still wanting for the proper accommodation of the country. Beside the private concerns of the inhabitants, the success of the herring fishery often depends on the easy and quick communication of intelligence by post; and by want of this, it has often been materially injured. An important branch of the trade of Britain is likewise concerned:—All the ships from the West of Scotland and England, to Norway and the Baltic, pass and repass annually through the Hebrides, where they are often detained by contrary winds for a considerable time; their crews naturally and ardently wish to acquaint their owners and friends with their situation, and it is hard they should be debarred the opportunity of doing it by post. Even though the expence of a particular post, or of a runner, should not at first be compleatly defrayed by the letters, it is ultimately the interest of the public, and of the revenue, to supply the deficiency.

MARKETS AND FAIRS.

By the want of markets in the Highlands, the common articles of living cannot be obtained, or at

least with great difficulty, by any persons who do not possess land. Hence labourers, mechanics, manufacturers, fishers, and traders, find it impossible to support themselves by their occupations. They must all, therefore, in some degree be farmers, which prevents their being fully useful, either in that capacity or in their proper business. If a grant for holding a weekly market, or an annual fair, is necessary, why ought it not to be obtained? and these necessary meetings fixed in places and at seasons the most convenient for all parties concerned.

At present, the inhabitants cannot get the produce of the country sent out of it, nor obtain those articles from the south which are necessary for their accommodation, without much trouble, much loss of time, and great expence; by these means, their progress is checked, and any exertions they might be disposed to make in the way of industry discouraged. These inconveniences are great, but they might be all obviated by holding annual fairs at proper stations in the country.

Goods to be sold by the Inhabitants.

Black cattle, horses, sheep; salt beef, hides, wool, butter, cheese, sheep and goat skins, lamb and kid skins, goats hair, tallow; furs, deer skins, rabbit skins, feathers; potatoes, fern ashes, kelp,

slate, marble; herring, cod, ling, cairban oil, dog fish oil; woollen yarn, linen yarn and cloth, blanketting, sacking.

Goods to be bought by the Inhabitants.

Seed-corn, meal, lintseed, garden and grass seeds, farming utensils; salt, staves, hoops, fishing tackle, hemp, cordage; wood, iron, flax, articles of cloathing, hard ware, stone ware, dye stuffs, groceries.

These articles are numerous, and would of course be bought and sold at such fairs in a very great quantity, considering the extent of the country, and the numbers of people. By having easy access to an interchange of these commodities, which is not the case at present, the prosperity of the inhabitants, and their progress in industry and every useful art, would be greatly advanced.

There is an article which would deserve attention in the places where such fairs were to be established. By the progress of sheep farming in the Highlands, the surplus quantity of wool is now become very considerable. To have it disposed of, and sent in the easiest and most advantageous way to the distant counties where the woollen manufacture is established, is a great object with the Highland farmers:—Such fairs would be the most proper

places for its sale, but houses would be requisite to afford proper accommodation for storing it.

VILLAGES.

Two villages have been lately set on foot by the British Fishing Society, designed to become populous and considerable by the resort of fishers, manufacturers, and traders. A few establishments of this sort, near the seat of the different fisheries, and at some of the principal harbours, must turn out to be of great advantage ; but the villages meant under this article, are of a different kind.

In all the islands, and upon all the coasts of the West Highlands, north of Cantire, there is scarce any thing that can be called a village, except Oban, Fort William, and Stornoway. The inhabitants live in a very detached state, dispersed over the country upon their different possessions, large or small. This is a situation very disadvantageous to every sort of improvement. Were the lower people collected into small villages, they would become much more useful to themselves, to the proprietors, and to the public.

The property in the Highlands is at present possessed in such a way, that, at an average, ten or more cottagers might be spared to form a village,

for every hundred pounds of land-rent. Those persons, who form a great number in the community, are at present a burthen both upon the proprietors and the public, and the most they can do for themselves, is to preserve life; but were they placed in a village, as labourers, mechanics, and manufacturers, the case would be altered for the better, in all respects.

A village of the kind here meant, should contain from ten to thirty, or even forty houses. Most of the islands, every parish, and, indeed, every considerable estate, is capable of furnishing inhabitants, for one or more villages of this size. The most eligible situation is on the sea-shore, near a safe harbour, which almost everywhere occurs, and not far distant from a peat moss; that the inhabitants may have fuel at an easy rate, and ready access to fish; a matter of great advantage to poor villagers, where fish is to be had in such plenty, and in so easy a way: a common pasture for cows, and some land to be laboured with the spade, for potatoes and a little corn. Some of these villagers to have one, two, or three cows; others again, only a house and a garden for potatoes, and to be supplied with milk by their neighbours.

The first and most numerous class of persons to be established in such a village, are day labourers; to hold their house and little possession of land from

the proprietor, and to have their time and labour entirely at their own disposal. All mechanics, likewise, upon every estate, and upon every farm, ought to be settled in such a village; smiths, wrights, taylor, shoemakers, weavers, masons, and another class; dykers, or men to build dry stone dykes, an employment much wanted in the Highlands, and which ought justly to afford the highest wages of any mechanic. In every maritime village, a cooper, likewise, would be a very useful member, to supply the inhabitants readily with casks, of which they are very ill provided, and for which they frequently have a great demand.

WEIGHTS AND MEASURES.

In ancient times, every chief, every dignified clergyman, and the proprietor almost of every barony, had weights and measures of their own, by which their dealings were regulated. The stone has been a standard weight, made of metal, in England and Scotland, between two and three hundred years; but it has its name from what was used as the rule of weighing before metallic weights were in practice. This was a hard polished stone of a certain weight. A stone of this kind, which is a great curiosity, still remains in the Island of Lismore:—It was the weight by which the cheese, butter, wool, and other articles, payable to the Bishop of the Isles, were de-

terminated :—It is a round flat polished stone, of red granite, and lies to this day upon a cairn adjacent to the ruins of his old castle of Achinduin. The stone has suffered no decomposition nor diminution, and must be nearly of the same weight as when it was used : there was no opportunity, which was to be regretted, of determining its precise weight ; but it seemed to be about what we call a stone weight at present. From the use of such a stone, as a standard weight in ancient times, the present term of stone, applied to a certain metallic weight, is no doubt derived.

A perfect standard and uniformity in weights and measures, has, with much reason, been generally wished for, but hitherto always attempted in vain. It is a subject of deeper research, and of more difficulty, than the generality of the world are aware of ; but though this cannot, perhaps, be easily or soon accomplished, it is certainly the interest, and ought to be the endeavour of the public, to oblige all dealers, as much as possible, to use the present standard weights and measures of the kingdom, such as they are, and to exclude all local weights and measures, the real value of which is not generally known.

Though a stone and a pound, a boll and a peck, have the same names over all the country, they vary exceedingly in value. If they were marked even by different names, the ignorant and the unwary would

be less liable to imposition than at present, when the names of stone and boll are applied to very different quantities. By inveterate custom, without any reason, different weights and measures have also been appropriated to different commodities, which has been adopted even by law, as in the case of the wheat and oat boll of Linlithgow.

The old established Scots weight, or trone weight, was a stone of twenty-four pounds, and twenty-four ounces to the pound; but no such weight is any where at present in use. It has varied much in progress of time, and is now everywhere greatly deficient, by encroachments of the seller upon the buyer: the stone of butter and cheese, in some parts of the Highlands, is accounted only twenty-two pounds English, and varies even two or three pounds; the wool stone varies also from twenty to twenty four pounds Dutch; and the lint stone, different from both, is reckoned twenty Dutch pounds. In some of the islands, the boll of oat-meal is nine stone, but in others only eight.

This indeterminate value of the stone, the boll, and the pound, is a grievance not peculiar to the Highlands, but subsists in some degree through the whole United kingdom, and prevails in the South, as well as in the North of Scotland. The English, Dutch, and trone weight; the Galloway, Annandale, Teviotdale, and Linlithgow bolls; the Win-

chester and the Carlisle bushel, and the Annan cop, are all in use in the same part of the country, and sometimes in the same town, or in the same market: the persons well instructed in the comparative value of these weights and measures, have an advantage, which no doubt will be often taken, over those who are less informed. The middling classes and the poor, who purchase from retailers in small quantities, must often have the worst of a bargain, for the necessaries of life. The inhabitants of the Hebrides are often obliged to purchase them, by the weights and measures which are offered, and with which they are not fully acquainted; their safety, in general, is to abide by one established weight, in the purchase of grain, meal, potatoes, salt, coals, and other commodities, which are at present too often sold by measure, to the prejudice of the purchaser.

The excellent and most important institution of a Board of Agriculture, promises many advantages to this nation: among these may be enumerated,—the final adjustment of weights and measures; the abolishing of all those that are merely local; and the establishment of one weight and measure, that shall be universally observed over the whole United kingdom. To those who know it best, this must be acknowledged to be an Herculean labour, to which no individual is adequate; but such a board, under the countenance of the legislature, may certainly be equal to the task.

PUBLIC SCHOOLS.

By public schools are meant, not only such as are merely parochial, and which are appointed by law to be established and supported,—but those also which are maintained by his Majesty's bounty granted to the Church, and by the Society for propagating Christian knowledge. The number of these schools in the Highlands and Islands, is very considerable, and they are very properly established in those parts of the country which are most remote, the least cultivated, and where the people are at the greatest loss for instruction. Being thus situated, it would be happy if these schools could be rendered seminaries, not only of education, but of industry : the boys attending them, who are generally well grown up, and beside the ordinary school hours, have much spare time, might certainly be initiated in the practice of improved husbandry and gardening, and in some of the more simple, but most useful mechanical arts. To instruct the girls, at these schools, in female industry, would be a task still easier, and of the greatest benefit to the country.

The women are comparatively more numerous in the Highlands than anywhere else. Many of the men leave the country, but few of the women. Their labour, in consequence of their numbers, is low-

priced, their wages small, and they are scarce half employed as house or farm servants ; it would, therefore, be of great importance, to have them instructed, when young, at the public schools, in the different operations relative to the management of flax, wool, and hemp, and especially in the art of spinning, with which they are but imperfectly acquainted.

Notwithstanding the late increase of sheep in the Highlands and Islands, the linen should still be considered as the most important and staple manufacture of the country. Formerly, the woollen manufacture was no object at all ; when all the wool produced, was scarcely sufficient to cloath the inhabitants, it was a matter of little moment to the public, whether their woollen goods were of a better or of a worse fabric. The quantity of wool is now come to be increased above the consumption of the inhabitants, and will probably be much further augmented ; yet this does not at present, nor, for a long time, will it alter the case. The woollen manufacture requires towns and villages ; a large capital in the hands of the actual manufacturers ; expensive buildings ; complicated and expensive machinery ; cheap and expeditious carriage ; nor can it succeed, except where all the mechanical arts are in an advanced state. Any person who has surveyed that manufacture, at Leeds or Halifax, at Kendal or Hawick, at Gallowshiels or Stirling, may be per-

suaded of this ; and that the Western Highlands and Islands are not as yet prepared or adapted for the purpose : even the yarn, which is the basis of the manufacture, cannot be executed in the Highlands, as the spinning of wool by water machinery, has now rendered the spinning of wool upon the wheel, an unprofitable business.

The surplus wool, therefore, of these countries, must, for a time, continue to be exported to the places where the woollen manufacture is fully established. In the mean while, it is only the linen that can give full employment to the women. Every Highland wheel affords a material for further manufacture and for exportation, and may afford to the spinner, more for her labour than she can otherwise obtain. The instruction, therefore, of the young girls, in this simple but useful art, is highly necessary ; and can nowhere be so effectually accomplished as at the public schools. This would best be done, by allotting a small salary, and some spinning wheels, to the wives of schoolmasters and catechists, who should be found qualified for the task. The advantages that have arisen, in some parts of the Highlands, bordering on the low country, from the spinning of linen yarn, are well known ; but, in the remote Highlands, they would be still greater, and be more immediately and sensibly felt.

An alteration has lately taken place, in the industry of the women in some of the islands, which cannot be too much praised and encouraged ; some of them have now undertaken the work of weavers, and weave linen successfully on the loom. For this employment, the women in any country are as well adapted as men ; but, if the Hebridian women persevere in this undertaking, instead of being a burthen to themselves and the public, they will become the most useful members of the community. It would be well bestowed, were the trustees for manufactures, and the Highland Society, to pay some attention, in the way of premiums, to these women, in order to excite in others an imitation of their example.

INOCULATION.

The epidemic diseases of children are remarkably mortal in the Hebrides, as in all other places where the inhabitants live chiefly on animal food, and especially upon fish. The destruction occasioned by these diseases, especially by the small pox, has always been sufficient, independent of other causes, to obstruct the population of these islands.

The small pox are always most malignant and fatal when they first enter a country, or when their visits

occur only after an interval of many years. In the year 1726, the distant island of St Kilda, which then contained above one hundred and twenty people, was, for the first time, visited by the small pox; every person, seized with the disease, died; and the island was reduced to five families, of four or five persons each. From that time to the year 1764, the small pox had never appeared, and during these thirty-eight years, as there had not been one emigrant from the island, it had become re-peopled, with twenty families, containing ninety two persons. The Island of Barra received the small pox from a party of the military, in the year 1746; the distemper did not make its appearance again till the year 1758, when above sixty of the inhabitants died. In the year 1754, of two hundred persons under the small pox, in the parish of Glenelg, one hundred and forty were carried off. In Ila, the small pox is less hurtful than in the more remote islands, owing perhaps to the great resort of shipping; yet, of those who take the disease, a much greater proportion dies than in most places on the main land. The Island of Lismore is visited by the small pox, always once in six or seven years, and sometimes in three or four years: at one time sixty persons have died, and, usually, from forty to sixty are swept away each time; in general, every second person seized with the disease perishes. In the Isle of Bute, also, the small pox occurs, usually, once in seven or eight years, and rages with great violence: in au-

tumn 1768, above one hundred persons fell, in the small town of Rothsay; and, over the island in general, not a half survived, of those who took the disease. In the year 1756, in the Island of Tirey, one hundred and five children and adults were seized with the small pox; but upon enquiring how many of this number had died, there could not be found a certain account of one that lived, out of the whole number.

These are only a few instances, but the most authentic that could be obtained, of the devastation of this cruel disease in the Hebrides. The most forward population could not withstand such a consumption of people; nor is it any wonder that these islands should have continued hitherto so thinly peopled.

That sovereign remedy, inoculation, devised by the wisdom of man, but the gift of heaven, was first practised in these countries in the year 1763. At that time, Mr M'Caskile, a well qualified surgeon, and an active benevolent man, began the salutary practice. Between the 1st of November in that year, and the 1st of September 1764, he inoculated, in the Isle of Skye, two hundred and eighty-seven persons, of whom only three died; at the same time, Dr Maclean inoculated eleven, who all lived; and Mr Macleod, surgeon, inoculated twenty-six, of which number two died. In the parish of Glen-

elg, adjacent to Skye, Mr M'Caskile inoculated, during the same period, two hundred and seventeen persons, thirty-four of whom were men and women, and of these, only one died: some of them who had no sensible fever, nor any sensible eruption, had a swelling in the axillary glands, of one or both arms; and, in some cases, this swelling suppurated, but healed in an easy manner.

In these instances, inoculation met not with that opposition which it has had to encounter, in countries reckoned more civilised; but the minds of the most uncivilised Highlanders, wear strong features of sound reason and good sense. Being strangers to the erroneous ideas on the subject, falsely attributed to religion, and prevalent among the methodists in England, or seceders in Scotland, they no sooner saw the happy effects of inoculation, than they embraced the practice with devout thankfulness; they knew too well, what their country, what their friends, and what their families had suffered from the small pox in the natural way. The parents, at first averse to the practice, had their courage, or rather indeed their reason, roused by their fears; and calamity, as in many other cases, became the parent of improvement. It was remarkable in these, as it has been in other instances in the Hebrides, that, even in those places where the small pox is naturally most virulent, inoculation is equal-

ly efficacious and safe, as where the disease naturally appears in its mildest and least mortal form.

But, notwithstanding the excellent behaviour of the people on this occasion, in that part of the country, inoculation is far from being so universally and regularly practised in the Highlands and Islands, as is certainly requisite: it is not to be promoted by any public encouragement; its advancement must chiefly depend on those who have any superintendancy over the people, the proprietors, the clergy, and other principal inhabitants. These, by their advice and example, may effectually promote this salutary practice; and especially, by providing to the body of the people, the means of having their children inoculated in the most easy and inexpensive manner.

Inoculation will never become so universal as it deserves, till the operation passes from the hands of physicians and surgeons, into those of nurses and other homely practitioners.

For many years after it was introduced into Britain, it was practised, by making a considerable incision through the skin. Gentler methods have since been found to answer: a slight scratch has been used instead of an incision; the scarf skin has been removed by a bit of blistering plaister, to make way for the inoculating matter; a linen thread dipt in the matter, and drawn with a needle under the

cuticle, has been found equally effectual ; and even the external application of the variolous matter, without breaking the skin at all, is now known to answer the purpose.

Inoculation was first practised in the Isle of Bute, in the year 1768 ; and on the most dangerous occasion, amidst the general spread of natural contagion ; yet of forty children, then inoculated, only one died. At that time, the inhabitants of Bute, fell upon a new method of implanting the disease, and conveyed the infecting matter to the blood, by the aliment. A hard sea biscuit was given to a child recovering of the small pox, and after chewing at it for some time, it was given to another, for whom the disease was intended ; to some children, the variolous matter was given in their bread and butter ; and to others, in a little milk. In these different ways, the children took the disease regularly, came through it easily, and recovered well, without any symptoms that were singular.

The population of the Hebrides, during the last thirty years, has been considerably increased ; but that increase has been chiefly owing to inoculation and the introduction of potatoes ; the one, by saving the lives of the inhabitants, and the other, by adding to their sustenance.

DESTRUCTIVE ANIMALS.

Fox.—Before the year 1764, the stock of sheep in the Highlands, was very confined ; and that chiefly by the havoc occasioned by the fox. This pernicious animal prevailed so much, that no farmer could pretend to keep more sheep than what he was capable of housing at night, as it was exposing them to certain destruction, to suffer them to lie abroad.

A farmer in many places, thought himself well off, if the fox had not destroyed one half of his lambs before Christmas ; and frequently, he would not have above one third remaining, against that time. From this cause, he was obliged to keep no more sheep than what was necessary to afford cloathing for his family, and there was seldom above two or three score to be found upon some of the largest farms. This forced him also to breed a great number of goats, comparatively, an unprofitable flock ; but the goat is an animal better armed, and of greater strength and courage than the sheep, and lies at night among rocks and precipices, where the fox dares not attack him. Accordingly, the small farms in Kintail, Glenshiel, Glenelg, Knoidart, and Lochaber, kept often from five to fifteen score of goats, while they had few or no sheep.

A farm in the country of Ardgour, not far from Fort William, was turned, in the year 1764, into a sheep pasture. In the month of June, twenty-nine score of ewes and wedders, were brought from Douglass in Clydesdale, and placed upon it. This was the first flock of south country sheep that was settled beyond the chain. Their price at Douglass, upon an average, was six shillings and sixpence each. Their driving from Douglass to Ardgour in twelve days, cost five-pence a head, and only three of the whole flock were lost upon the journey. As the farm was rented, the grass of each sheep stood only sixpence half-penny. Of the tarred fleeces of the sheep, which were shorn in July, seven went to the stone, and the stone which was twenty-one pounds weight, sold upon the spot, for six shillings and sixpence. It was therefore to be judged here, as was the case in most parts of the Highlands at the time, that the fleece was equal in value to the grass and herding. The lambs of these ewes sold, about the 1st of August, for two shillings each; and the ewes, after having three lambs, sold at Fort William for nine shillings a-piece. From this account, it is easy to perceive, that the profits upon this sheep farm, would have been extremely high, had no cross accident intervened; but though Ardgour was better freed from the fox, than most parts of the Highlands, and though the above flock was carefully herded and watched; yet between the month of June, when it came upon the farm, and the end of November, for-

ty of the number were killed by the fox. So that notwithstanding the above advantages, this misfortune was alone sufficient to render sheep-farming ineffectual.

Since that time, indeed, the foxes in some Highland districts, have been considerably thinned; yet even at present, in many parts, no sheep can be kept, but what are housed every night, for fear of the fox. The storemasters in the South of Scotland would pity such sort of sheep-farming; and the raising of sheep can never be extensive, while this obstacle stands in the way. In those places also, where the flocks are so large, that they cannot be housed, the farmer is subjected to heavy losses by the depredations of this animal; and some proprietors have even been obliged to let down their rents expressly upon this account.

To diminish the number, and even to exterminate the foxes in the Highlands, is, therefore, a matter of importance to all the inhabitants; though a work of difficulty, not suddenly to be done, it may certainly be executed in a gradual way. The foxes in the Highlands are, indeed, larger, stronger, and more fierce; they possess also a stronger country and more inaccessible holds, than those of the Lowlands; but the extirpation of the wolf, a far more difficult and dangerous enterprize, was accomplished by our ancestors.

In the year 1764, the Gentlemen in Skye, for the first time, entered into a resolution to diminish the number of foxes, and for this purpose, offered a premium of three shillings for each fox that was destroyed; in consequence of this offer, no less than one hundred and twelve foxes were killed in the year 1765, in the single district of Trotterness, in that island, of which number, one man destroyed thirty-seven.

Such a premium would require to be augmented, as the number of foxes was diminished, and would be highly useful. The only other method for attaining the end is to hunt with dogs, which in many places, would be very difficult indeed, by reason of the strength of the country; but a great number of dogs would not be necessary. The proper pack for the purpose, should consist of two beagles, two Talbot hounds, four strong terriers, and two ratches or rough greyhounds. If the old grey dog of the Highlands yet subsists, and is to be had, he would be preferable. A number of such packs, however, would be requisite, in each of the Highland counties, in order to accomplish the design.

The most effectual way to eradicate the fox, is to adopt both these methods at the same time. To allot a premium for each fox, by whomsoever killed, and to station such a pack of dogs, in each district, with an additional reward to the huntsman, for every

fox destroyed, to secure his diligence; by these means, in a few years, the country might be effectually delivered from what is become an intolerable evil.

Eagles.—The eagles in the Highlands, are likewise a formidable enemy to the sheep farmer; they abound greatly, and are of four different species; the golden eagle *, the ring-tail eagle †, the black eagle ‡, called in Gaelic, Iolair; and the erne or fawn killer §, which is the most numerous of all, and the largest bird of prey in Europe.

These birds not only kill, and prey upon the lambs, and upon the fawns of the stag and roe, but the erne, even carries them off, if they are under four or five weeks old. In examining the airy of the erne and ring-tail eagle, on several occasions, it was found to contain the remains, not only of lambs, but of hares, black-cock, muirfowl, and partridge, and likewise of salmon and trouts; so that these birds, though of a large size and heavy, are more prejudicial even to the small game, than is commonly imagined.

* *Falco chrysaetos*, Linn.

† *Falco fulvus*, Linn.

‡ *Falco melanaetus*, Linn.

§ *Falco albicilla*, Linn.

The raven is almost as destructive to young lambs, as any of these eagles, and is destroyed in the sheep countries in the South, with equal assiduity. The most effectual method to restrain these birds of prey, is to destroy the young in the nest, especially when they are so far advanced, that the old ones will not breed again, during the same season. To attack the nest, affords also the most favourable opportunity of shooting the old birds, who then rush fearless, very near to the persons who make the attack ; at all other times, they are so wary, and keep at such a distance, as seldom to be within reach of the fowler.

The Commissioners at the Annexed Board, employed a few persons, for some years, to destroy the eagles on the forfeited estates ; the feet of those which were killed, and which were all full grown birds, were sent up to Edinburgh, in order to secure the premium that was offered. The numbers sent were so great, though but from a few spots of the country, as to show, that the prejudice which the sheep farmers in the Highlands sustain, from these birds of prey, must now be very material.

Wild Geese.—The crops in South Uist, Benbecula, and North Uist, are exposed to a very singular, but a very serious misfortune, being sometimes almost entirely destroyed by the vast flocks of wild geese, which haunt these islands and their neigh-

bourhood. The farmers in the Lowlands complain of the hurt done by pigeons, rooks, and sparrows ; but all this is little, compared to the mischief done by the wild goose in these islands.

This bird is never seen in the South of Scotland, except in winter, where it does no harm ; but in these islands, it hatches, and resides all the year round ; they are, indeed, peculiarly adapted for its reception by the numerous fresh water lakes they contain, which are filled with solitary islets never visited, and their shores covered with the finest grass. These birds, after their young take wing, become extremely numerous, from the 1st of July to the 1st of November. During all this time, it is the principal employment of the inhabitants, to defend the corns from their depredations, and for this purpose, they are forced to make use of a variety of expedients.

It is remarkable in the wild goose, that it never alights in a field of grain, but always in the neighbouring grass field, and from thence walks into the corn. The farmers, therefore, totally surround their corn fields, with a heather rope, two or three inches thick, laid upon the ground ; and this, the birds do not venture to pass over, unless much pressed by hunger ; they are noted for being of a very shy and suspicious nature, and are extremely cautious against all gins and decoys, so that their fear of this weak

defence, seems to be occasioned by their suspicion of a snare.

Sometimes, however, this device is insufficient to prevent their inroads into the corn. The farmers are then obliged to surround the field with small pillars of turf, two feet high, and six or eight feet distant. By these, the heather rope, which is led round the field, is suspended six or eight inches from the ground, which renders it a more effectual fence; yet notwithstanding these precautions, when the corns are near ripe, the owners are forced to watch all night over, and to kindle fires in many places, which frequently, upon the rising or shifting of the wind, communicate themselves to the crop and make great devastation.

It was only since the disarming act took place, soon after the year 1745, that all these destructive animals became such a grievance in the Highlands; before that period, the inhabitants, being naturally vigilant and patient in hunting, and dextrous marksmen, kept the country clear of all pernicious wild animals, by their fire-arms. If they are not to be allowed the use of arms, for the same purpose, some other methods should certainly be adopted to remedy the evil.

THATCHING.

The inhabitants of the Western Islands, and indeed over all the Highlands, are ill instructed and inexpert, in thatching their houses, a rustic art which well deserves attention and improvement in every country. In some places they cover the roofs of their houses with sweet grass*, which is thrown in by the sea in great quantities, but it is only a flimsy and perishable cover. Sometimes they use the rubbish obtained from the dressing of flax, and sometimes even the haulm and refuse thrown out by rivers. Having too good reason to be parsimonious of their straw, the most usual roof is formed of oat or bear stubble pulled up by the roots. This is bound down by straw ropes; and these, instead of being tightly fastened, have each of them a stone tied to its extremity, which hangs over the eaves of the house. This clumsy and superficial contrivance can last but for a season; yet it forms a considerable piece of work, which must be yearly renewed.

The consumption of straw in thatching is undoubtedly to be avoided, in a country where there is no wheat, and where there is not sufficient pro-

* *Zostera marina*. Linn. Grass wrack.

vender for the cattle in winter; but there are many other materials, in the Highlands and Islands, excellently adapted for the purpose, which are at present neglected.

On many of the shores, there is a luxuriant growth of the sea bent*, and sea lyme grass †, to be cut with the sickle or the scythe, which forms a hard and durable thatch. In the more inland and marshy tracts, there is plenty of rushes and sprets, to answer the same purpose; broom is to be had in other places; the bullrush ‡ and the common reed || also abound in many lakes and stagnating waters; each of which forms a thatch preferable to any straw whatever: but, where these are not to be had, there are still other materials which are seldom wanting; these are brakens and heather.

The brakens § form one of the best and most durable thatch roofs. For this purpose, they should be pulled up by the roots, when rank and luxuriant, in the month of August, and used immediately when pulled: they are to be laid upon the roof, previously

* *Arundo arenaria*, Linn.

† *Elymus arenarius*, Linn.

‡ *Scirpus lacustris*, Linn.

|| *Arundo phragmites*, Linn.

§ *Pteris aquilina*, Linn.

covered with turf, layer above layer, to a considerable thickness, with the root ends undermost, and then sewed down with coarse tarred rope-yarn. Roofs of this sort are frequent in some of the mountainous parts of the South of Scotland, and often last for a dozen, or even twenty years, without needing any repair. The braken is well known to abound in the Highlands, and it is inexcusable to use straw for thatch, wherever it can be procured.

Heather, upon the whole, is the plant with us that forms the best thatched roof, and of this, also, there is no scarcity in the Highlands. Many gentlemen of the first consideration in the South of Scotland, lived long ago under this roof; and it has been known to last, from forty to sixty years, without any reparation. For this end, it requires only to be laid on green and fresh; its different layers to be disposed like so many slates; to be firmly compacted, and of a sufficient thickness; and to be strongly tied down with thick tarred rope.

As there is scarce any part of the Highlands distant from one or other of the above materials, there can, therefore, be no necessity for using straw in the roofs of houses; besides, with any of these, the inhabitants would have their houses better covered, and with more economy, than they are at present. One thing indeed is wanting, and that is a person who executes thatching as a separate em-

ployment: all the farmers, in the most cultivated parts of England and Scotland, well know, that, by an experienced thatcher, they can have their roofs better constructed and repaired, and at a cheaper rate, than by their own labour, or that of their servants.

GRADAN BREAD.

The making of what is called Gradan bread, from oats or bear, has been an immemorial practice in the Highlands: it was a natural and necessary contrivance for turning the grain immediately into bread, before kilns and water mills were introduced, for the drying and grinding of corn.

To make gradan bread, a parcel of corn with the straw is set on fire; after the inflammation is over, the grain being sufficiently dried or parched for grinding, is gathered up, sifted and cleaned; it is then committed to the quern; this is a hand corn-mill of stone; and, by this, it is immediately reduced to meal and made ready for use.

This simple method of preparing grain was universal in ancient times: the Roman armies, when in the field, had no other way of supplying themselves with bread; accordingly, at some of the Roman stations, both in England and Scotland, several

of the Roman querns have been dug up, which are of the same sort of stone, and of the same form and dimensions, with those that are to this day used in the Highlands.

The expedition with which bread is manufactured from the grain, by this process, must have been a matter of no small conveniency, in old times, to people living in a dispersed state, and without the assistance of improved arts. At the delightful seat of Sir Alexander Mackenzie, in West Ross, the barley which was standing ripe in the field, on the 24th of August, at breakfast, was presented in bread at dinner: no barley bread could be of a more agreeable quality. Not only the people of the Highlands, but most strangers, prefer the bread made of this parched corn, to that which is prepared in the ordinary way. The difference is something like what is observed between a roasted and a boiled egg, or between a roasted and a boiled potatoe. Most people give a preference to the former, and, in this way, the Highlanders, in point of taste, have a strong prepossession in favour of gradan bread. All the operations in the making of it are performed by the women; and one woman, with the quern, usually grinds and sifts about a firlof or six pecks of meal in the day.

It is a practice, however, for which there can be no apology but necessity; and, though this was the

case in former times, it is by no means so at present. Nothing can be more preposterous, in a country where cattle is the chief production, and where there is the greatest difficulty to support them in winter, than that their provender should be burnt by the inhabitants. Notwithstanding this, the erection of water mills for grinding corn, met at first with great opposition in several places; but, as the country comes to be sufficiently supplied with them, the manufacture of gradan bread ought to be strictly prohibited. This was first done by the late Sir James Macdonald, in the year 1765, and his example has since been followed by many proprietors.

THIRLAGE.

Thirlage is a practice, now so universally repudiated, that it cannot probably subsist long, to the detriment of the community. When water mills for grinding corn were first introduced, thirlage appears to have been necessary and proper, in order to ascertain work sufficient for defraying the expence of erecting the mill, and for its support. When a proprietor built a mill, it was natural for him, and probably requisite, to oblige all his tenants to carry their corns to it, for the purpose of securing employment for the mill, and for keeping it up as a public benefit. In this view, thirlage, in its original intention, was by no means so unjust and impolitic as

is often imagined: like many other customs, it is not so much to be condemned in its origin, as in its abuse and continuation; for, in other cases, proprietors erected mills, not so much with a view to benefit the public, as for their own private advantage: beside what was necessary as a tax for building and maintaining the mills, they drew in the way of mulcture, what they imagined to be an additional revenue, from their tenants. Upon this selfish and mistaken idea they proceeded, which, like other mistakes of the times, has proved itself to be an erroneous measure by its consequences; for no property, where a heavy mulcture is paid, has ever been, or is at present so valuable, as it would be without any such restriction.

Thirlage is in some places such a heavy tax, as to deter the tenants from tillage, and from raising so much corn as they should. If they improve their lands, and increase their quantity of grain, they must give up a twelfth, a tenth, and sometimes even an eighth, for thirlage: this may often amount nearly to the whole profit upon their improvement, and must naturally deter them from it. Thirlage, in this way, operates much in the same manner as tythes do in England: though the tenant, when he takes his land, knows that it is subjected to certain mulctures, yet by these, like the English farmer with his tythes, he finds himself hampered, incommoded, and discouraged. Exclusive of other hardships, it is not likely that

the farmer who is thirled, will have his corn dressed so well, so expeditiously, or with so much civility, as he would have at a mill of his own choice.

For these reasons and others that might be suggested, it must appear, that thirlage, as it stands at present, is a hurtful practice to the farmer, to the landlord, and to the public. It is not easy to get the better of old customs and mistaken ideas, yet the matter seems really so clear, as to give hopes that the practice may be soon and very generally abolished. This may be easily accomplished by the proprietors of Scotland, if they are inclined to the measure: let tenants liable to thirlage, make full compensation to their landlords, by additional rent, for being released from the incumbrance. This expedient would be conducive to the interest of all concerned: the dues that may be voluntarily and most reasonably paid by the country, for the grinding of corn, will always be sufficient to render mills profitable both to the proprietor and the miller. With the expences for supporting the mill, the farmer ought to have no concern; these should all be abundantly defrayed, and with ample profit, by the dues exacted for the work performed.

By the changes in property, there are some heritors, whose lands are thirled to the mill of another proprietor. It was, no doubt, with this burthen, that they purchased or acquired the lands; but, by

consent, and upon proper terms, they may, and ought to be freed from it: it is the interest of such heritors, to give more than an equivalent for being relieved from the obligation; if more than an equivalent is offered, a refusal would be inexcusable; but the good of the country is so materially concerned in the transaction, that it is to be hoped such terms would seldom be rejected.

The quern was the original corn mill of Scotland; though a very imperfect machine, the Highlanders were, with great difficulty, induced to give it up, even in our own times, and to accept the superior advantages of a water mill. We may easily guess from this, the opposition that must have been encountered, when corn mills driven by water were first introduced, and the necessity of appointing thirlage. In many of the Islands there is no corn mill; and in others there cannot be any, for want of water or a sufficient fall, or for want of sufficient business; in other parts of the Highlands, the people are excluded from the advantage of a mill, by their great distance from it, or by bad roads: it would, therefore, be a great benefit to the people in such situations, had they access to a hand corn mill, of a better construction than their present querns. The want of a mill of this kind, prevents many of the gentlemen and principal farmers from raising wheat, as they have no way of getting it properly dressed. If a simple inexpensive mill could be contrived, to re-

duce the different grains into meal, especially wheat, either by the hand or by the labour of a single horse, it would be an invention of great utility, not only to the Highlands, but to Scotland in general.

MECHANICAL EMPLOYMENTS.

In a thin peopled and uncultivated country, every person almost practises every trade: this is remarkably the case in the Highlands; but the fault, if it is a fault, cannot be ascribed so much to the inhabitants, as to the nature of their situation: from the want of tradesmen at command, every family is obliged to apply to every thing, and to supply its own necessities. The exercise of so many employments, prevents indeed their excelling in any; yet they always, in some shape, supply the want of the necessary artists. When the end is in some degree answered, they are not very anxious as to the manner in which it is accomplished; knowing nothing better, they are easily satisfied.

The spades, ploughs, harrows, and sledges, of the most feeble and imperfect kinds, with all their harnessing, are made by the farmer and his servants; as also the boats, with all their tackle.—The boat has a Highland plaid for a sail; the running rigging is made of leather thongs and willow twigs; and a large stone and a heather rope serve for an anchor

and cable; and all this, among a people of much natural ingenuity and perseverance: there is no fulling mill nor bleachfield; no tanner, maltster, or dyer; all the yarn is dyed, and all the cloth fulled or bleached by the women on the farm: the grain for malt is steeped in sacks in the river; and the hides are tanned, and the shoes made at home: there are, indeed, itinerant shoemakers, taylors, wrights, and masons, but none of these has full employment in his business, as all the inhabitants, in some measure, serve themselves in these trades: hence, in the royal burroughs, of Inveraray, Campbelton, and Inverness, and in the considerable villages of Crieff, Callander, Oban, Maryburgh, Fort Augustus, and Stornoway, there are fewer tradesmen, and less demand for the workmanship of mechanics, than in any other places of the same size; yet these are either situated in, or are next adjacent to, a more extensive and populous country, than any other similar towns or villages in Scotland.

An accurate and beneficial division of labour, however, is not suddenly to be expected in the Highlands: the country is not yet prepared for it; and, as in other countries, it must be the work of time. There are some mechanical employments, destined merely for domestic accommodation, with which the public has less concern; but there are others in which the public is much interested, and

especially those on which the progress of agriculture greatly depends.

Every man, with a little skill, and without much labour, may rickle up a dry stone dyke ; and accordingly, we find many such in the Highlands; but none that are built with tolerable art, or with sufficient strength ; yet there is no art, nor perhaps any agres-tic improvement in the Highlands of so much im-portance as that of a well built dry stone dyke. If the dyke is carelessly and unskillfully executed, it is a perishable and expensive work, which answers no end ; but if properly constructed, it is upon the whole, the cheapest, the most durable, and most effi-cient fence in such a country. It is by this fence, that Galloway has been improved and enriched as a grazing country, where there are dry stone dykes, which have stood for above half a century, without needing almost any repair. There is a park at Fin-larig in Breadalbane, inclosed with a dry stone dyke, six feet high, flat on the top, and covered with a turf, which had been built by skillful masons in the year 1620. It was the first inclosure in all that part of the Highlands, and the wall is to this day a sufficient and strong fence.

But while the dry stone dykes continue to be built in the Highlands, by the people on every farm at random, and with stones picked up from the sur-face of the ground, they never can be expected to

be sufficient fences. It is a work that requires men to be regularly bred to it, and also experienced in the art of quarrying the different sorts of whin-rock. The business of the dyker, ought, therefore, to be marked in the Highlands, as a separate mechanical employment of the first importance, and well qualified persons should be highly encouraged to engage in it as such.

In like manner, there ought to be men, who have no other business but draining; some, whose sole occupation is the watering of land, and others to be entirely employed in thatching. In every district of a few parishes, there ought also to be settled an expert plough-wright, to furnish the inhabitants with ploughs, harrows, fanners, rollers, and carriages of a right construction, and a skillful smith to supply them with proper spades, pick-axes, wedges, hammers, and levers. Persons occupied in these separate mechanical employments, would be the most useful inhabitants of a village. Was this design pursued, it would be the means of drawing a great many people from off the farms, to settle more advantageously in villages, which is an alteration of great moment at present in the Highlands.

FOSSILS.

Of the fossils in the Highlands there are some which might be exported as articles of trade, as they are capable of being rendered useful in manufacture, or in the fine arts. The places where such are to be found may be here noticed, and the uses to which they may be applied.

MARBLES.

The marbles which have been generally most esteemed, both by the ancients and moderns, are those which are most remarkable for their variegated and vivid colours, and for their exquisite polish ; but there are others which have been held in high estimation because of their rarity ; some on account of the singular ingredients of which they are composed, and some because they answer best the purposes of the sculptor. There are marbles of all these different sorts to be found in the Highlands.

At Armady, in Argyllshire, there is a very beautiful marble * which was worked for some time by

* Marmor *Abanae*.

the late Earl of Breadalbane. There are a few tables of it preserved at Taymouth, at the house of Lochnell, and at Edinburgh. The spar of which it is composed, consists of plates remarkably large, yet it is very hard, susceptible of a fine polish, and possessed of great variety of bright colours. It is disposed in the earth in a vertical stratum, only a few feet in thickness, between strata of hard whin rock. In this situation the working of it would be expensive, but the expence would not be thought too great by the opulent, who have a taste for fine marbles.

In the Island of Icolumb-kill there is a white saline marble, sometimes veined with black, and sometimes containing veins of greenish mica. A large altar table which formerly existed in the ancient abbey, upon the island, was formed of this marble *. A quarry upon it was opened some years ago by Mr Raspe, a German miner, and some pieces of it brought to Edinburgh, which were much esteemed.

In the year 1764, there first occurred to me a very uncommon marble in the Island of Tirey. The ground of the stone is of a carnation colour, and the concretions are of green chrystalised schorl †.

* *Marmor D. Columbae.*

† *Marmor Hebridianum.*

A block of it was brought to Edinburgh, from which a table was formed for the Duke of Argyll, and placed in the Palace of Holyrood-house. In this block a mass of quartz of extreme hardness was included, and smaller quartz nodules of the same nature do sometimes occur in the stone. Several pieces of this marble have been since brought to Edinburgh, where it has been much admired. It is not only beautiful, but its composition and colours are quite singular, and not known to exist anywhere else.

An eminent person, well known as a mineralogist, and especially for his great knowledge in the antique and modern Italian marbles, was of opinion that it might be exported to Italy, and disposed of in large quantity, and with great advantage.

There was discovered at the same time, in the Island of Tirey, another marble, likewise of a very singular nature*. It is of a pure white colour, and of a very compacted substance, having no visible grit or grain, which is the case in what are called the saline marbles.

It is considerably hard, admits of a fine polish, and is interspersed with concretions of a grass green

* *Marmor Borcale.*

transparent schorl. It is situated on a hill near the centre of the Island, where it constitutes an extensive body of rock which bassets or breaks out at the surface. Near Appin house, in Argyllshire, there is a marble which has been quarried for the purpose of burning it into lime. It is generally of a whitish grey uniform colour; but in some places it is filled with yellow bands or stripes of an equal breadth throughout, and exactly parallel to each other*. This stone, when cut and polished, has a very singular and fine appearance.

In the country of Strath, in the Isle of Skye, and in the neighbourhood of the church of Hul-Christ, there is a variety of marbles which well deserve notice. One of these is a dove marble †, being white, but finely clouded with a variety of grey colours. It receives a finer polish, and is of a finer appearance than the common dove marble brought from Italy.

At the same place there are strata of a white marble of a very remarkable sort ‡. It is a saline marble but not of a plated structure. It has a visible grit or grain, composed of very minute particles, and possesses but a low degree of transparency.

* *Marmor fasciatum.*

† *Marmor palumbinum.*

‡ *Marmor Caledonium.*

Though it admits of a fine polish, its surface is not glossy and shining, but of a soft milky white colour, and is of that sort called the antique statuary.

The white Italian marbles, used for statues, and especially that of Carara, are very transparent, and admit of the looking-glass polish. Instead of such a marble, with a refulgent surface, the Greek artists preferred one of the above description, or one of a dull white colour, which more resembled the whiteness of the human skin. The finest Greek statues, now extant, are formed of a marble of this kind; but the quarries from whence it was obtained are now little, if it all, known.

The strata of this marble in Strath, appear at day, and are very extensive. The minister's manse at the place is formed of it; being the only house in the three kingdoms that is built of marble.

The stone stands the weather, and is very durable, but like all other white marbles acquires a yellowish colour, when long exposed to the air. It may be obtained of any dimensions, and is at no great distance from the sea shore, where it may be easily shipped.

These marbles, which have now been enumerated, are well adapted for tables, vases, mortars, chimney pieces, monuments, or other articles of internal

architecture, and might be exported, with advantage, to the principal ports of Great Britain and Ireland.

The last mentioned well deserves to be tried by our statuaries.

GRANITES.

When architecture and sculpture among the Romans came to a great degree of perfection, they employed, for the finest works in these arts, stones of a harder and more durable nature than marble. Such were the granites brought from Egypt, which constituted their most costly and superb monuments of art. Stones exactly of the same nature, and applicable to the same purposes, are to be found in several parts of this country, and especially in the Highlands.

The parish of Ross, in the Isle of Mull, abounds with the syenite*, or red granite, which the Romans brought from Siene in Upper Egypt. It is the hardest stone of the kind, has the most vivid colour, and is susceptible of the finest polish. To quarry, cut, and polish a table of this stone might be indeed expensive, but the expence would not be nearly so great

* Syenites *antiquorum*.

as is sometimes bestowed upon a table of the same sort brought from the Roman ruins in Italy.

The granites are disposed in the earth, and also found lying on its surface, in much larger masses than any other rocks whatever. In consequence of this property, the Romans were supplied with those immense columns and obelisks of a single stone, which continue objects of admiration in modern times.

The high mountain of Cruachin, in Argyllshire, consists chiefly of syenite or red oriental granite, being the same stone with that of Pompey's pillar at Alexandria. The shaft of this famous column consisting of one stone, is sixty-six feet high. Masses of equal, or even superior magnitude, might probably be discovered in Cruachin. One block lying on the surface of the mountain, of a parallelepiped figure, and of considerable breadth and thickness, was found to be forty-two feet in length. The same is the case with the grey granite or moor stone*. The large pillar, consisting of one stone of this material, preserved at Wilton, is said to have been erected by Julius Caesar, in the temple of Venus Genetrix at Rome.

* *Psaronium Egyptiacum.*

The mountain of Crufelt in Galloway is composed precisely of the very same stone, where masses of much larger size might be obtained.

PORPHYRY.

The antique red porphyry *, or Leucostictos of Pliny, is by far the hardest of any kind of rock that is known. It was for this reason chosen by the Roman sculptors, to form their finest busts and smaller statues, which, on account of the extreme hardness of the stone, were of the most costly workmanship, and accounted the most valuable. Porphyry is a compound rock, consisting of a siliceous ground, with concretions of felspar. Stones of this kind are frequently to be observed in the Highlands.

One species of it has been worked at Inverury †, but though it consists of the same materials, it is not equal in colour, hardness, and polish, to the Roman porphyry. Numerous varieties of this stone are to be seen on Ben-nevish and other mountains; but they are to be seen only at the surface, where they are probably much softer than at a greater

* *Leucostictos antiquorum.*

† *Leucostictos obscurum.*

depth. In the neighbourhood of this mountain, and in other places, loose nodules are to be found, which equal the antique porphyry in colour and hardness; and of which fast rocks do probably exist, not far distant from the places in which they are found.

SERPENTINE.

The stone called serpentine, or ophites, much esteemed by the ancients, was so termed from its coloured spots and streaks, which very much resemble the skin of some serpents. The true antique serpentine, is very little known; that which commonly passes by the name, is not a serpentine, but a porphyry, having a green transparent siliceous ground, with white concretions of felspar*. The real serpentine is of a very different composition, and consists chiefly of jaspideous and steatitical matter †.

A fine stone of this kind is to be seen in Icolumbkil ‡. Extensive rocks of it are stretched along the shore, at the southern extremity of that island, where it might be quarried in abundance. It is of

* *Leucostictos viridis.*

† *Echidna veterum.*

‡ ——— *Columbae.*

considerable hardness, of a pleasant green, clouded with other colours; admits of a fine polish, and is capable of furnishing tables or sculptured ornaments, superior to any sort of marble.

Another fine species of serpentine is found in the north, especially in the district of the Boyne. It was formerly worked; and known, though erroneously, by the name of the Boyne marble*.

Before the Union, it was frequently carried to France, where it passed by the name of the *Verde d' Ecosse*. It consists chiefly of a red martial jasper, and of green steatitical matter of the nature of the nephritic stone, and deserves to be better known than it is at present by our marble cutters and statuaries.

JASPER.

Several sorts of jasper occur in the Highlands; but the most remarkable and valuable is that which occurs in the Isle of Rhume. It forms fast rocks towards the summit of the mountain, which is opposite to the Isle of Canna; and masses of it abound on the beach at the foot of the mountain.

* *Echidna Scotica*.

It is of a bright green colour, with a degree of transparency, receives a fine polish, and would form a valuable material in the hands of the sculptor*.

LAPIS NEPHRITICUS.

The nephritic stone † is a production found at Port na-churich, in Icolumbkil, the creek where Columba first landed from Ireland. It is known among the natives by the name of the Port-na-churich stone; and is accounted a sort of amulet. Small rounded nodules of it are thrown out by the sea, but these have all been separated from the green serpentine above described, in which they are originally lodged.

Good pieces of it are of a greenish colour, half transparent, with whitish clouds, and when held between the eye and the light, resemble very much congealed Florence oil. Its polished surface is not merely smooth, but unctuous, as it were, to the touch, from the magnesian earth which enters largely into its composition. This property did, in former times, and does still, among the Turks, render the stone valuable for the hilts of a sword or sabre. It used

* *Tanos Scoticum.*

† *Nephriticus Columbae.*

to be highly prized for other ornaments, and might be still deservedly in request among lapidaries, was it sufficiently known. Small bits of it are sometimes found fit for rings, very transparent, and with opaline colours *, when it becomes one of the finest of the semipellucid gems.

On the western shores of the Isle of Mull, in the parish of Ross, and on the shores of the Isle of Rhume, lapidaries might likewise be supplied with great variety of onyx and chalcedony of a good quality.

SOAP-ROCK.

The soap-rock is well known to be the best material for the manufacture of porcelain, and which gives to the porcelain of China and Japan, so great a superiority over what has been generally manufactured in Europe.

The English china is formed of various sorts of clay ; but the finest ever made in England, was at the Chelsea manufactory, which, for some time, was supplied with soap rock brought from the Lizard in Cornwall. The scarcity of this material in Britain,

* *Nephriticus opalinus.*

is much to be regretted, but there are appearances of it near Dunvegan, in the Isle of Skye, which deserve enquiry.

In the neighbourhood of that place, a very fine steatitic, or soap rock breaks out at day*, and in such a manner as to give ground to think, that upon digging, it may be obtained in large quantity. It is of a pure white colour, and of a fine impalpable substance, unmixed with any other mineral matter.

Some of it has a greenish tinge, with a degree of transparency resembling the pure steatites called Spanish chalk, and is of a finer quality than that which was found in Cornwall.

TRIPOLI.

The tripoli used by our manufacturers and artists is brought from the African territory of that name. It is little known in Europe; and though many different opinions have been offered concerning its origin, it does not appear that any naturalist has ever had an opportunity of examining this singular earth in its native state: its origin, however, is evident, from its appearance on the maritime rocks at

* *Smectis frustulosa.*

Ord, in the Isle of Skye*. These rocks consist of a simple opaque siliceous stone of a grey colour, and of great hardness. By the influence of the weather, these rocks are decomposed at the surface, and become covered with an earthy crust.

The stone of which they consist, though so hard as to strike fire with steel, passes into a soft friable earth which stains the fingers.

The stone itself is grey, but this earth formed by its decomposition assumes a yellow colour. The earth itself in the aggregate is indeed soft and friable, but its integral parts or particles are extremely hard. When rubbed between the fingers, it appears, indeed, impalpable, and yet a peculiar degree of asperity or hardness is sensibly felt in its most minute particles,—the property which renders this earth of such signal use in the polishing of stones and metals.

It covers these rocks in Skye with a crust from half an inch to several inches in thickness. In its sensible qualities and mechanical properties it is exactly the same with the tripoli from Africa, and may be obtained in quantity at this place to answer all the purposes to which that earth is applied.

* *Tripola Hebridiana.*

CRYSTALLINE SAND.

The high mountains called the Paps of Jura, and many others on the northern coasts of that island, and of Ila, are composed of a peculiar species of siliceous rock *. It is so white, that the bare summits of these mountains appear, at a distance, as if covered with snow. Though this stone consists chiefly of quartz, it is not of a compacted substance, but composed of particles palpable to the eye. It is worn down and reduced to powder by the agitation of the waves, and thrown in upon the shores of these islands in the form of a pure white siliceous sand.

As it is easy to be had in any quantity, and in great purity, it may be considered as a valuable material for the white glass manufacture, any where upon the West coast of Britain, or the Eastern coast of Ireland. In the year 1766, soon after it was observed, there was trial made of it at Glasgow; but to that port, or to any other place upon the Clyde, it may now come to be more easily transported by means of the Crinan canal.

* *Cyanea Juræ.*

MILLSTONES.

It may be presumed, that, in every country, the use of millstones accompanied the introduction of grain. They have been formed, both in ancient and modern times, of various sorts of stone, according to the different sorts of rock in different countries.

The Romans, in Italy, naturally made use of marble, which has also been the practice in other countries; millstones of Italian marble have long been used in Britain for the finest wheat flour: there is a limestone prevalent in the northern parts of France, which has also been applied to this purpose; it is the stone of which the city of Paris is mostly built, and out of which the cave of the Observatory is formed. Millstones of this kind, were formerly transported both into England and Scotland; but, if a calcareous stone is to be used, we have limestones in different parts of the country, particularly at Bruntisland in Fifeshire, which are equal, if not superior, to any foreign marble or limestone whatever.

All these are simple rocks, not composed of different materials obvious to the eye; they are so soft as to refuse striking fire with steel, and are not sufficiently durable for a millstone. The stones most

proper for this purpose, are some sorts of compound rock, consisting of different ingredients; some of which are soft, but others so hard as to prevent the stone from being soon or easily worn down by triture: of these, the different sorts of Sand stone or Free stone, as they are called, have been commonly used in Scotland.

Freestone consists essentially of two ingredients; the one is an argillaceous matter or paste which serves as the base, or, as it is called, the ground of the stone; the other, called the charge of the stone, or the concretions, consists of particles of siliceous sand, imbedded in the argillaceous paste. By the softness of the clay and the smallness of the sandy particles, these stones, however, are soon worn out: the best of them are such as have the least clay in their composition, and in which the siliceous particles or concretions are of the largest size, and the most firmly united.

But the stone usually termed Molaris, or Millstone, is of a different nature from these: it has a base or ground of sand stone, consisting of clay and sandy particles; but in this there are imbedded larger concretions or masses of other stones, some of them very hard, and especially rounded nodules of quartz. These very hard concretions preserve the softer parts of the stone, and prevent their being worn away by the trituration.

In many countries, none of the above stones are to be found, and the inhabitants are therefore obliged to have recourse to others for grinding their grain.

Their choice, however, has been generally and very reasonably directed to rocks of the compound kind, consisting partly of soft, and partly of very hard materials: such were the stones used by the Romans, who accommodated themselves with those stones found in the distant countries which they invaded. A Roman hand-mill for grinding corn, was shewn to me at Papcastle in Cumberland; it was dug, with some other antiquities, at that place, which was a Roman station.

The two stones of this mill were of a micaceous rock *, consisting of two ingredients; the one being mica or glimmer, which is very soft, and the other quartz, which is extremely hard. With this stone they had probably been supplied from the mountains in Wales, or from Westmoreland.

It is very remarkable, that the Roman hand-mill was, in size and shape, exactly the same with the querns still used in the Highlands of Scotland, and formed of the same kind of rock.

* Lepidotus. Scale stone, Micaceous rock.

We have no account of corn having been in use among the Caledonians, previous to the Roman invasion of the country.

This great similarity between the querns and the hand-mill used by the Romans, would insinuate, that it was from them the Caledonians first received the knowledge of grain and its manufacture.

Another sort of millstone brought from France, esteemed more valuable than any other, is known by the name of the French burre: this is a sort of granite whose hardness renders the working of it very expensive, but that is overbalanced by its great durability. All granite is composed of three essential ingredients, quartz, mica, and felspar: these form what is called a conglomerated rock, or one in which the ingredients are compacted together, without any visible intermediate cement. The mica or glimmer is soft, but the felspar and the quartz are siliceous stones of great hardness.

The granites best calculated for a millstone, are those in which the concretions of felspar are neither too copious nor of too large a size. For this stone, the hard granite is of a plated structure, and its plates are apt to separate upon violent concussion or trituration.

The small-grained granites are the best for a millstone, or those in which the concretions of felspar, mica, and quartz, are of a moderate size.

It is surprising, that the granites in Scotland have never yet been applied to this important use.

They abound in many parts of the Highlands and other places in the North, where they might be quarried for the service of the immediate neighbourhood; and they frequently occur, likewise, so near the sea-shore and harbours, as to be conveniently transported to any port of Britain.

There is a fine red granite fit for the purpose, on the shores of the Isle of Mull, opposite to Icolumbkil, where the stones had been quarried of which the ancient abbey on that island is constructed. The high mountains of Cruachin, in Argyllshire, is chiefly composed of a granite of the same kind, upon which quarries may be opened near water carriage on Loch Etive.

On the East coast, there is not a more favourable opportunity for the purpose than what occurs at Aberdeen. Here the grey granite is of an excellent quality, may be easily obtained, and capable to afford a millstone superior to any burre that is brought from France. At Aberdeen, the quarrying and dressing of granite is likewise better under-

stood than at any other place in Scotland—the inhabitants having iron tools for the purpose of a peculiar construction*.

Over all the South of Scotland, granite is a rare production, and chiefly confined to the Stewartry of Galloway; but here there are two places very commodious for procuring millstones of burre or granite: the mountain of Crufell is entirely composed of a fine grey granite, nearly the same with that at Aberdeen; it may be there easily quarried of any size, and easily shipped at the foot of the mountain from the quay at the carse: the other place is upon the river Urre, a little above the house of Munches, where the river becomes navigable; here the granite is quarried for the buildings in the country.

It is so regularly stratified at both these places, as to be easily raised of the proper size, and easily shipped. From these places on the west, and from the neighbourhood of Aberdeen on the east coast, all the rest of Britain might be easily supplied with millstones of the burre kind, superior to any that are brought from France.

* These tools are said to have been introduced, above a hundred years ago, by a native of Aberdeen upon his return home. He had lived many years abroad as a Polish Cremer, and had become acquainted with the use of these tools, in some of the countries on the Baltic.

EMIGRATION.

The present times afford the first instances of Highlanders in a body leaving their country, and even the kingdom, from necessity or disgust. No people in the world have a stronger attachment to their native spot, which nothing but singular occurrences, or very strong motives, could oblige them to abandon.

By the extension of grasing farms in the country of Cowal, even before sheep farming was introduced, great numbers of the inhabitants were removed, who retreated to the low country, and especially to the towns upon the Clyde: the parishes of that district are, in consequence, much inferior, in point of population, to what they were half a century ago; nor are they likely ever to recover it. When the sheep farming took place, in the hills of Dumbarton-shire, and western parts of Perth-shire, the bulk of the people had nothing else for it, but to fly also to the low country. A colony of these found an asylum on the estate of Blair Drummond, where they have indeed exemplified the merit of the common Highlander—they have shewn what a valuable man he is, when properly

treated and encouraged, and his labour properly directed.

There has been for a long time, also, an avenue of emigration to Ireland, from the Western Islands and Highlands, next adjacent to that kingdom. These emigrants are, generally, the young men and women who are induced to leave their country, either for want of employment, or who are enticed by the hopes of reaping more from their labour in another kingdom. As these islands and coasts raise a greater number of people than what is requisite for their present system of agriculture and industry, this sort of emigration must continue till they can be allured to remain at home, by being profitably employed. About the 1st of August, above eighty young men and women have been known to embark in one vessel for Ireland. They usually go about that season of the year to the harvest, but scarce any of them ever return; nor do they even continue long there, but generally join the emigrants who go annually in great shoals from the North of Ireland to America.

The comparative population of the Hebrides and West Highlands, at different periods, for about half a century past, may be judged of by the following statements.

*Twenty-two parishes in the Hebrides, North
of Cantire, contained, Inhabitants.*

In the year 1750, or soon before it*,	36,067
In the year 1755, by Dr Webster's list,	37,126
By an exact enumeration taken in the country, anno 1764,	42,574
By the Statistical accounts, between the years 1791 and 1795,	53,236

*The five parishes in the Hebrides, South of
Cantire, comprehending Bute, Arran, and
the Cumbrays, contained,*

In the year 1750, or soon before it,	7134
In the year 1755, by Dr Webster's list,	8384
By an exact account taken in the year 1771,	9331
By the Statistical accounts, between the years 1791 and 1795,	11072

*Twenty-four parishes on the main-land, North
of Cantire, and chiefly on the coast, con-
tained,*

In the year 1750, or soon before it,	34298
In the year 1755, by Dr Webster's list,	34536
By a particular account taken in the country, in the year 1764,	37772
By the Statistical accounts, between the years 1791 and 1795,	43568

* Register in possession of the church.

OBSERVATIONS.

1. These last twenty-four parishes, form a chain on the West coast of Scotland, near three hundred miles in length. It appears that the inhabitants of this tract, increased about three thousand in number, between the years 1755 and 1764. The real increase, however, was much greater ; for, beside the usual emigrants, the seven years war intervened between these years, during which time, these twenty-four parishes were drained of men for the land and sea service.

2. It appears also, that the people of this district have increased about six thousand in number, from the year 1764 to the year 1795 ; but this is far from being the real amount of its population ; for during that term of years, great numbers of the inhabitants have been drawn off, to the American, and the present war ; and a great part of the people, who have emigrated to America since the year 1771, was from these parishes.

3. It may be observed likewise, that the increase of the people in the islands, is comparatively greater than that on the main land. A family in the Islands is more easily supported, and that chiefly by sustenance drawn from the sea. The inhabitants

eat more frequently, and live more plentifully, than persons of the same condition on the main land ; who, on that account, sometimes reproach the Islanders as gluttons. This gluttony, however, which in other places would be reckoned great moderation, is friendly to population.

4. In general, the above fifty-one parishes in the Hebrides and West Highlands, contain at present one hundred and seven thousand, eight hundred and seventy-six inhabitants, which is probably a greater number than ever subsisted in them before. Their increasing population, from the year 1755, and especially since the year 1764, is remarkable, and fully ascertained. Notwithstanding repeated wars, and frequent emigrations, the number of people in these distant parts, has continued to increase, greatly to the national advantage.

5. Such an overflowing population, where there is not full employment for the people, must induce many of them to leave the country ; one, or perhaps two or three from a family at different times ; but this occasions only the departure of individuals in a slow and successive way, not to the prejudice of the country in its present state, and much to the advantage of other parts of the kingdom. When entire families, and numerous bodies of people, desert the country at once, this, indeed, is an event of a more serious and alarming nature, and this has of-

ten occurred, in different parts of the Highlands since the year 1755. In the remote Highland parishes, above mentioned, where there has been little alteration in the possessions of the people, their numbers have increased, notwithstanding the emigrations which have happened ; but if we attend to other places in the Highlands, we will find that the case is different.

Seventeen parishes in Dunbartonshire, Perthshire, and Argyllshire, bordering on the low country, contained, inhabitants.

In the year 1755, by Dr Webster's list,	30,535
By the Statistical accounts, between the years 1791 and 1795, only	26 748

These seventeen parishes, and many others adjacent to the Lowlands, were, in a great part laid out into large grasing farms for black cattle, soon after the year 1755, and many tenants were turned out of their possessions. The population of these parishes, has been, of course, diminished ; though they neither furnished so large a proportion of men to the wars, as the more distant Highland parishes above mentioned, nor suffered by emigrations to America.

The number of people who have emigrated to America, from the Hebrides and West Highlands, north of Cantire, between the years 1771 and 1794

inclusive, have amounted, by the nearest calculation that can be made, to at least five thousand eight hundred and fourteen persons ; and they carried with them, in money and goods, to the amount of fifty thousand pounds and upwards. It is believed, that both the number of emigrants, and the sum of money, may have been considerably above, but not under that computation. This emigration still goes on, though not so rapidly ; and will probably continue, unless proper measures are taken to prevent it*.

* It was the opinion of an English author of great candour and penetration, while the Union was in dependance, that to admit the Scots to trade with the American colonies, though a measure much opposed by his countrymen, would result to the advantage of England. This seemed a paradox, and was in direct opposition to the prevailing opinion at the time ; but he knew that the wealth the colonies stood most in need of, was a number of people ; he, therefore, pronounced, “ that with this wealth, they would be supplied from the “ barren mountains of Scotland ; and that the poor of Scot- “ land would thereby make England rich *.”

This sagacious conjecture, approaching almost to a prophecy, we have seen realised. The emigration of the Scots to America and the West Indies, since the Union, has been immense. During fourscore years, their numbers have strengthened and enriched the colonies, and the colonies have thereby enriched England.

* Essay on the National Prejudices against the Union, 1706, quarto.

This emigrating spirit commenced about the year 1770, when some considerable proprietors resolved to raise their rents. The tacksmen refused to comply with the offered terms ; upon which, the lands were let to the inferior people, who had been their subtenants. It does not appear that these tacksmen were induced to leave their country from any wanton desire of change, or any deliberate plan of enterprize ; but they found themselves uneasy at home, by alterations in the state of property, to which they had not been accustomed, and to which their minds and views could not correspond ; being men of substance and influence, they had power to persuade numbers of their servants and dependents to accompany them to the wilds of America.

These measures, however, in the management of property, and this emigration, were by no means unfriendly to the population of the country. The subtenants, who form the bulk of the people, were not only retained, but raised in their situation, and rendered more useful and independent. It is the emigration of the lower people that is most to be dreaded ; that of the higher class is really of less importance. A few of them, through disappointment or discontent, may be disposed to leave their country, but the want of them, and of all the stock they can carry with them, is nothing compared to the body of the people of low degree.

Of late years, another cause of emigration has arisen in the Highlands, more formidable than any that may happen, merely from the raising of rents; and that is, the sheep farming.

There is, to be sure, no way of raising the produce of the soil, in any country, with so few people, as by this method. A stock of black cattle requires many hands, both for tillage and for the dairy. A sheep farmer on the hills of the South of Scotland, or of the North, requires neither of these, but can live and make rich in a desert, with his sheep and a very few servants. The introduction of sheep farming, therefore, upon a large scale, must everywhere be destructive to population. Wherever it takes place, if the country has any inhabitants at all, they must, to a trifle, be expelled.

The storemaster, of all farmers, requires the greatest stock in money. In consequence of this, money is often borrowed to a great amount, and at a high rate, generally to his own prejudice, and always to the disadvantage of the landlord. A farmer's property in sheep, especially in a high country, is subjected to more risk and greater losses than any other. It is a stock liable at times to almost utter demolition, by intemperate seasons, and infectious diseases; both calamities having been often experienced. Many of the mountainous tracts in

the Highlands, must be more exposed to disasters of this kind than any other parts of the kingdom; not only from a more severe climate, but because many of them are unwholesome pastures for sheep, and at first sight would be pronounced to be so by a skillful storemaster. Sheep cannot, like black cattle, be driven from the Highlands, to Lincolnshire and Norfolk. If driven two hundred miles, they are unfit for the shambles; and if driven to that distance, to be afterwards fattened, they can afford but a very slender profit. Wool, and its manufacture, are, indeed, valuable, but even these too are precarious. Wool, upon several occasions, in the sheep countries, has become a drug. The stone weight, has been sold for half a crown, which a few years before brought seven or eight shillings.

These circumstances are noticed to show that in the Highlands, sheep are a more precarious stock, and sheep farming a more perilous employment than is sometimes imagined; for the reasons now mentioned, it would be rash, impolitic, and dangerous in the highest degree, to alter the general economy of the Highlands, by giving up black cattle and tillage for the introduction of sheep. Mutton and wool are not to be depended on, as the chief or only produce of the country. Were sheep farming to become universal in the Highlands, and fail; as from many causes, it probably would, the country, being depopulated, could never again return, even to its pre-

sent state. This would not be like other experiments, which, though they fail, and do no good, are productive of little or no harm. The temptation of present advantage may lead to a future calamity that would be irreparable.

The Highlanders are attached to their native land, with a great degree of fervour and patriotism, as the country of their fathers, for whose memory they have a high veneration. They are habituated, from their infancy, to all the inclemencies of a rigorous climate, and to all the hardships and inconveniencies of a thinly peopled and unproductive country. They are, from these causes, however, a temperate, strong, hardy race of men, and of great energy and industry, when well directed. They can live in heart, and in health, where people otherwise brought up, would starve, or die of diseases; they are a people, in fact, made for the country, and the only agents, that can ever reduce it to a state of cultivation. If they are expelled, the Highlands never can be reclaimed or improved, by any other set of men, but must remain a mere grasing field for England and the South of Scotland. By this alteration, indeed, the present rents may, no doubt, be augmented, but they must become immediately stationary, without any prospect of further advancement, and will, in time, from obvious causes, be liable to great diminution. All improvement of the country must cease, when the people to improve it

are gone. The soil must remain unsubdued forever, and the progress of the Highlands must be finally stopt, while all the cultivated wastes of the kingdom are advancing in population and wealth.

The word capital, is now bandied about as sufficient for every thing; but without the sinews of men's arms, it is neither the sinews of war nor of agriculture. The power of money is well known; but the true capital of a nation consists in its number of people. If they are numerous, it is the fault of government if they are not industrious:—If they are industrious, capital, and every other advantage must follow. Money to a state, as well as to an individual, is a precarious possession. The number of people, in such a nation as ours, is the only permanent wealth. While they increase, prosperity of every kind is the consequence; if they are diminished, the power and prosperity of the state must be diminished of course; nor can any capital or wealth compensate for the want of people.

It is but an unseemly reason for the expulsion of people from the Highlands, by sheep farming or otherwise, that they may resort to towns and manufacturing places in the low country. For the reasons already stated, the measure militates against the essential interests both of the proprietor and the public; both are deprived of the hands which should cultivate the country, and the poor emigrants become

a degenerate race, fit only to be consumed in cotton mills. By extensive sheep farms, numbers of the people being dispossessed, have already fled to America, having, in their own country, neither house nor home, nor employment, to which they could resort. If proper manufactures were at hand, these indeed would answer the purpose; but they are not. The establishment of manufactures in the Highlands must be a work of time; whereas, by sheep farms, the people are dismissed at once; and when banished the country, it is certainly too late to talk of manufactures for their employment.

There can be no doubt that sheep farming may, and ought to be carried on in the Highlands to a great extent; but it is equally certain that this may be done without depopulating the country, and much to the advantage of all parties concerned.

To a person well acquainted with the sheep farming of the South of Scotland, the state of the Highlands, in the year 1764, with respect to sheep, could not but appear surprising. On many extensive farms of mountainous pasture, there were none kept; on others, there was only a handful, which, from necessity, were housed every night. The whole scarcely afforded wool sufficient for cloathing the inhabitants. The only reason given for this scarcity of sheep, was the destruction they were exposed to from the fox and the eagle.

It was evident, upon every hill farm, that there was a great quantity of pasture lost, which would have been fit for sheep, and which was not consumed by the black cattle; on every such farm, therefore, a considerable number of sheep might be maintained, could they be kept in safety, without diminishing the number of cattle. The additional sheep which might have been kept, and which still may be kept, were computed at least, to be five hundred thousand, without any decrease in the number either of the inhabitants, or of the black cattle. The great and indeed only impediment to this, which was then thought insurmountable, was the devastation occasioned by the foxes and eagles: an obstacle which has since been partly obviated, and, in a little time, may be entirely removed. The number of sheep may therefore be enlarged in the Highlands to a great degree, without diminishing the number of people, without encroaching on the stock of black cattle, and without any hazardous alteration in the general state of the country. In this way, the addition of five hundred thousand sheep, kept generally where cultivation is impracticable, would not only add greatly to the income of the proprietors, but, instead of depopulating the country, would give additional employment to the inhabitants. Any proprietor who converts his hills into sheep pasture, with advantage to himself, must communicate advantage to the public, provided the population of his estate does not suffer; but if, in consequence of his

particular and temporary emolument, the people are set adrift, the detriment to the public is greater than he will ever be able to compensate: He may make many improvements and many alterations; but if he respects the future interest of his property, of his family, and of his country, he will retain his people.

The depopulation of the Highlands of Scotland, would be a serious and alarming event to the kingdom; the disposition of the natives to emigrate ought, therefore, to be counteracted by every possible and prudent method. The mere raising of rents, in an equitable manner, will never force the body of the people from the country; but if large tracts of inhabited land, capable of cultivation, and of maintaining a stock of cattle, are laid waste for the maintenance of sheep, the flight of the people is inevitable. The remedy for this, must depend on the proprietors of the country. The institution of the Highland Society took place at a very seasonable time. Its efforts have already been highly useful, and, it is to be hoped, will continue to be so, in warding off the threatened calamity of emigration either from the above or from other causes. Were government to prevent it, in the way of restraint, either upon the people or proprietors, it would be with a hand too high for the nature of British liberty. Coercive measures are but desperate expedients to confine people to a country: But there is one way

in which the interference of government would be laudable and effectual ; that is, by certain regulations in the laws, respecting the fisheries. All the emigrants to America have been from those parts of the Highlands and Islands, where a large proportion of the inhabitants may have full and lucrative employment in the fisheries ; but for this purpose, several alterations in the present laws would be requisite. It might be rendered evident, however, that, by these alterations, government may obtain this end, without any expence, without infringing on the revenue, to the great advantage of the proprietors, and of the population and wealth of that extensive tract of the kingdom.

ECONOMICAL SOCIETIES.

In a paper which was circulated in the year 1772, among other articles relative to the improvement of the Highlands, particular notice was taken of the expediency and utility of instituting an economical society in each of the four great counties of Perth, Argyll, Inverness, and Ross. If such a society, consisting of the proprietors, and most intelligent inhabitants, was to take under its cognisance, the advancement of husbandry, and all other matters within the county relative to agrestic and national economy, the most beneficial effects might be expected. Nothing tends so much to advance na-

tural knowledge, and all the arts of rural economy, which are founded upon it, as a free communication between individuals, and different societies engaged in the same pursuits.

Such a society in these counties, or in any other part of the North of Scotland, has now the advantage which it would not have had then,—of the information and patronage to be obtained from the Highland Society, and the Board of Agriculture. Since that time, several societies of this kind, now deservedly of considerable name, have been established in England, as at Bath, Manchester, and other places. Of late, there has been one formed in the shire of Ross, another in Caithness, and one in Orkney; and it is to be hoped, that the example will be followed in other counties. Every such society, in any part of the country, must do some good:—If rightly conducted, it must advance the interest of the farmer, of the landlord, and of the public.

In general, some of the objects most deserving the attention and encouragement of such a society, are,

The expedient alterations and improvements in tillage and pasture.

The most perfect implements of Husbandry.

The best sorts of grain, and other crops to be used.

The most eligible changes of seed-corn.

The improvement of the breed of cattle, and of their management, with that of the dairy.

The properest methods of constructing and upholding the fences best adapted for the country.

The old and hurtful practices in husbandry to be discountenanced, and those which are beneficial, though new, to be introduced.

To promote the separate exercise of the mechanical employments, connected with agriculture.

The advancement of plantation and gardening.

The discovery and use of natural manures.

To communicate and disseminate the knowledge of useful experiments and practices.

To distribute premiums among the operative farmers, and to keep alive the flame of public spirit in the breasts of private men.

F I N I S.

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