

COLOURING OF THE MAP.

- NO. 1. Lakes, or Waters.**
- NO. 2. Carse Clay.**
- NO. 3. Moor, and Mountain Pasturage.**
- NO. 4. Soils chiefly Alluvial, or formed from decomposed Whinstone.** The first passing from sand and gravel to friable clay or loam; the latter chiefly friable clay. They are mostly of a red colour, passing to brown and dark brown, according to the proportion of vegetable matter they contain.
- NO. 5. Retentive Subsoils.** These are also of a reddish colour, but often darker than the former, from the upper soil containing a proportion of moss.
- NO. 6. Sandy Downs, provincially *Links*,** where the sand is generally blown into hills.

AGRICULTURE

OF

ANGUS, OR FORFARSHIRE.



GENERAL VIEW
OF THE
AGRICULTURE
OF THE COUNTY OF
ANGUS, OR FORFARSHIRE;
WITH
OBSERVATIONS ON THE MEANS OF ITS IMPROVEMENT;
DRAWN UP
FOR THE CONSIDERATION
OF THE
BOARD OF AGRICULTURE,
AND INTERNAL IMPROVEMENT.

BY THE
REV. JAMES HEADRICK,
MINISTER OF DUNICHEN.

Quid faciat letas segetes. VIRG.

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INTRODUCTION.

IT seems unnecessary to expatiate upon the importance of Agriculture, because every person who takes the trouble of looking into this work, must be satisfied, that it is the first, and most necessary of Arts, and that it combines in its illustration, the whole circle of the Sciences.

Amidst the great improvements which have been lately made in this art, men are apt to look back with contempt, upon the rude and imperfect practices of their ancestors, and to conclude, that the art of rendering the earth productive of human food, has already attained its acmè of perfection, beyond which it cannot be carried. But from some hints which are suggested in the following work, and from others which might have been adduced, had they fallen in the Author's way, it may appear, that this is very far from being the case; that Agriculture is still comparatively in a state of infancy, and that a future generation, may have as good reason to look back with contempt,

upon the most approved systems of this, as we have to censure those of the generations that are past. The establishment of a National Board, which has successfully laboured *to collect facts*, concerning the state of Agriculture in the various districts of the kingdom under its inspection, has laid a solid foundation, on which future improvements may be erected. They have not only made the improvements of one district, known to those who reside in other districts; but they have furnished abundant hints, by which the practice even of the most improved districts, may be carried to a higher degree of perfection, than it has yet attained.

With regard to the facts contained in the following work, the author can truly say, he has spared neither time, labour, nor expence, in order to attain them. He has received important information from various persons, whom he highly respects, but whose modesty, induced them to insist upon concealing their names, which would have added much weight and authority to his statements. The names of other persons are mentioned, along with the information they communicated. After all, in a subject so complicated, he is aware that many mistakes have been committed, and that the facts adduced, are very far from being so minute, so correct, or so multifarious as could be wished.

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observed several typographical errors, of which he thinks it incumbent on him to offer corrections, in so far as they affect the sense, leaving those which do not alter the sense, to be corrected by the reader. Thus, in

Page 21	} Line	} {	9	} For <i>North Esk</i> , read <i>South Esk</i> .
— 122			26	
— 176			1	
— 206			32	
— 338			23	
— 517		12		

Page 341 line 13, instead of *for* read *from*
 — 378 — 12, ——— *who* — *which*

The author has also observed several places, where the facts stated in the following sheets, are either defective, or in some degree inaccurate; or where alterations have been made since this account was drawn up. These defects, he thinks it incumbent upon him here to supply, as far as alterations have reached his knowledge.

Thus, in page 41., an account is given of the clay and stone marl, which have long been used, with good effect, in the parish of Lethnot, and places adjacent. He is now assured, that a great body of similar marl, has been lately discovered in the lower parts of the parishes of Kirriemuir and Cortachie, and has begun to be applied to land with flattering prospects of advantage. This appears to be a continuation of the fossil marl found

in

in Lethnot, as both seem to have the same relative position, in respect of the Grampians.

In page 52., there is some degree of inaccuracy, in the account given of the mineral spring, which breaks out from the lands of Dumbarrow, parish of Dunichen. The fact is, that although this spring has its source, or fountain, in the lands of Dumbarrow, the bason into which it is conducted, and the place where it breaks out, is in the parish of Kirkden, being close to the boundary of the two parishes. Chalybeate springs are so numerous in this county, that it was thought unnecessary to mention any, except such as are chiefly resorted to. Thus a small one, oozes from the north side of the drain, which conducts the water from the Mire of Dunichen, which, although not so copious, appears to be stronger than any that are mentioned.

In page 192., a description is given of floating docks in the harbour of Dundee, by means of which, the bottoms of vessels were repaired ; and this is marked as a singularity, the author having seen nothing like it before. Since this account was drawn up, or rather since it was submitted to the press, a most elegant dry dock has been constructed, towards the east side of the harbour of Dundee. This dock, is capable of receiving vessels of 500 tons burden, being the largest that can
enter

enter the harbour. It was ready for the reception of vessels on the 1st of September last, 1812.

In addition to the Infirmary at Dundee, which the author could not help stating as the most beneficial, and at the same time the least likely to be abused, of all charitable institutions: they have lately begun to build a Lunatic Asylum, in a well aired field to the east of the town, which commands a fine prospect of the Frith of Tay, and of the opposite coast of Fife. Here the author feels himself again embarrassed. Where so many persons require him to hold his tongue, and mention no names, he hopes it will give no offence to say, that this, as well as other charitable institutions, have been warmly patronised, and supported by liberal subscriptions, by our worthy representative the Honourable William Maule, and by other noblemen and gentlemen of the county. It may also be stated, that the charitable institutions of this place, as well as some of national importance, have been much indebted to the zeal and benevolence of the Reverend Dr Nicol, minister of Strathmartine.

In page 205., it is erroneously stated, that there are no fairs at Montrose. Now, there are annual fairs in every town of the county, as may appear from the usual Kalendars or Almanacs.

In page 330., an experiment is mentioned, which had for its object the improvement of the breed of Swedish turnips; and in page 352., a proposal is made, for improving the breeds of all the plants usually cultivated. In conducting this experiment, the author selected two of the largest and best-shaped Swedish turnips that grew in his garden, and planted them for seed, in a corner by themselves. When cabbages, coleworts, other turnips, or any plants of the *brassica* genus threatened to flower, in any part of the garden, they were instantly destroyed. The author has now, 10th November 1812, a lot of Swedish turnips, from this seed on his glebe of Dunichen, which, in size, shape and uniformity, very much surpass any other Swedish turnips he has seen in the county. He has two other lots, one of the globe, the other of yellow turnips, of which the seed was warranted genuine, but they exhibit a mixture of various sorts of turnips. Upon the whole, the result of this experiment affords good encouragement, not only to persevere in improving the breed of Swedish turnips, but to extend the operation to other plants.

In a Note, page 374., it is stated, from Mr Robertson's Survey of the County of Mearns, that larches had been found to grow from shoots, as well as from seeds. The author tried this experiment, by planting young shoots of the larch, early
last

last spring in his garden. But though they were planted several times, the shoots were instantly carried off by crows, or rooks, of which there is a numerous fraternity in the immediate neighbourhood, for building their nests. In page 459., the author speaks doubtfully concerning these birds, because several gentlemen, for whom he entertains the highest respect, think they do much good, by picking up slugs, and other vermin which destroy the crops. He is now, however, from sad experience, induced to adopt the opinion of the great body of the practical farmers, that the good they do, is extremely problematical, while the mischief they occasion is extensive and glaring. In winter, they root out the young plants of wheat and clover; and they commit much havoc upon potatoes, and every species of corn, both in spring and autumn. In England, where these birds are sometimes used as food, they make some compensation for the depredations they commit. But as they are seldom used in this way, in any part of Scotland, it seems incumbent on proprietors, not to encourage and protect, but rather to adopt the most efficacious means of rooting them out.

In page 416., it is stated, that drifted sea-weeds, (*fuci*), are much used as manure to the lands near the coast. It should have been added, that small quantities of kelp, are annually manufactured at certain places along the coast. These are, where
there

there are openings to the sea beach among the rocks, and a considerable area of rocks, which are left dry at ebb-tide, extending from the shore. The weeds are cut with sickles, and are spread upon the beach to dry. They are afterwards burnt in small pot-kilns, formed with rude stones in the usual way. But as a great part of the sea-shore, is a sloping sandy beach, or perpendicular rocks, on which no *fuci* can fasten their roots, there is but a small proportion of surface, where *fuci* can grow for the manufacture of kelp. The surface for the production of *fuci*, might be very much increased, by dropping large stones at certain depths below tide. Each species of these plants, grows at a depth peculiar to itself; and they succeed each other, with as much regularity as the zones of the globe. Those which grow in the deepest water, yield kelp in the greatest proportion, and of the best quality.

Several years ago, when the author was employed in exploring the extensive estates of the Right Honourable Lord Seaforth, he made several experiments upon sea-weeds. He found them to contain muriate of soda, and the other salts which occur in sea-water, with a large proportion of mucilage, which, were it freed of these salts, seemed capable of serving the purpose of gum arabic in calico printing, and other manufactures. But no trace of alkaline salt could be detected in the fresh weeds,

weeds, by any of the tests he employed. By distillation, these plants yielded a volatile oil, somewhat similar to that which comes from coal; mucilage, which dissolved in water over which it was received; and a resinous substance, very much resembling japan varnish, of a glossy black colour, insoluble in water, and which burnt with a white and very bright flame. He therefore named it *Marine varnish*, and it seemed applicable to many purposes of the arts, as well as for paying the bottoms of ships. The heat being raised to redness, or even above this point, no more volatile matter came over. After the distilling-vessel had cooled, the residuum was found to be charcoal, impregnated with sea-salt; but still no trace of alkaline salt could be found in it. This coaly residuum, being burnt with access of atmospheric air, soon discovered strong symptoms of alkaline salt, by changing blue, red, and purple vegetable colours to green.

It seems to follow from these experiments, that the soda in kelp, is formed from the combination of atmospheric oxygen, with some ingredient in the sea plants, or from the decomposition of muriate of soda existing in the plants. But as the formation of soda, never takes place, without contact of the plants with atmospheric air, while they are in an ignited state, and much undecomposed sea-salt remains in the kelp, after it is burnt, the former appears to be much more probable than the latter.

latter. Sir Humphry Davy having demonstrated that alkalis, and alkaline earths, are metals saturated with oxygen, it seems to follow, that the basis of soda, exists in sea-plants, in its metallic state.

A very great proportion of the kelp manufactured in the usual way, consists of charcoal, which had escaped oxygenation in the usual process of burning. This charcoal, being separated from soapers' waste, and having every previously existing salt, carefully washed from it, the residue may be made into balls; and these being subjected to a strong heat, in a proper furnace, with access of atmospheric air, melt almost wholly into pure soda, or a mixture of soda and potash. From these facts it appears, that in the ordinary process of burning sea weeds into kelp, only a very small proportion of the weeds, are converted into that alkaline salt of which they are in quest.

The late Colonel Fullerton, constructed a kiln for burning sea-weeds into alkaline salt; and he produced soda, from the plants which grow around our shores, little inferior, if not equal, or surpassing in strength, the barilla of Spain. His kilns, are chiefly adapted for situations, where great quantities of sea-weeds are drifted in by storms, and which must be burnt into kelp, before putrefaction has made much progress. They have been tried

in the Orkneys, and some of the Hebrides; but they require a strong fire of peat, or of coal, during the whole process, which, in such situations, it is not easy to find fuel to support.

After making the experiments above detailed, the author proposed to add a long trough, or bason of water, to his friend Colonel Fullerton's kilns, over which the smoke, which escapes from the sea weeds, during the progress of burning them into alkaline salt, might be conducted, and the marine varnish be condensed. This trough might be composed of sheet-iron, or of wooden boards, covered with sheet-iron at the side most exposed to the heat. A pan, filled with cold water, might be placed above the tunnel through which the smoke was conducted, with a view to accelerate the condensation; or, there being few places where kelp is burnt, where there are not burns or springs descending from higher ground, a small rill of water, might be conducted through a pipe, and projected among the smoke from a rose, like that of a watering-pan. With regard to the gases, and incondensable part of the smoke, he proposed to take these off, by a tall chimney, which might be formed of coarse boards; and this would also cause a draught through the apparatus.

When conducting the above experiments, it was observed, that great quantities of water, mixed with

with incondensable gases, and volatile oil, first came over. Part of the oil was condensed, and floated on the surface of the water in the receiver; but the greater part went off, with the incondensable gases, to which it communicated a disagreeable smell. A considerable quantity of mucilage also came over, part of which remained dissolved in the water contained in the receiver. But the marine varnish, did not begin to rise until the heat, to which the sea-weeds in the retort were exposed, approached, or actually amounted to, redness. This was the last volatile product which was obtained, and it formed clots at the bottom of the water in the receiver.

If the volatile oil and mucilage which form part of the smoke of burning sea-weeds, be found of any use, they can easily be obtained in a separate state: If not, they can be washed off from the marine varnish, which will always sink, to the bottom of the water, over which the smoke is made to pass.

The author thought of a kiln for burning sea-weeds that were previously dried, which would effectually accomplish the object, without requiring any extraneous fuel, except what was necessary to commence the inflammation. This kiln might be constructed of bricks, properly moulded, and might be erected, on a flat-bottomed boat, which might

be moved round from creek to creek, and burn all the dried weeds, which were collected at each station in succession. Or the bricks and materials of which it is composed, might be carried in a boat, and the kiln erected, in a few minutes, on any part of the beach, there to operate, until all the sea-weeds within its reach were consumed. The kiln to be then removed to another station, there to operate in the same manner. To this kiln, the apparatus for condensing the marine varnish might easily be added; and thus this product, in addition to a much larger proportion of alkaline salt, might be obtained from the same quantity of sea-weeds.

When the author was last in the Orkney Islands, he caused a kiln of this sort to be constructed, with a view to try the experiment on a large scale. But in that country, it was so long before he could get the materials collected, and men to execute his plans, that winter came on, with violent storms, and excessive rains, which rendered the experiment impracticable. It behoves public bodies, such as our Highland Society, to assist in carrying such projects into effect.

Though somewhat foreign to the objects of this work, the author has been induced to lay before the public, a summary of his experiments and plans respecting sea-weeds, because he has long indulged

indulged the sanguine hope, of seeing an acre of these plants, especially those which grow in deep water, rendered more valuable, than an acre of cultivated plants, on the most fertile soil, or than an acre of sugar canes in the West Indies. While they rendered Britain independent of the world, for an indispensable material of her manufactures, namely, the alkaline salt they might furnish, the hands employed in its preparation, might strengthen that Navy, from which the marine varnish they yielded, excluded the sea.

In treating of turnips, page 330., it is stated, that "the feeding of sheep upon turnips, by means of nets or hurdles, has not yet been introduced into this county." This statement was correct, when that part of the work was drawn up a few years ago. But of late, this practice has been introduced into the parish of Inverkeillor, and places adjacent, and is every year extending. In place of nets, they use hurdles, provincially called *flakes*, which are composed of horizontal spars, morticed into upright posts, that are furnished with feet on which they can stand, and with angular posts, by which they are propped, and prevented from being blown down by the wind. These flakes are run along, from one side of an inclosed turnip field to the other, and are so placed, as to leave three or four rows of turnips on the outside, on which the sheep can feed at a time. When these are consumed,

the flakes are again moved ; and so on successively, until the whole turnips are consumed. The land derives much benefit, from having the droppings of sheep equably spread over it ; and sandy soils are likely to derive some benefit from being trodden, and poached by sheep during winter. There is always an inclosed field of pasture ley, to which the sheep can retire when they please, where they can ruminare, or nibble a few piles of grass. To what is stated respecting the breeds of sheep, page 446., &c. it may be added, that since that article was drawn up, some gentlemen have introduced the Merino breed of Spain, and parcels of very fine wool have been produced. Whether these animals shall continue to yield such fine wool, under a treatment so very different from that to which they are subjected, on the mountains and valleys of Spain, remains to be ascertained.

In page 525., it is stated, that the bridge of Finhaven, on the Strathmore toll-road, was built by subscription, and is upheld by a toll, &c. This account the author had from persons whom he accidentally met upon the spot, when he was exploring that part of the county some years ago. He is now assured, that this bridge was built from the same funds from which the road was constructed, and that the toll-bar to the east of it, is not a toll upon the bridge, but upon the road.

In

The only bridge in the county, on which a toll is levied, for the special purpose of maintaining it, is the wooden bridge at Montrose, so often mentioned in the course of the ensuing work. This is not the first time the author has had occasion to correct casual and erroneous information, by more deliberate inquiry; and though he has thus noted down such errors and omissions as have occurred to him, on perusing the following sheets, he is aware, that there may be others, which have escaped his notice.



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AGRICULTURAL REPORT

OF

FORFARSHIRE, OR ANGUS.

BOOK I.

GEOGRAPHICAL STATE AND CIRCUMSTANCES.

SECT. I.

NAME, SITUATION AND EXTENT.

THIS county derives its usual name from Forfar, the county town, where the Sheriff's courts are held, and where all general meetings of the Freeholders, Commissioners of Supply, and Justices of the Peace, are also held. But this county is also known by the name of *Angus*, which some think was imposed upon it by a son of one of our Scottish kings, of that name, to whom it was granted in appanage. Persons skilled in the Gaelic, however, think this name denotes a hill of a particular description, or which was appropriated for a special use. There is a hill eastward from the church of Aberlemno, which is distinguished by the name of the *Hill of Angus*, which was probably the usual place of rendezvous for the

the Angusians, during the predatory incursions of the Norwegians and Danes. It looks down upon Lunan Bay, and the whole sea-coast of the county, where these people commonly landed, and drew up their vessels upon the sandy beach. The curiously carved stones near the church, are commonly thought to be monuments over some chiefs who had fallen in battle with these people. Some think that the name of this hill had been gradually extended to the whole county.

The county of Angus, or Forfarshire, is bounded on the west by Perthshire; on the north-west and north by Aberdeenshire; on the north-east by the county of Mearns, or Kincardineshire; on the east by the German, or more properly, the British Ocean; and on the south by the Frith of Tay, which separates it from the county of Fife. It is situated between $56^{\circ} 27'$ and $56^{\circ} 59'$ of north latitude; and between $0^{\circ} 14'$ west, and $0^{\circ} 46'$ east of the meridian of Edinburgh. This meridian intersects the western division of the county, and is $3^{\circ} 11'$ west longitude from Greenwich.

The medium extent of this county, from north to south, is $28\frac{1}{2}$ miles, and from west to east 29 miles, of $69\frac{1}{2}$ to a degree. Hence its superficial area is equal to $831\frac{1}{2}$ square miles, or to 532,243 English, 435,144 Scotch acres*; the latter being the measure commonly used in this county. From this calculation are excluded small portions of the parishes of Cupar and Alyth, the greatest parts of which are situated in the county of Perth.

SECT.

* A Scotch is nearly a fifth larger than an English acre, so that four Scotch are nearly equal to five English acres.

SECT. II.

DIVISIONS.

THE county is naturally divided into four districts. These are, 1. The Grampian District, which includes somewhat less than a half of the superficial area. The Grampians* are a great chain of primary mountains, which extend from the Clyde opposite to Greenock, until they terminate in the British Ocean, at Stonehive, near Aberdeen. They run nearly from south-west to north-east; and form the barrier between the Lowlands and Highlands of Scotland. They exhibit ridge behind ridge, with many intervening lakes, and valleys on the sides of rivers, until they reach the Western Ocean. The portion of the Grampians included in this county, is distinguished by the name of the Binclinnin Mountains. None of these mountains are so abrupt and majestic as many other alpine districts of Scotland, nor are they covered with such valuable herbage as falls to the lot of some. These mountains are generally rounded and tame, are mostly covered with a thin coat of moorish soil, and carry stunted heath. Perhaps the only exception to this observation, are the mountains at the head of Glen Clova. There the glen divides into two narrow defiles, and the valley is bounded by a mountain which rises abrupt and majestic, between the defiles into which the glen divides. This, and the contiguous mountains exhibit bold and terrific precipices; and where there is any soil, it is clothed with green and succulent herbage. An observation of the late Dr Walker, Professor of Natural History, Edinburgh, "That the steepest side of moun-

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tains,

* *Gran-poa*, British, signifying *head, chief ridge, or ledge*.—Chalmers' *Gelebrics*, p. 112. *Gran-bhen*, Gaelic, *great-hill, or mountain*.

tains, islands, and continents, is chiefly towards the west,"—is in them verified; the most abrupt declivity of these mountains being towards the west. It is hence, that the streams which arise in the west and north of the county, run chiefly south-east, and receiving in their progress innumerable torrents from the mountains, are swelled into rivers before they reach the ocean. These streams have scooped out considerable valleys among the mountains, the principal of which are Glen Isla, with its branches, on the west, Glen Prosen, Clova, Lethnot, and Glensesk. The Grampian district of this county is about twenty-four miles from west to east, and from nine to fifteen miles in the opposite direction. It includes the following parishes, namely, Glen-Is'la Glentrethen, part of Kirriemuir, Kingoldrum, Cortachie and Clova, Edzel, Lethnot, Lochlee, Fern, and Menmuir.

2. The next division of the county is Strathmore*. This is situated between the foot of the Grampians, and the Seedlay Hills †.—Strathmore is a great valley, which runs parallel to the Grampians, from their commencement in Dunbartonshire, to their termination on the borders of Aberdeenshire. Excepting a narrow ridge which crosses this valley at Muthil in Perthshire, and which connects the Grampians with the Ochil Hills, and another lower ridge at Kippen, between Lochlomond and the plain of the Forth, and which also connects the Grampians with the hills of Touch, or Campsie Fells; no part of this valley seems to exceed 200 feet of elevation above the level of the sea. It would hence be a great national improvement to carry a navigable canal through

* *Great valley, Gaelic.*

† Probably, *Insular hills of prospect*, some of them having lakes interposed between them, and there being several swamps which have been drained, and were formerly lakes.

through the whole extent of this valley, from the Clyde at Dunbarton, to Stonehive near Aberdeen. This canal would connect the three great navigable rivers of Scotland, the Clyde, the Forth, and the Tay; would pass through a country which is every where well cultivated, or is capable of the highest cultivation; a country abounding in manufacturing towns and villages, where manufactures might be carried to an incalculable extent, were such an accommodation afforded; and this canal would possess the additional advantage of forming the shortest road of communication between the fertile and populous districts in the south, and those in the north of Scotland.—But of this we shall have occasion to treat more minutely hereafter.

The portion of this great valley which is situated in this county, is frequently distinguished by the name of the *How* [hollow] of *Agus*. From the western boundary of the parish of Kettins, to the mouth of the North Esk, it extends about thirty three miles towards east-north-east, and its breadth varies from about four to six miles. This valley is beautifully diversified by gentle eminences, fertile fields, plantations, villages, and gentlemen's seats. Portions of it still remain waste and uncultivated; other parts, as the Loch of Forfar, are covered with water, and there are others, which not being sufficiently drained, are covered with water during wet seasons. This district comprehends the district of Kettins, parts of Coupar and Alyth, Newtyle, Fassie and Nevay, Ruthven, Airly, Glammis, Kinnettles, Forfar, Kiriemuir, Oathlaw, Tannadice, Carraldston, Brechin, Strickathrow, Dun, and Logie-pert; with parts of Menmuir and Edzel.

3. The Seedlay Hills form the third division of the county. These are a continuation of a ridge which runs parallel to Strathmore, or to the Grampians, from the Hill of Kinnoul near Perth, to the north-east extremity of the

county of Mearns. It is probable the Hill of Kinnoul had formerly joined the ridge which separates the Tay from Stratherne, and that again had joined the western acclivity of the Ochils. The western acclivity of the hills of Touch form the continuation of this ridge; and thus, excepting the plain watered by the Teath and Forth, there seems to have been a continued ridge, facing the Grampians, from Dumbuck, or the rock of Dumbarton Castle, to the termination of Strathmore in the British Ocean, at Stonehive. The mineral strata of this long chain of hills, are all composed of similar materials; and the strata of the intervening valley between the ridge and the Grampians, are not only similar in structure, but in position. This seems to indicate, that all these strata are coëval, or of one formation. Many hills in this chain are detached, with conical summits. Of these, the most remarkable is the Hill of Dunsinnan, in the county of Perth, near the confines of Angus, which has been immortalized by the dramatic genius of Shakespeare. Some are rounded and detached, with intervening valleys, as the hills of Lower, of Dunichen, of Dumbarrow, and others. In some cases, these hills form a long ridge, of moderate elevation, of which we have an example in the ridge of the Tulloes, which bounds the parishes of Inverarity, Dunichen, Kirkden, &c. towards the south.

The name *Seedlay Hills* is appropriated to that part of the great chain facing the Grampians, which is situated in this county. Some of these hills are upwards of 1400 feet above the level of the sea. In many places they are covered with stunted heath, and in others they are cultivated to their summits. The Seedlay district terminates at Redhead, a promontory on the coast of the British Ocean. Its length is about twenty-one, and its breadth from three to six miles. It includes the following parishes, namely, Lundie, Auchterhouse, Strathmartin, Tealing,

Tealing, Inverarity, Dunichen, Kirkden, Rescobie, Aberlemno, Guthrie, Carmylie, with the north part of Murroes and Monikie.

From some of the detached Seedlay hills, there are extensive prospects, on the one hand, of the valley of Strathmore, through its whole extent; beyond which are seen Benlomond, Benliddi, Schehalien, the conical mountains behind Kingshouse, at the summit of Argyleshire, and many other high summits within the Grampians, of less note. Upon some of these summits the snow remains a great part of the year, and at the approach of winter it is seen gradually to descend down the sides of the Grampians, until it covers the lower grounds. In these cases, what is rain below, is snow in the more elevated regions; and the Grampians exhibit an irregular barrier of snow, intercepted by a regular line, whose elevation varies with the ascent or descent of the region of frost. On the other hand, the prospect from these hills is bounded by the Ochils, and the higher grounds of Fifeshire. They look down upon the Frith of Tay, and the shipping which is constantly plying in that estuary; upon Arbroath, Montrose, and the British Ocean.

4. The fourth, or Maritime Division of the county, is, with a few exceptions, a fertile and highly cultivated tract. It extends from the south-west boundary of the county, to the north-east, near the mouth of North Esk, upwards of thirty-seven miles. Its breadth varies from about three to upwards of eight miles, and it contains upwards of 222 square miles. Excepting a few rounded jutting hills, some of which are distinguished by the Gaelic name of Dunes, its surface slopes gently to the Frith of Tay on the south, and to the British Ocean on the east. At Broughty Castle, where the Frith of Tay is very much contracted in its dimensions, there com-

mences an extensive tract of links, or sandy downs, which occupy a great part of the parishes of Monifieth and Barry. Towards the point of Tay, where the estuary joins the Bay of St Andrew's, the sand is blown into hills, without any vegetation, which are dangerous to approach in blowing weather. Another tract of sandy downs is situated between Panbride and Arbroath, and there is another contiguous to Montrose. In many places, these downs exhibit extensive beds of sea-shells, proving that they had been once covered by the sea. On examining the bank towards the rising ground, it appears evident that the sea had formerly occupied a higher level, by at least fifty or sixty feet, than it does at present; and this remark is confirmed by an inspection of the British shores, both on the east and west. This tract is adorned with towns and villages, with elegant villas and farm-offices; with plantations, and land in a high state of cultivation. It comprehends the parishes of Liff, Dundee, Mains, part of Murroes and Monikie, Monifieth, Barry, Panbride, Arbirlot, Aberbrothwick, St Vigeans, Inverkeilor, Lunan, Craig, Maryton, Farnell, Kinnel, and Montrose.

When a parish is stated to be in a particular district, it is meant, that the greater part of it is so situated; though a small portion of it may be in another district.

SECT. III.

MINERALS AND FOSSILS.

Grampian District.

THE rocks of which the Grampians in this county are composed, and those which occupy the intermediate space between them and the sea, are very accurately described by the ingenious Colonel Imrie, in the Transactions of the

the Royal Society of Edinburgh, and illustrated by an accurate plan, which exhibits the relative space which each sort of them occupies. It will therefore be only necessary to notice a few particulars which do not occur in the district examined by the Colonel, and to point out the relative position of the different kinds of rocks which occur in the county*.

These are, 1. Towards the summit of the county, on the confines of Aberdeenshire, GRANITE of various qualities, some of it very beautiful, and forming a very durable stone for building. This stone is chiefly composed of felspars of various sizes, crystallized into rhomboidal figures, which, when fresh broken, commonly exhibit a sparkling appearance somewhat resembling the more perfect crystals of lime. When the felspars are of small size, or are contaminated with iron, the fragments of this stone are not so beautiful. Between the crystals of felspar are commonly interposed thin laminae, or plates of talc, which is more properly called mica, from its glittering appearance, though it is often of a dull leaden or greenish colour. This stone polishes like marble, and polished plates of it transmit a small proportion of light. There is one particular by which this stone is distinguished from all others that are known. It contains no visible substramen, or cement, which unites the parts together. Its crystals adhere, without having any visible substance interposed, which occasions their adhesion.

In cavities and fissures of the granite rocks, topazes, or rock-crystals, are found. When they are white or transparent, like crystal-glass, they are commonly named rock-

* See Transactions of the Royal Society of Edinburgh, vol. vi.—We are just favoured with the second edition of the ingenious and accurate Colonel SMITH'S Survey, and beg leave to present an abstract of it in Appendix, A.

rock-crystals; when they are of a smoky, or yellow colour, they obtain the name of topazes. They are found of all degrees of perfection, from a rude approach towards a regular figure, to complete crystals. The more perfect ones are of various sizes; sometimes, though rarely, from twelve to fourteen inches in length, and of a proportional thickness. They are commonly five-sided prisms, the sides furrowed transversely, and terminating in polished five-sided pyramids at each end. The end which projects from the rock to which they adhere, is always much thicker than the opposite end. These more perfect crystals are always found disseminated in large crystals of felspar, distinguished by the foolish name of *adularia*, which form a crust on the rock to which they adhere. They are either of a smoky, or yellow colour, the latter often rivalling in brilliancy the Indian topaz. The frost of winter diminishes their adhesion to the rocks where they are formed; and torrents swelled by melting snows, sweep them down, and expose them to be picked up by shepherds. In this country they are commonly known by the name of *cairngorums*, from a granite mountain at the summit of Aberdeenshire, where they abound. In the west of Scotland, they are called *Arran diamonds*, because they abound in the granite mountains of that island*. When the Angusian shepherds find a stone of this sort much larger than the usual size, they think it a thunderbolt, and that it portends some direful calamity, unless it can be conveyed as far from them as possible. But the difficulty lies in getting it away; for the person who takes it in charge, brings all the mischief upon himself, unless he can contrive to convey it to another person, before the dreaded vengeance is executed.

2. Next

* See Hendrick's View of the Island of Arran.

2. Next to the granite, a very large proportion of the Grampians, in this county, is composed of MICACEOUS SCHISTUS, or *mica-schist*. The term mica is applied to this rock, because the scales of mica which cover the surfaces of its plates, give it a glittering appearance. It is called schist, or schistus, because its beds are generally divisible into plates of various thickness, which are often curiously bent in various directions. It is sometimes called scalestone, because the mica makes it resemble the scales of fishes. It is always stratified, though its beds are often perpendicular, or form a very high angle with the horizon. Within a short distance, its beds are often inclined in opposite directions; and are frequently so irregular that its mode of stratification cannot easily be ascertained. This rock is generally of a dull leaden colour; though it is often of a brilliant appearance, when its mica happens to be bright. Heating it in the fire, converts the mica in its composition into a bright yellow, or into a silvery whiteness. The plates of which this stone is composed, often contain a large proportion of compact quartz*, or siliceous spar, in their composition; and are sometimes of a red colour, from an admixture of iron †.

Siliceous

* The word *quartz* is German, and is destitute of meaning. Siliceous, or flinty spar, seems preferable.

† In ascending Mount Battock, Colonel Imrie found many large veins, or dikes of porphyry, intersecting the micaceous schistus nearly at right angles to its beds. In the part of the Grampians traversed by me, though many fragments of such porphyry as he describes, occurred, the rocks being generally covered by moorish soil, no veins were observed. But the fragments shew that such veins exist, though they may be concealed from view, or exposed in some torrents where I did not observe them.

Siliceous Spar, or Quartz.

This rock is almost wholly composed of the primitive earth, which has obtained the name of *silica*, because it forms the basis of flint. It frequently forms jutting or detached hills, among the mica schistic rocks. It also occurs in irregular detached masses, and sometimes forms irregular veins. It is frequently of a red colour, from iron in its composition; but often it is colourless, or of a pure white. In this case, its fracture is splintery, and its fragments transmit light at the edges. It strikes fire with steel, and fragments struck against each other, emit sparks of fire. This is the purest form in which flint is presented by nature. The Chinese call it *petunse*; and being reduced to impalpable powder, and mixed with white clay, to which they give the name of *kaolin*, their beautiful earthen ware is formed. On the borders of Caithness, in Sir John Sinclair's property, there are large hills of this substance, of a white colour.

Laminated Talc, or Mica.

To this substance shepherds have assigned the name of *sheep's siller*, because it is often of a silvery lustre. It occurs in large blotches, or in irregular veins among the schistic rocks. Sometimes it is of a leaden colour, and its laminæ are bent in various directions. Often it contains a mixture of siliceous spar, and is thickly studded with small garnets. These garnets vary in colour, from a faint crimson, to a deep red; and are regular figures, of from ten to twelve equal sides. I did not see any of them of sufficient size to be polished into gems; though such may occur in the veins where the small ones abound.

At

At the head of the Chisholm's country, Invernesshire, there is a high mountain, great part of which is composed of talc. Much of it has mouldered into small scales, by the weather. On the shores of Loch Duich, in Lord Seaforth's country, there are massy veins of laminated talc, of a leaden colour. I found, that a certain degree of heat, in open vessels, conveyed to this substance the colour and lustre of gold, and a greater heat made it assume a silvery lustre, which ever after remained permanent in the air. It hence occurred, that small scales of this substance, prepared in this manner, might make a very ornamental species of hair powder. Or it might be used for ornamenting rooms; the scales being stuck on with paste, in the way velvet-paper is prepared.

In some water-courses of the Grampians I found fragments of garnet rock, and was told such rocks occur there, though I did not see any of them. This rock is composed of a concretion of garnets, and it abounds in an island of Loch Roag, on the west side of Lewis, where the people fashion it into querns, or millstones, for grinding their corn.

Porcelain Stone.

On walking over a mountain south from the minister's manse of Glen Isla, I found great quantities of this species of stone near the summit. The late Dr Walker, Professor of Natural History in the University of Edinburgh, assigned this name to this species of rock, because it contains nearly the same proportions of silica and alumina which enter into the composition of the finest porcelain ware. It occurs in the Pentland Hills south from Edinburgh, but not in such quantity as in Glen Isla. The late Dr Walker caused a quantity of it, from the
Pentland

Pentland Hills, to be ground down at the potteries, and fabricated into porcelain ware, of great beauty; and as it required no addition of any other substance, he was hence induced to distinguish it by the name of Porcelain Stone. Here some parts of this stone are reddish, from containing iron; but the greatest part of it is white, or inclining to gray. Its fracture resembles that of porcelain ware.

Lead.

A lead mine was wrought at Gilfianan, in the upper part of the parish of Lochlee, during the forfeiture of these estates, after 1715; and another was wrought at Ardoch, near Mill-den, on the Esk. It appears from Edward's Account of Forfarshire, that the mine at Gilfianan, above the old castle of Innermark, had been discovered and wrought at a much earlier period; for he states, that in his time, (A. D. 1678), "eighteen miners were employed in this mine, which seemed to be inexhaustible; and that the lead, when extracted, and properly refined, yielded $\frac{1}{2}$ th part of silver."—These mines were abandoned after they got under water; though there is sufficient declivity to drive a level to draw it off. In various parts of these mountains, burns and torrents expose small veins of lead, indicating that this metal abounds here, were sufficient pains taken to discover it. The two mines formerly wrought are supposed to be a continuation of the same vein, running from west by south, to east by north. It is thought the ore is sufficiently abundant to admit of being still wrought with advantage, were the water previously drawn off. The ore is of the species called galena, of a black colour, and metallic lustre; and hence called *glance-lead* by the Germans.

Limestone

Limestone

Abounds in various parts of the Grampians. It occurs on North Esk, at the mouth of Glenesk, a little way above the plantations of Burn; where it was much wrought by the late Lord Adam Gordon. I observed what seemed to be a continuation of the same rock, about two miles towards the south-west, below Muckle Tilly, situated among cultivated land. Limestone also abounds in various places towards the upper parts of Glenesk, and is partially wrought by the farmers, for building, or manure. Limestone also abounds in Clova, the glen through which the South Esk runs. It is quarried, and burnt into lime, at the summit of Cornuskay, a rounded mountain on the north side of Glen Isla, and at the base of Blair, the highest mountain on the south side of that glen. Limestone also occurs in various parts of the Grampians, where it is either not known, or not wrought. The species of limestone found within the Grampians, is what mineralogists distinguish by the name of *mountain limestone*. It is composed of crystals, or spar of lime, in very small grains. It is frequently of a blue colour, from talc in its composition. It is frequently blue and white, in alternate stripes, or blotches; and when this is the case, were its blocks of sufficient size, they would make very curious marble. Sometimes it is yellow, or spotted with yellow, from a mixture of iron. In many cases, the Grampian limestone is thought to contain a considerable mixture of sand; and all mountain limestone is known to vary in quality, from absolute purity, to such an excess of sand that it melts in burning. Though the crystals of granite sometimes effervesce with acids, from containing a portion of lime, I never observed any great bodies of
granulated

granulated spar of lime, or mountain limestone, except among the micaceous rocks.

Slate.

In the mouth of Glen Prosen, above Cortachie, in the upper part of the parish of Tannadice, and in many other places along the declivity of the Grampians, a very broad vein of slate occurs. This seems to be a continuation of the same sort of slate which is wrought in the neighbourhood of Dunkeld, in the Grampian range. It is of a dark blue colour, or inclining to purple. Though slate makes a much more elegant and durable roof for houses, than the flag-stones which are generally used in the county, I could not learn that this slate had ever been used for roofing more than one gentleman's house. The people remarked that this slate did not come off in plates of sufficient size. But this may have been owing to their not having been at sufficient pains to explore the main, or best vein of the slate. In all slate quarries, great quantities of inferior slate are known to occur; and the main vein is always the better the deeper it is wrought.—Perhaps the tax on slates, or old usage, may have turned the balance in favour of flags in this county.

Jasper.

The late Lord Adam Gordon, in cutting his romantic walks through mica schistic rocks, at the mouth of Glensesk, on his property of Burn, discovered vast masses of jasper immersed in the schistic rocks on North Esk. The bridge of Cortachie is founded on mica schistic rock, at the issue of South Esk from the Grampians, and there similar masses of jasper are seen immersed in the micaceous rock. This jasper varies in colour, from

a bright yellow, to a deep red. It is susceptible of a fine polish, and may be fashioned into ornamental trinkets.

Behind the bridge of Cortachie, a remarkable vein of indurated claystone, is seen to intersect the schistic rocks. It is generally of a white or greyish colour; and contains, in some parts, very thin scales of lime-spar in its cracks. If found to burn white, this clay might be advantageously used in the potteries.

3. *Porphyry* is the last of the primary rocks of which the Grampians are composed. It is seen contiguous to the schistic rocks at Burn, on North Esk, and at the place where the Isla discharges itself from the Grampians; and in other intermediate places forms hills. It is generally of a brown, or yellowish, or whitish colour, and contains rounded felspars, of a dull white colour, interspersed through it.

These are the rocks of which the primary mountains in Scotland are generally composed, and they commonly succeed each other in the order here described. The relative proportion of each genus of rock varies exceedingly. In some parts of Skye there are only small stripes of schistic and porphyry rocks between the granite and the secondary strata. In the Grampians, the schistic rock occupies by far the largest space. No veins of whinstone or basalt, or of pitchstone, were seen to intersect any of these rocks, as takes place in the Island of Arran, and other places. They might have been present; but the surface being mostly covered with coarse herbage, they were not observed.

The granite is reckoned the most ancient rock now in existence, and its formation certainly preceded the existence

tence of animals or vegetables on our globe. But that other rocks existed before it was formed, appears from this circumstance, that various species of water-worn porphyries, and indurated claystones, were found immersed in granite in the Island of Arran. On the Black Mount, near Kingshouse, many large masses of granite have been blasted to build bridges, and are seen to include rounded, and sometimes angular masses of dark blue whinstone, or basalt. Other examples might be adduced illustrative of the same point; but these seem to indicate, that the oldest rocks now existing had been formed from the materials of still older rocks, which having been worn, or mouldered down, formed the present rocks by a new concretion. The basalt included within masses of granite at the Black Mount, is decisive against the supposition of this latter rock having been liquefied by heat at the time of its formation. As basalt melts at a much lower temperature than granite, had the latter been liquefied by heat, the basalt must also have been melted, and blended with the mass, so that no trace of it, distinct from the granite, could now be found; which is not the case.

The mica-schistic rocks, likewise, discover no traces of animal or vegetable impressions, in their structure; but the rounded masses of siliceous spar which occur in their beds, and which occasion strange contortions in the plates into which these beds subdivide, seem to indicate, that rocks of this spar preceded the formation of the schistus. In the schistic mountains above Kilree, near the entrance into the Island of Skye, I observed various sorts of rounded, or water-worn stones, though all of them of the siliceous genus, immersed in the schistic rocks. It follows, therefore, that rocks of which these stones made a part, preceded the formation of the schistus.

Slate

Slate is always found forming veins, of various, and generally of very large dimensions, which intersect the mica-schistic rocks; and I never observed it to be connected with any other rock. In slate I have seen very distinct impressions of plants; and in one case, the perfect skeleton of a small fish; from which it seems to follow, that though plants and fishes had not become numerous, they existed at the time slate was formed. As slate and the schistic rocks are nearly allied to each other, they were probably formed at the same time.

The porphyry seems to be a concretion of siliceous sand, washed from the rocks already described, and including crystals of felspar, which had been rounded in its passage from the granite mountains. This is the last, of what are commonly reckoned primary rocks; although their formation appears to have been progressive.

Strathmore District.

IN descending from the Grampians, the first rock that occurs, after the porphyry, is what is commonly called coarse Pudding-stone, Gravel-stone, or Breccia. The people of this country apply to it the more descriptive name of *yolky ston*, because it is composed of a vast number of rounded pebbles, resembling yolks of eggs, which are bound together by a ferruginous sandy cement, of various, but generally of great hardness. This rock has evidently been formed from fragments detached from the rocks above described, which in their progress towards their present position, had been rounded by water. As we descend the beds of the rivers, this rock is found to graduate into sandstone, of the species commonly called *bastard freestone*, or rubble-stone, because, owing to its

ourselves to suppose, that this chain had formerly been uninterrupted,—which the similarity of the materials of which these hills are composed at the opposite sections, renders very probable,—it would follow, that the waters of the Earn and of the Tay had at one period flowed through Strathmore, and had discharged themselves into the British Ocean, near Stonehaven. We can also figure, that the Grampians had formerly risen by a gradual ascent from their base, and that they discharged a much greater proportion of water into Strathmore, than they do now, after they have been furrowed out into deep ravines, and many powerful streams have found their way into the sea, in various other directions, without passing through this channel.

Whatever probability there may be in these conjectures, and they are only thrown out as such, it is certain that the How, or Hollow, of Strathmore, has much the appearance of having, at some very remote period, been the channel of a great river. After the waters had found another channel, parts of it continued to be lakes, or stagnant pools, of which the Loch of Forfar, and some others, still continue to be examples. Parts of this valley are occupied by accumulations of gravel. This is remarkably the case to the east of Forfar, where it is thrown up into rounded hills, or knolls; indicating that here had been a violent collision of waters, owing to some powerful stream from the Grampians meeting the main current. It is probable these waters had forced a passage to the sea, through the lochs of Restennet and Rescobie, before the South Esk had scooped out its present channel, and had forced a passage through the Seedlay Hills at Brechin.

Sbell.

Shell-marl.

This useful manure abounds in various parts of Strathmore, or in lakes and swamps contiguous to it. This marl is formed from the exuviae of several kinds of shell-fishes, which inhabit fresh water. The Chinese, who neglect nothing by which the soil may be rendered more productive, or the amount of human food increased, are said to convey not only the spawn of useful fishes, but even the animals which form the most rapid accumulations of shell-marl, to lakes where they did not previously exist. It is possible these fresh-water testaceæ may have found their way into their present situations from the sea, as each species has similar species in the sea, with which it corresponds in figure and structure. There is, however, this difference betwixt them, that those in fresh water are incomparably smaller in size than their relatives in the sea. In fresh water, the larger shell-fishes seem to be least prolific, and to form the smallest proportion of the marly accumulation: These are, 1. *Buckies* [buccinæ] of various species.—2. *Cornua Ammonis*. These are spiral shells, increasing in breadth from the tip to the extremity, and resembling in figure the ram's horns which adorned the brow of Jupiter Ammon's statue, from which they derive their name. Of these there are two species, one of which is sulcated, or furrowed, transversely, like a ram's horn. The shell of the other is smooth. These are found in a living state, in a great variety of streams and lakes, particularly in those where shell-marl abounds. But they are not known to exist in a living state any where in the sea, excepting, perhaps, within the tropics; though they are found petrified and imbedded in the mineral strata, in a great variety

riety of places. They abound in the Island of Skye, particularly in the district of Strath, and in the small island of Pabbay, opposite to it, where they are disseminated in beds of bituminated clay, or shiver, of a greyish blue colour, such as usually accompany coal. There both the species are found in great quantities, and they are named by the people *ram's horns*, which many of them, both in size and shape, very much resemble*.—3. Bivalves; of which there are several species, varying in size, from that of a large vetch, to a small pin-head; and some are so small that they are scarcely visible without being magnified. These seem to be by far the most prolific, and form the greatest proportion in the accumulated mass of shell-marl. They are also so fragile, especially the smaller ones, that they readily crumble down into a fine powder. I have examined some of the larger of these bivalves, taken alive from a marl loch, towards autumn, and found they included five or six young shell-fishes, perfectly formed. It would appear that the young ones continue to increase in bulk, until they rend asunder the body of their parent, whose shells go to increase the mass of shell-marl.

In some parts of Ross-shire, Caithness, the Orkneys, and other places, I have sometimes observed small accumulations of shell marl, where springs, terminating in a swamp, erupted from the side of a declivity. But the
greatest

* There is some reason to suppose, that many of our secondary strata had been formed, when what is now the northern hemisphere, had been under the torrid zone. Beside several tropical productions in the mineral strata of Skye, I found a large turtle petrified into limestone, on the sea-beach, below Loufearn, on the north-eastern side of that island.—For farther illustration of this point, see the Reverend David Ure's History of Kilbride and Rutherglen.

greatest accumulations of this marl are found in hollow places, which either are now, or have been, lakes of considerable depth. It sometimes happens that moss, conveyed by alluvion, or formed from the decay of aquatic plants, is spread over the surface of a bed of marl, and other marl is afterwards deposited upon the moss; and thus we are presented with alternate layers of marl and moss. Sometimes the barrier which confined the water in the lake is worn down, either by the slow action of the water flowing from it, or by some external accident. In this case, we find a bed of marl, sometimes covered by a bed of moss, laid dry. Of this I observed an example on the mainland of Orkney. What had formerly been a lake had a deep ravine cut through it, and its soft clay outlet, by a hill torrent, which exposed a thick bed of shell-marl, under a thin bed of moss. On the northern part of the island of Lewis, there is an extensive tract of hollow ground, stretching across the island, which had formerly been a lake. But the Atlantic Ocean, having worn away the rocky barrier which had once been between this lake and the sea, this tract exhibits a bed of moss, over which shell-sand has been blown from the ocean, and which rests upon a bed of fresh-water shell-marl. During the great earthquake at Lisbon, in 1756, the waters of Loch Coulter in Stirlingshire, were violently agitated, and sunk into a lower level, by about ten or twelve feet. This has left dry great quantities of shell-marl, particularly at the west end of the loch.

Water arising from strata containing coal, or what are commonly called the *coal metals*, as it is often impregnated with sulphate of alumina, sulphate of iron, and other salts, which destroy these fishes, seems unfavourable for the production of shell-marl. Hence this manure is seldom found in the coal countries.

tries. But I have observed springs containing carbonate of iron in marl lochs, which had conveyed an ochry colour to the marl, without sensibly impeding its accumulation. The purest water, such as that which commonly springs from red sandstone, from whinstone, mica schist, granite, &c., seems to be most favourable to the health of these animals, and to the accumulation of shell-marl. It is not found to accumulate much where the lake is exposed to rapid currents, or to sand and rubbish washed into it by mountain torrents. This I found to be the case in the Island of Arran. As these shell-fishes live in rills and rivulets, as well as in lakes, it is probable their shells may be washed down, and increase the marly accumulation in the lake. Sometimes sand and clay are washed down in this manner, and contaminate the marl. I have sometimes seen marl and clay arranged in alternate beds, similar to what was stated respecting moss.

Pure shell-marl always contains a portion of animal substance, as well as carbonate of lime. But in general, this marl also contains a greater or smaller mixture of clay, sand, moss, and other extraneous substances; and it would be of importance to have these marls analyzed, that their comparative value may be ascertained.

When we behold such great masses of carbonate of lime as are accumulated in various places by these small shell-fishes, a question occurs,—whence it was derived? As they thrive best in the purest water, we can hardly suppose that the lime had been conveyed to them by solution in the water. The same question occurs respecting those still more extensive beds of shells and coral rocks which are found accumulated in the bottom of the sea. Still farther; all those strata of limestone and marble which contain shells, and which constitute so large a proportion of the solid materials of our globe, have evidently

dently been at one period, beds of shells at the bottom of the sea. Have the fishes only extracted these immense masses of carbonate of lime from the waters in which they lived, or are they endowed with a power of forming it from other matter, by their animal functions? We confess our inability to answer this question; and shall only observe, that animals as well as vegetables, have a power of decomposing many compounds, and of forming from their ingredients new compounds which did not previously exist. Since the illustrious Mr Davy has demonstrated that the alkalies and alkaline earths, of which lime is one, are metals combined with oxygen, a probability arises, that a great part of the lime found in the composition of animals, has been formed from some other kind of matter, by the action of the animal functions.

The principal places where shell-marl is now found in this county, are,

1. Kinordie.
2. Lundie.
3. Logie.
4. Loch of Forfar.
5. Restennet.
6. Loch of Rescobie.
7. ———— Balgavies.

1. The Loch of Kinordie was a considerable lake above the village of Kirriemuir, near the foot of the Grampians. I was informed, that after the suppression of the rebellion 1745, numbers of the Highlanders, being deprived of the means of subsistence, came down here, and were employed by the then proprietor of this estate, in draining this lake, which they were glad to execute at 2d. per day. This has been a work of great and persevering labour; for a long drain has been cut through a red sandstone rock, in some places from 30 to 40 feet
in

in depth. The stones are said to have been used for building houses in the town; and the loch is completely drained. It displays an extensive field of shell-marl, of about 300 acres, of various depths, a considerable part of which has been removed, though not in a regular manner.

2. Lundie Loch is a small lake, embosomed among the Seedlay Hills, a little way above the parish church. It has been drained by a mine, led up from a considerable distance, through whinstone and sandstone rock, the greatest part of which has been blasted with gun-powder. When I visited the place, September 1809, the operations were not completed; but it appeared they would acquire about forty acres of good marl, under a cover of soft alluvial moss and mud. It seemed doubtful whether the value of the marl would repay the great expence of the mine. At the outlet of the lake, I observed a great body of clay marl, with a mixture of sand, which would answer well for porous soils, but would not defray the expence of distant carriage.

3. The Loch of Logie is situated in the lower part of the parish of Kirriemuir, and in the How of Strathmore. It has been drained under the direction of that able engineer Mr Abercrombie. A mill on a different property, operated as a bar to the drainage; for which the loch served as a mill-pond. An arched under-ground tunnel conveys the water which falls upon the loch, through the contiguous property; while an embankment around the north side keeps off the land floods, and collects a sufficient quantity of water to serve the purpose of a mill-pond. A broad drain is led from the tunnel up through the centre of the loch, and exposes the marl to its bottom, on each side.

It

It is proposed to take out the marl regularly from this central drain on each side, so that the whole will be removed without any loss. The marl is covered with a bed of moss mixed with alluvial earth, which makes excellent compost for solid land. It is proposed to replace this on the bottom, after the marl is removed, where it will form a very fertile soil, of great depth. The whole area drained in this manner, is about 150 acres, of which, the marl occupies upwards of 100 acres in a regular bed, of from 4 to 6 feet in depth. Supposing the marl to fetch only 1s. per boll, it is calculated that the value of this bed exceeds L. 100,000.

4. The Loch of Forfar is a long narrow sheet of water, which is entirely fed by powerful springs, erupting from its bottom and sides. It formerly extended to the east end of the town, on the north side; or rather seems to have inclosed the town both on the south and north; but about 16 feet of water has been drawn off, by a long drain extended from the neighbourhood of Glamis Castle. This loch abounds with shell-marl, which, at the places where it is now wrought, does not seem to have any covering of moss or mud above it. The marl is taken out by scoops, and thrown into boats, by which it is conveyed to the shore. The scoop consists of a large iron scraper, somewhat similar to a Dutch hoe, which has a long wooden handle fastened into it, and a bag of strong leather fastened by whip-cord around its rim. The bag is perforated by small holes, to allow the water to drain off, and has a thong at its bottom, by which it can be turned over, and its contents discharged into the boat. After the boat is firmly fastened, by anchors extended from each end, one man forcibly presses down the scoop to the bottom, by means of the long pole, at the stern of the boat, while another man, by means of a windlass or wheel

wheel and axle, fixed in the opposite end of the boat, drags the scoop along the side of the boat, by a rope attached to it, and then raises it up to the boat's side, where the contents of the bag are emptied into the boat. When the boat has received her load, the marl is thrown out upon a wooden platform at the side of the loch, to drain. Whether this marl extends through the whole loch, I have not been able to learn; but it is chiefly dragged at the upper end, near the town of Forfar.

5. The Loch of Restennet is situated about a mile to the eastward of Forfar. It is entirely fed by erupting springs, and is the commencement of a chain of lakes or pools, through which it has often been proposed to lead up a canal from the sea. It is the head source of Lunan Water, which discharges itself into the sea at Lunan Bay. It has been drained, by a deep cut, through a long tract of sand and loose gravel, which is very apt to fall in and stop the current. The drain, with the purchases necessary to complete the work, cost about L. 2000. There was thus exposed upwards of 120 acres of marl, varying in thickness from about 18 to 2 feet. The marl is covered by a bed of good peat moss, which, from the scarcity of fuel in this country, has nearly repaid all the expence of draining and digging the marl. The peats are cast and dried by the purchasers, and when ready to be removed, they are appraised and sold at 2s. the cart-load, which is no very well defined quantity. The marl was at first sold for 6d. per boll, of 8 cubic feet; but it has gradually been raised to 1s. 3d., and is still in great demand. At first it was dug, and laid out into middens, at 1d. per boll, but now this operation costs 1½d. There have already been nearly L. 16,000 of clear profit made out of this marl loch, after defraying all expences of draining, digging, &c.

6, 7. The lochs of Rescobie and Balgavies are lower situated than that of Restennet, and upon the same stream. Although the depth of water in these lochs has been diminished by drains, they are still of considerable depth, and the marl is taken out by scoops, in the same way as at the Loch of Forfar, which is very similar to the mode by which ballast is dragged from the bottom of the Thames. As there is a mixture of aquatic plants, of moss and mud in this marl, it is not so much esteemed as that at Restennet and Forfar, and now fetches only 1s. per boll, while the former brings 1s. 3d. All the other marls in the county are now sold at 1s. per boll. Those who drag the marl from the lochs get from 3d. to 4d. per boll for their work.

To ascertain the quantity, the marl is laid upon an extended flat surface, of a square figure, and of the same uniform depth in all parts. A heap of this sort is called a *midden*, the dimensions of which are measured, and 8 cubic feet are reckoned a boll.

There are several other places in the county where marl has been raised, and some where there are flattering symptoms of it, which have never been explored.— Among the first, we may mention the moss of Baikie, in the parish of Airly, consisting of 128 acres, which was drained about fifty years ago, so as to expose about sixty acres of marl. But this manure was then so little valued, that 200 bolls might have been purchased for half a crown. It afterwards rose to 4½d. per boll, and is now at 10d. The upper stratum is nearly exhausted, but there is a considerable bed below, which cannot be got at without draining off the water, a work which must be attended with much labour and expence. There is also some marl at Cookstone, in the same parish, which is not in much request, as it is not reckoned pure. There is also

a marl mire south of Belmont Castle, near Meigle, in the contiguous county of Perth, which has been much used by the farmers in that district of Strathmore, but is now got below water. A large and deep drain, however, is nearly completed, which will not only expose a great body of marl, but will improve an extensive tract of wet land. Marl was also dug from the loch or mire of Dunichen, and to get at it, a long drain has been led up from the Den of Letham. But this marl has either been exhausted, or it has not been found advantageous to persevere in working it, for it has been abandoned, since the Loch of Restennet, on the other side of the hill, was drained.

Iron.

About the beginning of last century, an iron mine was discovered at the Wood of Dalbog, in the lower part of the parish of Edzel, and north-eastern division of Strathmore. A smelting-house was afterwards erected, for reducing the metal, but this work has long been abandoned. The ferruginous springs which erupt in various parts of the county, induce a belief that there are beds or veins of that species of ironstone which is known under the name of hæmatites. But such substances as I have seen, that were supposed to be ironstones, were far from being so pure as to be worth working. But although ironstone of the best quality, and in sufficient quantity, were to be found, it could not be worked with advantage, unless the county were laid open by canals, to admit coal, and to carry off the manufactured produce.

Pipe-

Pipe-Clay.

The only other fossil I observed in Strathmore, which seems capable of being converted to use, is a species of pipe-clay, in some marshy ground to the north of Glamis. This clay, when dry, is of a pure white colour, and is used by the people to whitewash their houses. It might be worth while to try it in some branches of the pottery manufacture.

Seedlay Hills District.

Although some of the marl lochs project among these hills, it was thought necessary to throw all we had to offer respecting them into one place.—It was observed, that the strata on the north side of Strathmore, are inclined from the Grampians; and that the angle of inclination, or dip, is continually diminished as they recede, until the strata approach the horizontal position. But on the south side of Strathmore, the position of the strata is reversed. The Seedlay Hills are chiefly composed of sandstone, whose strata rise towards the south, and are inclined towards the north, at an angle of about 45°. As we traverse these hills towards the south, the angle of elevation of the strata is perpetually diminished, until, in the upper part of Carmylie, and in a range along their southern exposure, the strata become horizontal, or nearly so.

The sandstone of these hills is of various colours, red, brown, grey, white, with a slight inclination to green. Some of the finer grained beds are susceptible of so smooth a polish, that they may be converted into imperfect mirrors. Frequent examples occur of rounded pebbles, or yolks, as they are here called, immersed in the beds

of sandstone. Numerous beds of indurated clay alternate with these strata, which are of a red, grey, or bluish colour. When this clay is used for whitening hearths, and other domestic purposes, it is known by the name of *cam-stone*. It is generally arranged in thin layers resembling slates.

There are also beds of coarse pudding-stone, or gravel, or yolky-stone, as it is here called, interposed between these beds of sandstone. Some of these beds of yolky-stone are of enormous thickness, varying from about 50 to 100 feet. Of this sort is the rock on which Brechin Castle, the seat of the Honourable William Maule, is situated. It is perpendicular towards the south, and of great altitude above the South Esk, which flows below. The rounded stones of which it is composed, seem to be cemented by limestone interposed betwixt them. In several cases, this rock occupies the summit of the hills, and exhibits an abrupt precipice at its outcrop towards the south. This is the case with the hills of Finhaven, Carse, Turin, and several others. Here we see these rocks to be composed of a great variety of rounded stones, of various sizes, the most prevailing of which are quartz, sometimes white, but chiefly red; jasper, porphyry, whinstone, granite, red granite, or sienite. Sometimes rounded fragments of topazes, or cairngorums, occur. In some cases, an abortive approach towards a stratum of sandstone is seen in the face of these rocks; and sometimes rounded fragments of sandstone make part of the stones of which they are composed. This shews that sandstone rocks had existed previous to the formation of these strata, and that from the fragments of the former, the latter had been partly composed. I observed one or two examples of rounded stones, which were themselves composed of smaller rounded stones. I had first observed

served this fact in the mountain of Morven in Caithness, which is chiefly composed of gravel stone; and afterwards in the Scridan rocks, on the north-east end of the Island of Arran. These facts lead back our thoughts to successive decompositions and recompositions, of what are now accounted to be the secondary strata of our globe. All these stones are cemented together by a ferruginous sandy matter, which, in many places, effervesces with acids, and seems to be a natural *terras*, or *puzzolana* cement.

The superficial stratum over a considerable part of the Seadlay Hills, towards the north, and even in the vallies interposed betwixt them, is whinstone, of several varieties. This sometimes forms veins, which intersect the sandstone strata, and it is then hard basalt, of a blue colour, or what the Germans call *grünstein*, or greenstone. The latter is of a smooth fracture; its colour approaching to black; but its surface, by exposure to the air, assumes a greenish crust, which is the reason of the name assigned to it by the Germans. In other cases, the veins are filled with a confused congeries of fragments of various kinds of whinstone, angular, or partly rounded, which are immersed in, and cemented by, a softer kind of matter.

The whinstone that covers the other strata, but does not intersect them, sometimes juts above the surface, forming detached knolls, or abrupt rocks, as at Dumbarrow Hill. It is then hard basalt, or greenstone, of a dark blue, or blackish colour. But a great proportion of this superficial stratum is of a dirty brown or reddish colour, with spots of steatites interspersed, which, from its resemblance, has obtained the name of *toad-stone*. Much of it is cellular, or blown up with numerous air-holes, of various size; and is what the late Dr Walker

distinguished by the name of *cysteoilitus*, or cellular stone. The colour of this varies, from a dirty grey, to a dark brown, or approaching to red. In some places, where quarries have been opened, this stratum is seen to graduate into sandstone, so that it is difficult to say where the one begins, or the other ends; the sandstone next it being blown up into cells, and being more hard and brittle than what is below.

In some ravines in the upper part of the parish of Inverarity, a thick stratum of what is commonly called *rotten whin*, is seen to rest upon red sandstone. It is variegated by many small veins, and detached masses of steatites, of a white colour. At Cononside, parish of Carmylie, Mr Brown lately sunk a pit, to a considerable depth, in quest of limestone. He found only a few detached masses of sparry limestone. But he intersected a great body of steatites, some of which is white, and would make beautiful porcelain ware. Much of it is red, of various intensity, with numerous white veins interspersed. This answers well as fullers earth, and would be highly useful where woollen manufactures are carried to any great extent. But as it would be easy to purge the iron from it, in so far as it injures the colour, it might be worth while to try this material in the potteries.

In some places, particularly in the hills above Guthrie and Kinnell, the superficial stratum is here and there an irregular kind of whinstone, which includes large blocks of what I shall call *whinstone porphyry*. This stone is compact, its fracture of a blue colour, of various intensity; and it exhibits numerous felspars, of a rhomboidal figure, interspersed through it. These are sometimes of considerable size, from one-fourth to one-half inch broad. Some are white, some jet black; and their fresh fracture has always a metallic lustre.

In

In the cracks and vacuities of this stratum, there are numerous concretions of spar of lime, or of imperfect spar mixed with clay and carbonate of iron. Hence the decomposition of this rock, where it is dry and of sufficient depth, always makes a fertile soil. But the soil is frequently so shallow, that the rock interrupts, or breaks the plough, or sometimes juts above the surface. The superficial rock on a hill south-east from Cononside, is a shattery kind of jasper, of a blood-red colour, with hardly any soil above it; and the rock is used for making the roads. As the farmers do not use these rocks for building, and they frequently interrupt their operations, they are universally distinguished by the name of *scurdy rock*; which, I imagine, implies something which is either useless, or mischievous.

Some think this whinstone, and especially the cellular species of it, is lava, which had been ejected from volcanoes now extinct. It may be so; but we do not see any symptoms of the craters from which it had issued; nor can we easily account for its remarkable equality of thickness over such an extent of varied surface. Congealed lava always forms masses of rock in what were formerly hollow vallies; but this is sometimes much thicker on the side of a hill, than in the valley below.

Beside the calcareous concretions already described, other concretions of the siliceous kind are frequent in this rock. Some of its hollows are lined with a brittle crust of quartz, or siliceous spar, which has crystals terminated in four-sided pyramids, projected from the interior surface of the crust, towards the centre of the hollow all around. Sometimes the crust is compact agate, of various size and thickness, which is hollow in the centre, and lined with similar siliceous crystals. Here all the kinds of agates which have been enumerated by mineralogists,

have been found. They consist of alternate concentric stripes, or rings, of jasper and calcedony, which, however they may be curved or bent into angles, as in the fortification-agate, each stripe is always of the same uniform thickness, and they are all parallel to each other. The jasper is of various colours, the calcedony always white. When these stripes are straight, and run parallel to each other, the stone is here called an onyx. These stones are often turned up by the plough, where the soil has been formed by the decomposition of the rocks in which they had been disseminated. They are neither so large, nor so numerous, as they occur in rocks on the north side of the vale of Eden, in Fifeshire, nearly opposite to Falkland.

These stones are always more or less rounded, and sometimes they approach to the globular form. Their shape always corresponds to the hollow of the rock in which they are found. Whether the rock had been moulded upon the stone, as asserted by the Vulcanists, or the stone had been moulded on the rock, as asserted by the Neptunists, I shall not pretend to decide.

Limestone.

There are several veins of rhomboidal spar of lime intersecting the sandstone strata in this district, particularly one in the parish of Inverarity, and one on the north side of the Hill of Turin. The latter shewing symptoms of copper in its composition, had been scooped out to a considerable extent; but it has not been found advantageous to work any of these veins for the purpose of burning the spar into lime.

A considerable stratum of limestone was discovered in 1780, in the parish of Logie-Pert, nearly opposite to Marykirk, in the county of Mearns. It runs along the
brow

brow of the hill which bounds Strathmore in that quarter, in a direction nearly from north-east to south-west; which is the trend, or bearing of the strata of which the Seedlay Hills are composed. It is wrought in various places in this tract, in some by proprietors and farmers, for their own use. In other places it is wrought for general sale; and where the stratum has been followed to a considerable depth, so as to be under water it is wrought by mining, in the same way as coal is wrought. In one place, a subterraneous drain has been cut, 500 yards long, and 15 fathoms deep, to draw the water from the quarries. It is burnt into lime by coals brought from Montrose. This limestone is very singular in its structure, being a calcareous pudding or gravel stone. It is composed of a great congeries of fragments of limestone, of various colours, most of which have been rounded into a globular form, and cemented together by means of a sparry cement crystallized among their interstices. To the eastward of the Brechin toll-bar, which is the westernmost part where I observed this limestone wrought, the stratum is about 12 feet in thickness, and it inclines to the north, like other strata on this side of the Seedlays, at an angle of about 45° . It is covered by, and rests upon, red sandstone. Other beds of limestone are said to be below this, but I doubt if they have been accurately examined. Where it passes through part of the parish of Strickathrow, it is said to be covered by scurdy rock, or whinstone, of great hardness. This stratum is thought to extend, in the same direction, to the parish of Oathlaw; but I have not heard that any investigation has been made to ascertain the fact. Although a stratum composed of stones of such various colours, may be supposed to possess various degrees of purity, yet I doubt not, but upon the whole, it makes good lime.

Were blocks of this stone found sufficiently compact, and free of cracks, it would make an uncommon species of marble. I found a bed of marble, similar to this, in the Island of Skye; being composed of globular pieces of red, blue, yellow, black, green, and other coloured limestones, immersed in a compact greenish-white cement.

Clay Marl.

A great mass of this substance is touched by the drain leading from the loch of Dunichen, and it is exposed by the Vinney water, below Letham, opposite to the church at Kirkden. I observed it also in some ravines above Inverarity, and below the minister's glebe of Kinnettles. It is of a red colour, and being alluvial, contains a mixture of sand and rounded stones. The great use of this stuff is to consolidate such sandy and gravelly soils as are apt to throw up broom, which abound in this county; or such as are puffy, from containing a mixture of moss. I have known the most striking, as well as the most permanent good effects, result from the application of clay, which contained only a very slight proportion of lime, to soils of this description. I doubt not but this marly clay may abound in other parts of the district, though it has not been observed.—In treating of Strathmore, it should have been noticed, that a great body of similar clay marl is exposed by the South Esk, in the upper part of Tannadice parish. There the soil is chiefly a loose sand, or gravel, on which other manures produce little effect; and there can be no doubt but it will be benefited by clay marl.—There are also indications of this marl in the banks towards the lower part of West Water, and other places towards the east of Strathmore.

In the parish of Lethnot, there is a great stratum of this clay, or rock marl, which is applied with great advantage

verage to the porous soils in its neighbourhood, though it will not bear the expence of distant carriage. This bed is said to extend into the county of Mearns, towards the north-east, and to pass through several of the contiguous parishes towards the south-west. In several places it is applied by the farmers with good effect.

The Chinese and Japanese are well acquainted with the good effects of mixing soils, and earths, of opposite qualities. A sandy soil laid on tenacious clay, corrects the defects of the latter, while clay laid upon loose sand, conveys to it a consistency more favourable to the growth of plants. Of all the kinds of clay that can be used for this purpose, those which contain a portion of lime in their composition, are not only the safest, but the most beneficial.

Sandstone.

Every district of Angus (excepting the Grampians) abounds with sandstone, or freestone, which is highly useful for building houses and fences, and for other purposes. What is found north of Strathmore is chiefly of a red colour, can seldom be cut with the chisel, and is commonly used for rubble work, for which purpose it is only dressed with the hammer, or pick. The same remark is applicable to much of the sandstone in all parts of the county.

But in various districts of the Secdlay Hills there are numerous strata of sandstone flags, which may be raised of various thickness and dimensions. The thinnest of them are from about half an inch, to an inch in thickness. They are formed into plates of about fourteen or sixteen inches broad, and eighteen or twenty inches long, and are used for roofing houses. These plates are coated with scales of mica, or talc, of a greyish-blue colour, and
this

this occasions the easy separation of the plates from each other; but after long exposure to the air, they assume a grey, or brownish colour. They are here called *slates*, but are, in fact, sandstone flags. Genuine slates are only found in rocks of much older formation than sandstone. As these flags, from their excessive weight, require a much greater strength of wood to support them than slates, and must be laid in plaster lime, or fog, (*sphagnum palustre*) which must be frequently renewed, and after all seldom make a roof that is either wind or water tight; it seems doubtful whether it might not be more advantageous to use slates for roofing houses. Slates have a much more agreeable appearance; but the people have been long accustomed to these flags, and by using them they save the duty on slates.

These flags are raised in great quantities on the Hill of Balnashader, and in the moor to the south of Forfar; also along the north side of the Hill of Turin in the parish of Aberlemno, and along its south side, in the parish of Rescobie. But the most extensive range of these flags is in the parish of Carmylie, and along the southern declivity of the Seedlay Hills. These quarries also furnish beds of various thickness, of a very fine grain; of a white colour, or with a slight tendency to blue or green, which are used for making stairs, lintels, columns, grave stones, and various ornaments in architecture. The quarries of Carmylie furnish flags of from three to six inches in thickness, which can be raised of any portable dimensions, and require only to be squared, to be fit for use. These are exported, in great quantities, from Arbroath, to Leith, London, and other towns, and are used for paving the ground-flat of houses, or laying the footpaths at the sides of streets.—Flags are also raised in the parishes of Auchterhouse, Glamis, and various other places.

They

They seem to form a zone of strata, running from south-west to north-east.

Metallic Ores.

About thirty years ago, some pieces of lead ore were discovered in the bank of a rivulet near Glammis. Upon digging into the rock, more was found. But the quantity being inconsiderable, the trial was abandoned.

I should rather be disposed to expect copper in the Seedlay Hills, and in those projected from the foot of the Grampians, which are composed of similar strata. The copper mine of Airthrey in Stirlingshire, and that at Applecross on the western part of Ross-shire, intersect gravel-stone, and red sandstone. The only case where I ever observed lead in these strata, is at Cantray in Nairnshire, where a large vein of ponderous spar intersects strata composed of gravel-stone, marble, and red sandstone, and this vein includes a mixture of lead and copper. All the great veins of lead in this country, are found in micaceous rock. Lead is, however, sometimes found in limestone; and in Caithness and Orkney it is found in bituminated calcareous sandstone, which is an inferior sort of limestone.

On the Hill of Dunichen, fragments of ponderous spar are often found, which have dropped from veins concealed by the superficial soil. Veins of this spar are frequent in freestone quarries, at Dumbarrow, and other parts of the Seedlay Hills, and the spar is often tinged green, from containing a portion of copper. It is reported, that in digging the foundation of the house of Kinnaird, on a bank projected from the Seedlay Hills, above the Carse of Gowrie, west from Dundee, they lately stumbled upon a very promising vein of copper ore.—The tendency of these hills towards copper, occurred to my ingenious
friend

friend Captain Fraser and me, when we viewed the Hill of Kinnoul, several years ago. But these hills are, with very partial exceptions, covered with earth, and they are not much cut by streams of water, so as to lay open their mineral contents. Almost all the great metallic veins in the world, have been exposed by streams of water, either flowing in their natural channels, or conducted across them by artificial canals.

Maritime District.

It was stated, that along the southern declivity of the Seedlay Hills, there is a broad range of sandstone flag strata, which are either horizontal in their position, or have a very slight inclination towards the north. On getting to the outcrop, or termination of this range, we find the strata in the district now under consideration, change their position, and they are inclined, at a considerable angle, between east by north, and north-east. In this district no gravel-stone was observed, but there is much red sandstone, in whose beds rounded stones occasionally occur. In some places the sandstone, together with the beds of clay and shiver which it includes, though they do not exactly resemble, yet make a faint approach in similarity to those strata which contain coal.—In this district several veins of whinstone are seen to intersect the strata; and there are a considerable number of jutting hills, some of which are composed of whinstone, or greenstone. But in no part of the county is the whinstone seen to affect the columnar form, so as to entitle it to the appellation of basalt. Some of these hills are composed of a species of porphyry, which has either a brown, a red, or whitish ground, and has numerous felspars interspersed

spersed through it. The felspars are not crystallized, and appear to have been rounded by attrition. Their colour is yellow, or yellowish white.

Limestone.

At Hedderwick, nearly two miles north of Montrose, there are inexhaustible beds of limestone, which are wrought to a very great extent. The upper stratum is six feet in thickness, of a bluish-grey colour, and consists of fine-grained spar of lime. Below this are some thin beds of hard calcareous sandstone, or sand cemented by carbonate of lime. These rest upon a bed of red clay marl, which contains a considerable proportion of lime. Below this the main stratum is situated, which consists of two beds. The uppermost is fifteen, and the undermost four feet in thickness; the whole stratum being nineteen feet: so that there are twenty-five feet thickness of good limestone in this quarry. The two lower beds are of a very fine grain, and of a white colour, very much resembling Carrara, or statuary marble, though they occasionally exhibit a few cells, and a red spot here and there. I could not learn if any attempt had been made to polish this stone into marble; but it is hard and brittle, which may prevent it from enduring a polish. I was told that the middle bed had been analysed, and yielded upwards of 90 *per cent.* of carbonate of lime. When the whole beds are burnt promiscuously, a boll of shells, when slacked, produces upwards of three bolls of powdered lime. There are three large draw-kilns, and several pot-kilns for burning the stone. The coals are brought from Fife. Upwards of 60,000 bolls of shells are here annually manufactured, which now sell at 3s. 4d. per boll.

In the parish of Craig, on the estate of Duninald, at a place called Budden, on the sea-shore, there is a very
thick

thick stratum of limestone. This stratum seems to have been exposed to view by the dashing of the sea, as it is seen extending into the sea within tide-mark. It consists of an immense congeries of nodules of limestone, all apparently of the same quality, united by a sort of calcareous clay, of a bluish-white colour. The stratum dips, at a considerable angle, towards the north-east. This quarry has been wrought to a great extent, and is now pushed so far northward into the sea-bank, that a great depth of earth must be removed to get at it; and if they follow it towards the dip, they will soon get under the sea. It is said that this stone began to be wrought, and burnt into lime, about the year 1696; and this was probably the first lime that ever was manufactured in Angus. At that time Robert Scott, Esq; of Duninald, and Patrick Scott of Rossie, first began to apply lime to their land, and were the first persons who set an example of improvement in this county. From 30,000 to 40,000 bolls of shells, Linlithgow measure, are still manufactured here. One boll of shells is said to produce nearly 3 bolls of powdered lime, after slacking; but this lime, not being reckoned so pure, does not bring so high a price as that at Hedderwick. The coals used in burning this stone are brought from Fifeshire.

Near a bridge, midway between the villages of East and West Haven, in the parish of Panbride, I observed a stratum of limestone jutting above the surface. It is of a bluish-grey colour, and being analysed, 100 parts were found to contain as follows:

Carbonate of lime,	-	-	77½
Coal tar and culm,	-	-	1½
Clay,	-	-	3
Siliceous or flinty sand,	-	-	18
			<hr/>
			100
			It

It would be worth while to dig down, with a view to ascertain if this limestone be of sufficient depth. If so, the lower beds will, next to a certainty, be found better than those above them. This I conceive to be the most advantageous situation for a limestone quarry, that is any where to be found in Angus. Great quantities of lime and coal are annually imported here from England and the Frith of Forth. The vessels are moored in some small creeks among the rocks, and are exposed to great danger, should a high wind blow from the sea. But if this limestone be found of sufficient depth, by removing it, a spacious harbour will be scooped out within the land, which may easily be converted into a wet or dry dock.

Rock and Clay Marl.

Towards the sea bank, on the estate of Duninald, rills of water have cut some deep ravines, in which great bodies of rock or stone marl, of a dark red, or brown colour, are exposed to view. This stuff readily dissolves into clay, by exposure to the air. The southern part of the park of Panmuir is distinguished by the closeness and luxuriance of the various sorts of succulent grasses which it carries, and where it is cut by a rivulet, I observed that the subsoil is an immense body of rock marl, similar to the former. There is also grass of extraordinary closeness and luxuriance, in the parks of Dun, about midway between Brechin and Montrose; and there are indications that the subsoil is marl of this description, if part of the marl has not also been washed down upon the upper soil, from the higher grounds.

In the extensive tract called the Sands of Montrose, which is occasionally overflowed by the tide, a vast body of sea-sleetch, or carse clay, is found. This clay is of a light

light blue colour, which effervesces with acids; and it is thickly studded with sea-shells, which are decomposed into a soft pulpy mass. In some places this clay is covered by a foot or more of loose sand; in others it occupies the surface, and in some places it is seen to pass under the loose sandy soil, towards the north of the town. This clay would certainly make the best of all manures for the sandy soils near Montrose.—There are many other places where symptoms of rock or clay marl occur in this district, though I had not the opportunity of examining them particularly.

Boulder Stones.

There are many Grampian stones scattered in all parts of this county, at the distance of many miles from the nearest rocks from which they could have been detached. The stones which are decidedly of Grampian extraction, are granites, mica-schists, porphyries, and rounded masses of quartz, or siliceous spar. Where these are found in the channels of rivers, or in the alluvial land contiguous to them, we may suppose they had been conveyed to their present situations, by the streams which flow from these mountains. Such stones are generally rounded, and diminished in size by attrition, in proportion to the distance they have travelled. But there are many Grampian stones, not only in the gravel-stone rocks, but scattered through the soil, which, from the hills and vallies that are now interposed betwixt them and the Grampians, it is impossible that any streams of water, however powerful, could have conveyed to their present positions. Not to mention innumerable smaller fragments scattered here and there through the soil, I shall only specify some huge masses of mica-schistic rock, on the top, and southern brow of the Hill of Dunichen. There is also a huge
mass

mass of several tons weight of the same kind of rock beside the rivulet of Vinney, near the church of Kirkden. Mr Ford lately blasted, or buried down, several large masses of granite, on the farm of Breadlees, Dunichen parish. None of these stones are much rounded; and it must puzzle the most ingenious theorist to account for their getting there. Are we to carry back our view to some very remote period, when the Grampians were much higher than they are now? before the valley of Strathmore, and the valleys among the Seedlay Hills were scooped out? Are we to suppose that the surface then sloped equally from the Grampians to the sea-shore, and that these stones had been conveyed by powerful streams of water flowing from these mountains? It is sufficient for us to mark the fact, and leave the cosmogonists, and those who undertake to account for the mineral phenomena of our globe, to assign the cause.

Coal.

I understand that several investigations have been made, in different parts of this county, with a view to discover coal; though they do not seem to have been conducted upon a clear-sighted plan. The great coal-field of Scotland forms a broad zone extending between north-east and south-west, from sea to sea. Its northern boundary commences somewhere opposite to West Ferry, near Dundee; in Fifeshire, intersects the vale of Eden, and includes Annfield and the Lomond Hills, below which coal is wrought. It includes the coal of Lochore and Keltie, on the northern part of Fifeshire. It skirts the Ochil Hills behind Dollar, near the base of which hills coal is found. This line now passes down the northern side of Glen Devon, and crosses the plain of the Forth, near St Ninian's, where it includes the coal of Sauchie,

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and others. It then cuts the Hills of Touch and Kilsyth, in a line extended to Campsie; from which its continuation becomes very irregular, until it terminates in the Western Ocean, on the peninsula of Kintyre, somewhere near Campbelton, Argyleshire. The southern boundary of this zone, is a line which commences somewhere to the north of St Abb's Head, near the southern entrance of the Frith of Forth. It passes the Lammermuir, and Fala muir, to the upper part of Lanarkshire, where it includes the coal near Douglas. It enters Airshire to the south of Muirkirk, and terminates in the Irish Channel, somewhere in the district of Garrick.

In this zone there are several irruptions of granite, of mica-schist, of porphyry, of gravelstone, red sandstone, and other strata below which coal is not usually found. There are also many exhibitions of favourable strata, such as bituminated schistus, or blaes, and favourable sandstone, where no coal has yet been found.

Symptoms of coal are also seen in several districts along the Moray Frith, and in Sutherland. On the northern side of that Frith, coal is actually wrought. Coal has also been found in Caithness, but none of sufficient thickness. These are probably continuations of the same great coal-field. The coal found in Dumfriesshire, in the Island of Skye, and other places, seem to be detachments unconnected with the main body.

I once observed a stratum of bituminated coaly schistus, within tide, near a whinstone rock, contiguous to the village of West Ferry, on the Frith of Tay. Its direction, or bearing, is towards the south-west, in the line I have marked out as the northern boundary of the coaly zone; and it is inclined, at a considerable angle, towards the north-east. The last time I was there, a storm had covered it with a vast mass of rounded stones. But the
position

position of this stratum being every way similar to those in the opposite county of Fife, where coal is found, renders it very probable that coal may be found in the lower parts of the parishes of Monifieth or Barry. There, however, the solid strata are concealed from view, and there is no way of ascertaining the fact, but by digging down to the solid strata, and exploring them by skilful boring.

I have just heard that a thin bed of coal has been found on the lands of Kelly, parish of Arbirlot, in the side of a rivulet which runs down from the parish of Carmylie. It is said to be of the kind here distinguished by the name of *Scotch coal*, which is usually brought from the opposite coast of Fife; and to be of excellent quality. It is within the northern boundary of the great coal-field of Scotland; and affords a flattering prospect of a thicker bed somewhere below it.

I am also informed that a search has been making for coal, a few miles west of Cupar Angus; and that a bed of several inches of good coal has been found in that part of Strathmore, which extends into Perthshire. The search is now going on, with cheering prospects of finding a good workable bed, somewhere below this.—In Angus, the solid strata are no where visible in the hollow of Strathmore, which I have traversed. But they may contain coal, and this is likely to be ascertained by digging a canal. But coal found in any part of this valley, will be a sufficient inducement to distribute it over the whole by means of a canal.

Mineral Springs.

The only mineral springs which have been observed in this county, are those which have been distinguished by

the name of *chalybeate*, or which contain a portion of iron in solution. These are very numerous in various places, and are deemed salutary in dyspepsia, and diseases arising from debility in the stomach. The principal springs resorted to, are one near Montrose; one in a gully to the west of Arbroath; and two in the side of a rivulet, about a mile farther to the west; and one on the north-west corner of Dumbarrow, in Dunichen parish.

SECT. IV.

SOILS.

SOILS are a coating, or covering, of mold and earth, and various materials, which conceal the solid rocks of which the interior parts of our globe are composed, and which have been chiefly formed from their decomposition. Chemists have discovered several primitive earthy substances, of which all the solid parts of our globe are compounded, the principal and most abundant of which is *silica*, which predominates in the composition of quartz, flint and sand, and which constitutes a large proportion of the rocks of our globe. The next in importance, though not in quantity, is called *alumina*, *argil*, or pure clay; and is the primitive earth from which common clays derive their tenacity. Were soils wholly composed of silica, they would be incapable of retaining moisture, and would be as unproductive as the blowing sands of Arabia. Were soils wholly composed of alumina or argil, they would form a paste with water, and harden with drought, so that plants could not push their roots through them in quest of nourishment. They would also retain moisture

so forcibly, that the roots of plants could not extract it from them, even though they should penetrate their mass. The best soils, then, are such as contain as much alumina, or pure clay, as renders them sufficiently tenacious and retentive of moisture; while they contain a sufficient proportion of silica or sand, to render them so friable, that plants can easily push their roots through them, and absorb the moisture they contain.—To these primitive earths may be added lime, magnesia, barytes, and some others which have been lately discovered; which it is needless to mention, as they make no figure in the composition of soils. The latter are distinguished by the name of *alkaline earths*, because they possess the properties of alkalies as well as of earths. Lime is used as a manure, and a certain proportion of it seems necessary to constitute a fertile soil.—Along with these primitive earths, soils contain various proportions of iron and other metals, which existed in the rocks from whose decomposition they were formed.

But besides these earthy substances, which have been derived from the decomposition of the solid strata of the globe, soils contain a greater or smaller proportion, of the remains of animal and vegetable substances. This is distinguished by the name of *vegetable mold*, and where it abounds, it renders the soil highly fertile. A soil may acquire this vegetable mold, from plants which have long grown and rotted upon it. Thus, in America, considerable accumulations of this mold are often formed from the leaves of trees, which, for ages, have dropped and rotted on the surface. Or this mold may be accumulated by long, and frequent, application of putrescent manures. This is what distinguishes old *infield* from *outfield* land, in this country.

We cannot help pausing to admire the beneficence of Providence, in having distributed silica and alumina so generally, in the composition of the rocks of our globe, and in the soils formed from their dissolution; and yet, in having varied their proportions so, that soils are found, which are adapted for all the various tribes of plants with which the world is stored. Human art can extirpate the plants which are natives of particular soils, and can change their quality, so as to render them productive of those plants which are necessary for the subsistence of man.

The upper covering of earth, to as great a depth as vegetable remains are found, according to some; or to the depth at which it is necessary to stir it with the plough, according to others; is called by way of preeminence, *the soil*; while the loose or soft earth below this is called the *subsoil*. The latter appears to be equally, or even more deserving of attention, than the former; for it seldom happens that there is a bad upper soil where the subsoil is good; or *vice versa*. If the subsoil be a tenacious clay, it keeps up water, so as to form the upper soil into a sort of subterraneous lake, in which the roots of the plants are chilled, and renders the soil only capable of producing *sphagnum palustre*, and other moss plants. If the subsoil be a porous gravel, or loose sand, it frequently happens that the upper soil is not sufficiently retentive of moisture; nor has it sufficient tenacity to hold the roots of plants so firm as they may be able to support the stems; and if putrescent manures be used, they are soon washed through the subsoil, and their effect seldom lasts beyond one season. In such cases, the application of clay, and especially those clays which contain lime, and are hence distinguished by the name of clay or rock marl,

marl, is always attended with the most beneficial effects.

The soil seems to discharge similar functions to plants, that the stomach does to animals. It prepares their food, and fits it for being absorbed by their roots. A well wrought, and a well manured soil, in consequence of imbibing the calorific rays of the sun, and in consequence of the fermentations which are going on within itself, is always much warmer than the air which rests upon it. Even dry earth, when exposed to the sun, is commonly 120° of Fahrenheit, while the air does not exceed 60° . But I have observed a well wrought, and highly manured soil exhibit from 140° to 150° , while the air was only from 50° to 60° . Hence the ingenious Mr Naysmith, in his Treatise on Vegetation, with much probability, supposes, that the water in soils is so attenuated by heat, as to enter the roots of plants in a state of vapour. It is also probable that the vegetable and animal matters in soils undergo a change, and enter the roots or leaves of plants, along with the water, in the gaseous or elastic state.

To describe the soils of a district, in language that will be intelligible to those who have no opportunity of seeing them, seems to be a herculean task. Agricultural writers commonly make use of the *slang* that is current in the district where they reside, or which they borrow from other writers, without annexing any distinct ideas to the terms. It hence happens, that their readers are generally as much enlightened by their long and elaborate descriptions of soils, as a blind man would be by a dissertation on colours, or a deaf man by a discriminating classification of sounds. Every experienced farmer knows the peculiar properties of a soil, when he has an opportunity of examining it; whether it be good or bad; whether

sition of that species of whinstone, to which the Germans have assigned the name of *grünstein*; but where porphyry occurs, the soil is not so good.

The fertility of these soils, as was stated in the Section of Mineralogy, I take to be owing to lime in the composition of the rocks. They are commonly of a red colour, passing to brown, or black, and may generally be distinguished by the epithet of friable clays: That is, they do not cake after moisture, like those clays which we have called tenacious; and they are equally adapted for every species of crop. It appears also to me, that the oxide of iron, in the composition of these soils, is in the state of a *carbonate*, that is, combined with carbonic acid, which is a food of plants; and that it contains no sulphuric or other strong acid, which would render it poisonous to cultivated plants. But perhaps a considerable part of the effect may be ascribed to the texture of such soils, in being neither too incohesive to retain the roots of plants, nor too tenacious to prevent their ramification.

We cannot treat of the primary whinstone soils, without taking also into view those that are secondary, or alluvial. In this county we never see a jutting whinstone rock, upon, or near the summit of a hill, but we find a sheet of alluvial whinstone soil, increasing in depth as it recedes, extended from its base. This is remarkably the case with the hills south from Maryton; with parts of the Hills of Dunichen and Lower; parts of the ridge of Tulloes, with the hills south from Glamis; and many other places too tedious to be here enumerated.—At the head of Lundie Loch, and places adjacent, the Seedlay Hills exhibit perpendicular ledges of whinstone rock, of great altitude, placed, like mural crowns, upon their summits. These ledges are intersected by perpendicular fissures; and the spectator recognises an
affectation

affectation of the imposing grandeur of columnar basalt. But they consist of rude blocks, which scale off, with softer matter interposed; and from their bases extend long sheets of alluvial whinstone soil, of great fertility.

The *Secondary*, or *alluvial* soils, as already hinted, are often so much intermixed with the primary, that it is difficult to distinguish them. But the former prevail in the hollows which have been scooped out by rivers and streams; and often extend to considerable distances from the present channels of these streams. They are also found at considerable elevations above the present beds of these streams; shewing that formerly the streams had meandered through land much more elevated than their present beds; in hollows of which, they had formed lakes, until the barriers of rocks, which kept back the water, being worn down, the rivers gradually scooped out their present low channels. As an example of this, we may mention the lands of Burn, and the soils which prevail between this place and the junction of the West Water with the North Esk. There the soil, and subsoil, to a considerable depth, are chiefly composed of rounded stones and sand, which are often thrown up into hills; shewing that the North Esk, before it cut its present deep channel through solid rocks, had run on a higher level, and had taken various directions, both towards the neighbouring county of Mearns, and westward through Angus, and thus deposited this sand and gravel as its current became weakened after its issue from the Grampians. Indeed, as far as I could observe, the nearer to the Grampians, the larger the stones found in these soils; and in the hollow of Strathmore, they gradually diminish into minute sand. There is reason to think that this and all the other streams which flow from the Grampians, at some very remote period, were met by a powerful river
flowing

flowing through Strathmore. The same observations, as far as they respect the deposition of gravel, may be applied to the Lunan, and several other streams of this county. These gravelly soils, towards the surface, contain a portion of vegetable mold; and where they contain a sufficient portion of clay mixed with the sand, provided the stones could be removed, so as not to obstruct the plough, they are not unfertile. But it often happens, that removing the stones, would cost more than the land is worth.

In the hollow of Strathmore the soils are all alluvial, but seldom fertile. We have hinted the probability of this having been formerly the channel of a great river. In many places the soil is gravelly, the stones generally of a small size. In others it is a dead sand, which is not worth the expence of cultivating. At Glamis, and several other places, rivulets from the Seedlay Hills, have extended sheets of alluvial whinstone soil, or earth mixed with vegetable mold; which latter sometimes also occur on the north side of the valley, and have formed soils of great fertility. In other places, slow moving rivulets have deposited an alluvial clay, resembling carse land, which, where it has been rendered dry, is very fertile soil. Several examples of this might be adduced; but we shall only mention, that at Carse*, to the north of Forfar, there is some soil of this sort, uncommonly fertile. But in some places, mosses have grown up in the hollow of Strathmore. In other places, the land is so flat, that

* I have been informed, that *Carse*, or *Kerse*, in Gaelic, means marshy ground, or land which is constantly, or occasionally, overflowed with water. This was the case with the Corses of Gowrie, Stirling, and Falkirk, within the memory of history; and in some cases, within my own remembrance.

that it is covered with water during heavy rains; and where the land is somewhat hollow, the water remains all days of the year, its quantity being only decreased by evaporation. This evaporation chills; and, in calm weather, infests with fogs and hoar-frosts, all the cultivated lands contiguous. These circumstances illustrate the propriety, or rather demonstrate the necessity, of forming a navigable canal through this valley, which might serve as a discharge for all the stagnant waters with which it is infested. Although no navigation were ever to take place on this canal, the value it would add to the contiguous lands, by relieving them of pernicious moisture, would more than indemnify the expence.

In the composition of the alluvial soils, a greater proportion of vegetable mold is generally found, than in those which we have distinguished by the name of primary. But this admits of many exceptions; for in some of the gravelly soils no vegetable mold is discernible, except what has been formed from the decay of plants that had grown upon their surfaces. In some of the primary soils also, which have been long subjected to cultivation, what had originally been a congeries of moss plants covering the surface, is now converted into vegetable mold. But in many soils, considerable proportions of alluvial vegetable mold are mixed with the alluvial mineral earths. This is the case in all the haugh lands on the sides of rivers, especially towards their lower parts. We shall only specify a fine sheet of alluvial land, which runs down through the parishes of Farnell and Maryton, towards the head of the bason of Montrose, which is of a dark brown colour, often approaching to black, owing to vegetable mold in its composition.—Various other examples might be adduced; and they all serve to shew, that the materials of which alluvial soils
are

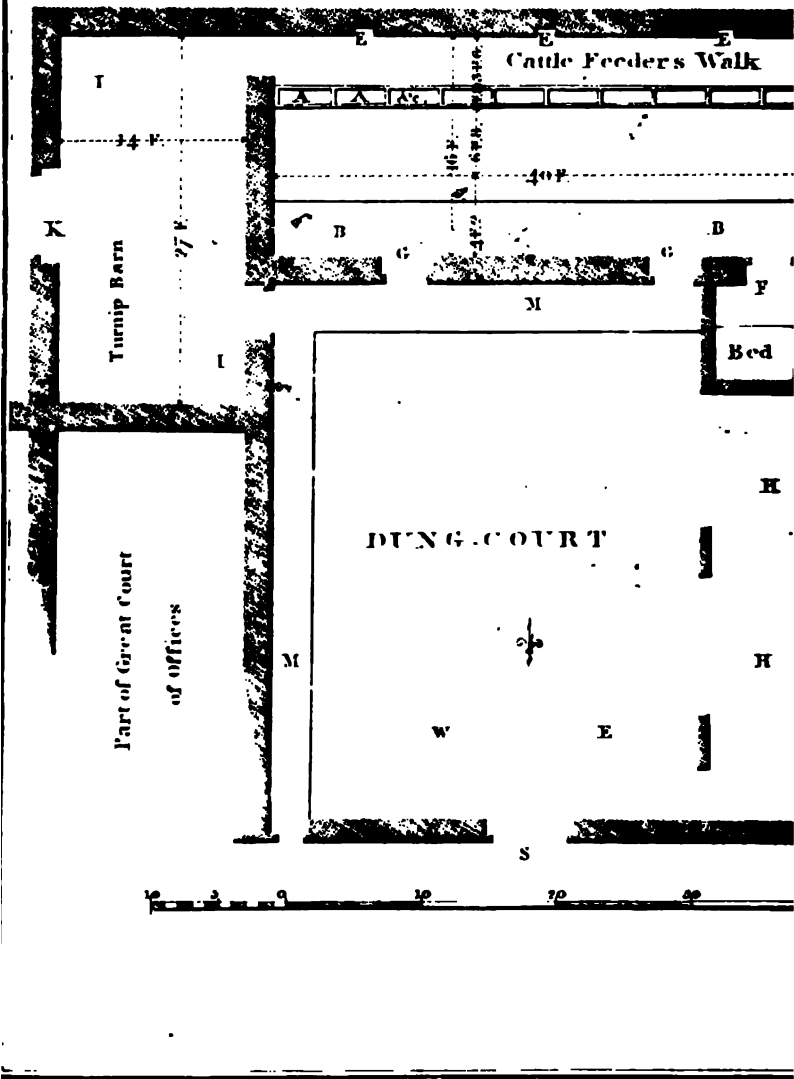
are composed, have all been deposited in the order of their weight, or their power to resist the current which conveyed them.

At Little Mill, north from Montrose, and various other places around the bason, there are stripes and patches of real carse clay, such as the Carse of Gowrie and Falkirk. It appears to me that this soil has all been deposited under the sea, when it occupied a much higher level than at present. In proof of this, we have only to refer to the sea-shells which are often found in the upper soil, or at no great depth below. This soil is always of a greyish blue colour, or inclining to yellow. It consists of the finer particles of clay, mixed with scales of mica, which have been washed from the Grampians. As clay has a strong attraction for water, it would not readily deposit until the current of the river was stopped by meeting the sea. In several hollows of the Maritime District, there is soil which resembles carse clay, like that in Strathmore. But this clay has been deposited by muddy rivulets when these hollows were lakes.

There is a circumstance respecting the extensive sands of Barry and Monifieth, which seems somewhat singular, and difficult to be accounted for. Where these sands have been intersected by rivulets, or laid open by ditches, a stratum of moss, of various thickness, is seen at different depths below the surface. As from the sea-shells which abound in various places, it appears that these sands had been covered by the sea, it is not easy to account for the formation of moss in this situation. In several hollows among these sands, there are shallow pools of water, which seems to be prevented from oozing through the sand, by the stratum of moss below. Towards the Gaa Point these sands are blown into hills, are perfectly steril, and dangerous to approach in blowing weather.



PLAN OF
Mr. Hunter's Feeding Byre at Eskmuir.



weather. In many places they are level, and covered with stunted grass, such as grows upon sandy downs; while the hillocks carry bent grass, which helps to bind the sand, and is used for various purposes. In their present state, these sandy downs appear fit for nothing but to be stocked with rabbits. The most probable method of improving these sands, would be to cause maddy burns and rivulets, which flow through them, to spread upon the surface of those places which are level, and clothed with stunted herbage, during the winter season. This would improve the pasture in the mean time; and by depositing clay and vegetable mold among the sand, it would soon be converted into a fertile soil for corn. The same method might be tried with the sandy downs near Montrose, and other places; and this experiment has one claim to a fair trial, that it has already been executed, with much success, on similar sands near Irvine and Saltcoats, in the county of Ayr. The mossy stratum below these sands might afterwards be rotted, and applied as manure to the soil.

Moss.

We shall have occasion to treat of moss as a manure, under that branch of the subject. At present we only consider it as a soil; and the only examples known to us where it has been attempted to reduce this substance into a soil, are, 1. In the mire or loch of Dunichen, which was drained to a certain extent, for its marl. Part of this moss, after the peats were removed, has been reduced into soil, by George Dempster, Esq; according to Mr Smith of Swinridge Moor's method; but it would require more effectual drainage to render the experiment complete; 2. Colonel Kinloch is converting part of the
moss

moss in his marl loch at Logie, already described, into very fertile soil.

There are no very extensive mosses in this county. The principal one is called the Dilty Moss, on the lands of Carbuddo, a ridge of the Seedlay Hills. It is resorted to from all quarters, and is so valuable for fuel, that converting it into soil seems inexpedient. The moss of Restennet, which has long supplied Forfar, is nearly exhausted; and such patches of moss as occur in Strathmore, are generally so wet, that they are hardly accessible for fuel, much less for being converted into soil. Among the Grampians, the mosses are situated in hollows on the summits, or sides of the mountains, whence it requires much labour to convey the peats to the valleys, but where converting them into soil is out of the question. These elevated mosses yield peat of much greater density, and more lasting as fuel, than those in low situations. In this respect moss seems to resemble wood, which the higher its situation, and the slower its growth, is the closer and more compact in its texture.

SECT. V.

CLIMATE.

THE word *Climate* is not here used in the sense annexed to it by geographers, indicating a space included between two parallels of latitude; but rather to denote what chemists distinguish by the name of *Temperature*, meaning the various degrees of heat in the atmosphere; its moisture or dryness, and the various circumstances which

which affect the growth of plants. But before entering into a description of the climate of this county, a few of the causes which occasion variations in the temperature, and in the other circumstances which distinguish the climate of the several districts of the globe, may deserve enumeration.

It seems to be ascertained, that the sun is the great fountain of light and heat to our globe; and to the solar system. A certain sect of geologists, indeed, assert the existence of a very intense heat at the centre of the earth, sufficient to liquefy the most refractory bodies. But they have not proved the existence of this heat, nor shewn how it is generated, nor how it operates. The heat of volcanoes does not prove the existence of this central heat, because the concussion of the earth produced by their eruption, is merely local, not reaching to any great extent, and thereby shewing that the cause of this concussion is not very deep seated, and cannot extend to the centre of the earth. A central earthquake has been known to agitate more than a quadrant of the globe; but the concussion of a volcanic eruption seldom extends beyond a small district around it. Besides, we are furnished with a clue which leads to the probable cause of volcanic fire, namely pyrites, pitcoal or bitumen, with water, and a moderate access of atmospheric air. When these bodies are in great mass, and placed in favourable circumstances, they are known to take fire, and to burn with great violence. By mixing great quantities of these materials, artificial volcanoes have often been formed; and some strata of coal, in which pyrites abound, after they have been opened to a moderate admission of air, have been known to take fire spontaneously, and to burn with a violence proportioned to their quantity. Of this we have an example in the great bed of coal at Dysart in
Fifeshire,

Fifeshire, parts of which have been burning for a very long period, and in some places the heat has even erupted at the surface.

If there be a heat at the centre of the earth, of such intensity as to keep the most refractory bodies always in a state of fusion, it cannot be confined to a small space, but must occupy a very large proportion of the interior of the globe. Now, from the known properties of heat, this internal heat should diffuse itself until it reduces the whole mass of the earth nearly to the same temperature, or to temperatures proportioned to the distance from the heating cause. The deeper we descend into the earth, therefore, the hotter it should become. But this is contrary to the experiments of those who have examined the temperature of the earth in mines, at different depths; for the lower they descended they have always found it the colder; and some calculate, that, at the centre of the earth, if the heat decreases in the ratio of the depths they have examined, there must be perpetual congelation, instead of perpetual fusion.

It may therefore be assumed, that the temperature of our globe, excepting where volcanoes and other local causes operate, is occasioned by the action of the sun's rays.—The late Dr Walker was of opinion, that carbon, and all the class of inflammable bodies, found in the bowels, or on the surface of our globe, owed their original formation to the action of the sun's rays.

It has been discovered, that the sun darts forth three sorts of rays, which, from their properties, have been distinguished by the names of the *colorific*, the *calorific*, and the *deoxydating* rays. These are all mixed together in their passage from the sun; and though they cannot be wholly separated, they admit of a partial separation, by passing them through a triangular prism,

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The *colorific* rays, or rays of light, are so called, because they are the cause of all the variety of colour with which natural objects are adorned. They are not perceptible by any of our senses except the eye; and were it not for the curious mechanism of that organ, by which they are made to converge upon points in the retina, or expansion of the optic nerve, corresponding to points in the body from which they are reflected, by which a small image of the object is formed on the retina, similar to that in the camera obscura, their existence would for ever remain a secret to us. The rays of light have been found to move at the rate of 200,000 miles in a second of time; yet they are so extremely minute, that they make no impression on any of our organs of sense, excepting on the optic nerve, the most delicate of all our organs; and that only in consequence of being made to converge, by passing through the curious lenses of that organ. The rays of light, as they come from the sun, excite in us the perception of a white colour. But when they are made to pass through a triangular prism of glass, or other transparent substance, they are separated into seven distinct rays, which excite the perception of seven different colours, and are therefore called the *primary colours*; as by mixing these in various proportions, all the compound colours in nature are produced. These primary colours are red, orange, yellow, green, blue, indigo, violet. The red rays are least refrangible, or are least changed from their rectilinear course by the attractive power of the prism; the violet most. It would hence seem, that the particles which compose the red rays are denser, or contain more matter, than those which compose the violet or any of the intermediate rays; and as they all move with the same velocity, their momentum, or power to overcome attractions which would draw them

them from their rectilinear course, will be in proportion to their respective quantities of matter. If this be well founded, it should follow, that colour is only a sensation, accompanied with a perception, excited in consequence of the mechanical impulse of these rays upon the optic nerve. But as plants never acquire colour, nor any of their discriminating properties, unless they be exposed to light, a question has been much agitated among philosophers,—whether light enters into chemical union with the substance of plants? Or, if it merely acts as a stimulus, by its mechanical impulse, in exciting the organs of plants to exert their peculiar functions?—This question we shall not enter upon at present.

The *calorific* rays, are those which excite in us the sensation to which we give the name of heat. The perception of heat is not confined to a particular organ, like the rays of light, but is distributed over the whole body, wherever the nerves retain their energy. It is also known by its effect in causing bodies to expand, or enlarge their dimensions, and hence its intensity is measured by the thermometer. To the material substance, whatever it be, which excites the sensation in us, to which we give the name of *heat*, and which causes bodies to expand, chemists have assigned the name of *caloric*.

Several facts had led philosophers to conclude that the light and heat emitted by common fires, were different substances; but it fell to the lot of the ingenious Dr Herschel to ascertain, that the heat emitted by the sun is a different substance from the rays of light. For on trying the heating power of the different colorific rays in the prismatic spectrum, by means of a thermometer, while two other thermometers on which the rays did not act, served as standards of comparison, he found their heating power to be in the inverse order of their refrangibility;
the

the violet rays having the least, and the red rays having the greatest heating power. Taking the centre and the two extremes, the heating powers were as the following numbers :

Violet	=	16
Green	=	22.4
Red	=	55

But what is most remarkable, the heating power did not cease at the confines of the red ray, but was greatest at the distance of half an inch beyond its utmost limits; and continued to be sensible at the distance of an inch and a half beyond the red ray. Here then rays of caloric, or the matter which excites the sensation of heat, and causes expansion in bodies, were separated by the refracting power of the prism from the rays of light, or those which are visible by the eye. It appears that these calorific rays are less refrangible than any of the colorific rays; and hence we may infer, that the particles of which they are composed are denser than those of light. The ingenious Professor Leslie has shewn that light meets with much obstruction in passing through the atmosphere; and in his Enquiry into the Nature of Heat, p. 162, he arrives at this conclusion: "That heat is only light in a state of combination." If this conclusion be well founded, it is probable that there may be no heat in the sun's rays when they are darted from his substance, but that the heat is formed in consequence of the combination of part of the rays of light, with some material they meet with in passing through our atmosphere. It may hence follow, that the sun, which contains much more matter than all the planets and their satellites of our solar system, though the fountain of light and heat to them all, may not himself be oppressed with an incon-

venient excess of heat ; but may be a commodious habitation of numerous orders of animated beings.

It had long been observed, that the oxide of gold, that is gold combined with oxygen gas, or respirable air, when exposed to the sun's rays, was reduced : In other words, the oxygen separates from the gold, which recovers its metallic state. The oxide of silver also blackens, and is reduced. Scheele first observed that the violet ray sooner reduces the oxide of silver than any of the other rays. But Messrs Wollaston, Ritter, and Bockman, found that muriate of silver is most rapidly reduced when placed entirely beyond the limits of the violet ray. It has hence been inferred, that, along with the rays of heat and light, the sun darts forth a third set of rays, which do not affect any of our organs of sense, and whose existence is only discovered by their effects in causing the separation of oxygen from bodies. To these rays, from the effects they produce, they have assigned the name of the *deoxydizing* rays. As the heating, or calorific rays, are least refrangible, or have their direction least changed in passing through the prism ; so it is obvious that the deoxydising rays are more refrangible than even those which excite the perception of violet colour.

It has been inferred by philosophers, that each of these several species of rays produce their appropriate effects in the vegetation of plants. Were it not for the heating or calorific rays, water, and many other liquids would remain for ever in a solid state ; no fermentation could take place in soils, by which the materials they contain form new combinations, which are adapted for the nourishment of plants. Nor would the vessels of the plants themselves be sufficiently expanded, so as to imbibe the nourishment presented to them. Whether heat be the cause of the rise and circulation of sap in vegetables ; or if their juices be impelled by the action of
their

their organs, as takes place in animals, is not yet determined; but it is well known that a certain degree of heat is necessary to produce this effect in vegetables, as well as in animals; and that the sap rises, and the juices circulate, both in vegetables and animals, with much more rapidity, at high, than at low temperatures. Were it not for the luminous, or colorific rays, supposing the necessary degree of heat to be present, all vegetables would be of a dirty white colour, resembling some of their roots; and would be destitute of the several products which distinguish their various tribes and species. It has been observed, that the food of plants consists of water, or some other substance, in which oxygen is combined with an inflammable basis. But in order that this food may nourish a plant, it is necessary that these compounds should be decomposed. This decomposition is ascribed to the action of the deoxydizing rays, which causes the oxygen to separate, and assume its elastic form; while the inflammable basis enters into the composition, or increases the substance of the plant.—It should follow from these premises, that where moisture, soil, and all other circumstances are equal, vegetation should be most vigorous where the solar rays are most abundant.

The circumstances which occasion variations in the temperature of different climates, are,

1. *Latitude.* From the oblique position of the earth's axis to the plane of the ecliptic, it is obvious that the intensity of the solar rays will be much greater under the equator, and between the tropics, than in either of the temperate or frigid zones. Although, in the course of a year, all parts of the earth enjoy the sun's rays during an equal length of time, yet between the tropics, where the sun is twice vertical in the course of a year, more rays fall upon equal spaces than towards the poles,

where they fall more obliquely. This county being situated in a high northern latitude, between 56° and 57° , the difference between the length of the days in summer and winter, is considerable. Although very intense, or long continued frost seldom occurs, yet showers of snow, hail, and frequent irruptions of frost, often encroach upon the summer. There is a general opinion among old men, that the seasons are much colder now, than they were in former times. They say, that in their younger days they were hardly able to carry any clothes, during the operations of seed time, and that their cattle could not work except in the cool of the mornings and evenings. Now, ploughmen are often seen at work in spring, muffled up in a warm great coat.—It seems to be ascertained, that Iceland, and other countries in the north of Europe, are colder now than they were in former times; which some ascribe to the accumulation of ice in the northern ocean. Whether this, or any other cause, may have the effect of diminishing the temperature in the northern parts of our island, we shall not take upon us to decide; but that our seasons are colder and less propitious to vegetation than they were formerly, is an opinion so general that it seems to rest on some foundation.

2. *Elevation above Sea Level.* It is well known that the sun's rays pass through the atmosphere, if it be limpid, without raising its temperature; and that it is only after they strike the opaque surface of the earth, that they give out heat, which is communicated to the air in contact with the heated surface of the earth. It is true, that when the sun's rays are intercepted by clouds and watery vapours in the atmosphere, they deposite heat, and often cause these vapours to dissolve into limpid air. Hence we often see a hazy morning succeeded by bright and warm sunshine. But in these cases, the greatest part
of

of the heat is absorbed, or becomes latent, in reducing the precipitated vapour to an elastic or aëriform state, and does not raise the temperature of the atmosphere through which it passes. The same observation is applicable when the sun's rays strike water, and especially wet and marshy land on the earth's surface. Spouty land, which carries aquatic plants and coarse herbage, discharges much water into the atmosphere through the plants it carries, and the heating rays of the sun which strike such land, are absorbed in converting this water into an elastic fluid. I have hence seen a wet patch of soil, in a field of dry, well-wrought and manured land, not exceed 57° of Fahrenheit, while the dry part of the soil was from 120° to 140° , and sometimes more. This shews, that in order to make a soil warm and genial for the production of all but aquatic plants, of what importance it is to make it dry.

That the air receives its heat from contact with the heated surface of the earth, can be seen on looking at a fallowed field during warm sunshine. An agitation in the air is perceptible, similar to that which is produced by exposing to it a hot iron. The heated air is perpetually rising upwards, while the colder air is sinking down, until by contact with the heated soil, it imbibes heat, and rises in its turn. In this way, the great heat of the burning sands of Arabia, and other tracts under the torrid zone, being imparted to the air, is conveyed by the currents of the atmosphere, and helps to thaw the ice in the polar regions.

In water, mercury, and other incompressible fluids, wherever the heat be applied, the hottest parts being most expanded, rise towards the surface. Hence, though the heat should be applied at the bottom, the surface of these liquids is always as hot as the lower parts. But
with

with air and other elastic fluids the case is different. When air is heated by contact with the surface of the earth, it rises in consequence of the expansion by heat. But as it rises it also expands, in consequence of diminished pressure; being less pressed by the incumbent column of air, at high than at low elevations. The consequence of this latter expansion from diminished pressure, is, according to the late Dr Black, that the heat which increased the temperature of the air becomes latent, or is absorbed; or according to the late Dr Irvine, the capacity of this expanded air for heat is increased. Thus these two forces tend constantly to counteract each other, and the heated air rises only to that elevation in the atmosphere, where its expansion from diminished pressure absorbs, or extinguishes, the increased temperature it had acquired by contact with the heated surface of the earth. Hence, contrary to what takes place with incompressible fluids, the higher we ascend into the atmosphere, the colder it is found to be.

From these causes it follows, that there is a certain elevation in the atmosphere where water is constantly frozen. This region of perpetual congelation may be conceived to be bounded by a curve line, extending from the equator, and touching the surface of the earth at either pole. At the equator, where the greatest heat is applied to the earth's surface, the boundary of perpetual congelation is from five to six miles above the level of the sea. When the sun is in either hemisphere, that is during summer, the line of congelation is more elevated, there being then more heat applied to the earth's surface; but in winter it descends to the surface. In our latitude, the line of congelation, even in the warmest summer, never amounts to a mile above the level of the sea. Hence, on our higher Grampians, at only from

2000 to 3000 feet of elevation, great masses of snow often remain unmelted, even with a southern, and still more with a northern exposure, during a great part of summer. Some of these districts are often buried in snow during six or eight months. In Strathmore, and in the Maritime District, the climate is milder; but violent gusts of wind often prevail. Showers of cold rain, snow, and hail, with inroads of frost at night, often encroach upon summer, and sometimes prevent the grain from arriving at maturity. In all the intermediate districts, the genial warmth of the soil, besides its elevation, is much affected by its exposure, a southern inclination being preferred; by its shelter, in being defended from the chilling north and eastern blasts; by its wetness or dryness; and the degree of cultivation to which it has been subjected.

3. *Maritime position.* This has a great effect upon the temperature of a climate. Where a great body of land is exposed to the heating rays of the sun, the air becomes much warmer than that which rests upon an island, or a small body of land contiguous to, or surrounded by the sea. On the other hand, as the sea preserves always nearly the same temperature, and is never frozen during winter, it communicates warmth at that season to the air passing over it, and which had been cooled by resting on continents covered with ice or snow. Scotland being nearly surrounded, and much intersected by arms of the sea, is not so warm in summer, at the same elevations, nor so cold in winter, as England, which exposes a much greater and unbroken surface to the sun's rays. The same observations are applicable on comparing England with the opposite continent, though situated farther towards the south.—In the Maritime District of this county, snow, except in very severe storms, seldom remains
twenty-

twenty-four hours unmelted. In spring and summer there may often be perceived an alternation of sea and land breezes. When the land is heated during the day, a cold chilling breeze from the sea often sets in towards evening, accompanied with thick haze, which spreads over the lower grounds, and often rises to considerable elevations. This haze is distinguished by the name of eastern *baar*; and is very offensive to the feelings, and hurtful to vegetation, especially when, as often happens, it is precipitated in the form of hoar-frost. This eastern haar is productive of rheumatisms, colds, coughs, catarrhs, and various maladies. It is doubtful whether the effects of these sea-breezes should be ascribed to their coldness, their moisture, or to some infectious quality conveyed to the air by passing over the eastern continent. It is certain they affect the feelings with much more disagreeable sensations of cold, than is indicated by the thermometer.

Owing to the position of this county on the British Ocean, our heaviest rains are from the east and south-east; the heaviest snows from the north and north-east. On the western side of our island this order is reversed; the heaviest rains coming from the Atlantic, which are generally discharged before they pass the lofty barriers of mountains, which are interposed between the west and east coasts. Much less snow falls on the west than on the eastern side of our island. The electric fluid seems to have a strong influence in all the operations which are going on in the atmosphere; though the mode of its action is not yet ascertained. Often the clouds that pass through Strathmore are seen to divide towards the Seedlay ridge on the one hand, or the Grampian on the other, and there will be heavy showers on these mountains, while there is sunshine in the valley.

The

The learned Dr Playfair has favoured us with the following extracts from Registers of the Weather, the one kept at Belmont, in Strathmore, the other in the vicinity of Dundee, accompanied with remarks.

Perpendicular Height of Rain that fell every Month, at Belmont, during six Years, in Inches and Decimals.

Months.	1790.	1791.	1792.	1793.	1794.	1795.
	In. Dec.	In. Dec.	In. Dec.	In. Dec.	In. Dec.	In. Dec.
January	2.8	5.0	2.9 $\frac{1}{2}$	2.8	3.7	1.0
February	1.0	2.7	2.0	3.2	3.1	2.2
March	1.0	1.5	4.0	4.7	2.5	1.8
April	1.8	1.3	1.5	1.4	2.4 $\frac{1}{2}$	4.6
May	2.7 $\frac{1}{4}$	1.7 $\frac{1}{2}$	3.4	8.0 $\frac{1}{2}$	1.5	1.0
June	1.9 $\frac{1}{4}$	2.3	3.2	2.5	8.0	2.8
July	3.8 $\frac{1}{2}$	1.0	3.4	2.6		1.8
August	3.2 $\frac{1}{2}$	3.0	5.8	3.7		4.4
Septemb.	2.9	7.0	2.8	3.2 $\frac{1}{2}$		1.7
October	2.7 $\frac{1}{4}$	7.0	4.1	1.5	4.3 $\frac{1}{2}$	8.4 $\frac{1}{2}$
Novemb.	4.4	2.8	2.2	6.2 $\frac{1}{2}$	6.0 $\frac{1}{2}$	2.8
Decemb.	3.0	1.8	3.0 $\frac{1}{2}$	3.6	4.7	4.1
	31.4 $\frac{1}{2}$	37.1 $\frac{1}{2}$	38.4	39.5 $\frac{1}{2}$	39 nearly	36.6 $\frac{1}{2}$

Mean height of the Barometer, in { 1790, 29.59
1791, 29.61
1792, 29.59

Mean height of the Thermometer, in { 1790, 41°
1791, 42 $\frac{1}{4}$ °
1792, 42 $\frac{1}{2}$ °

The

The greatest degree of Cold, by the Thermometer, at 9 o'clock A. M. { 1790, 23° Jan. 1
1791, 22° Dec. 1
1792, 19° Jan. 1

The greatest degree of Heat, in { 1790, 56° June 1
1791, 60° June
1792, 69° Aug. 1

Number of Days in which the S.E. and S.W. Winds prevailed every Month at Belmont, during these Years.

	1790.		1791.		1792.		1793.		1794.		17
	S.E.	S.W.	S.E.	S.W.	S.E.	S.W.	S.E.	S.W.	S.E.	S.W.	
Jan.	5	14	2	17	13	3	6	12	2	20	11
Feb.	0	10	3	4	7	1	3	15	1	20	13
Mar.	4	14	1	12	4	18	12	7	9	12	10
Apr.	10	6	16	6	10	12	15	3	5	18	14
May	15	7	3	13	7	10	6	11			3
June	10	12	3	9	5	12	5	16			9
July	7	15	4	14	6	18	7	18			7
Aug.	3	17	10	4	12	12	5	18			7
Sept.	3	14	0	9	4	19	9	13			1
Oct.	10	16	12	9	15	6	5	1			14
Nov.	14	5	6	13	2	20	15	3			4
Dec.	0	11	1	11	3	10	7	4			4
	81	141	71	121	88	150	95	140			104

Perpendic

Perpendicular Height of Rain that fell every Month, at Crescent, during the same six Years, in Inches.

Months.	1790.	1791.	1792.	1793.	1794.	1795.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
January,	$1\frac{1}{2}$	$2\frac{3}{8}$	$2\frac{1}{8}$	$8\frac{5}{8}$	$0\frac{1}{4}$	$2\frac{1}{2}$
February,	$0\frac{3}{4}$	$1\frac{1}{4}$	$2\frac{3}{8}$		$0\frac{1}{6}$	
March,	$1\frac{3}{8}$	$0\frac{5}{8}$	$3\frac{1}{8}$	$4\frac{1}{8}$		$6\frac{1}{2}$
April,	3	$1\frac{3}{8}$	$1\frac{9}{8}$		$2\frac{6}{8}$	
May,		$1\frac{1}{2}$	$2\frac{3}{8}$	$4\frac{1}{8}$		$4\frac{1}{8}$
June,	$2\frac{1}{8}$	$2\frac{1}{4}$	$4\frac{1}{15}$		$4\frac{1}{8}$	
July,	$1\frac{7}{8}$	$0\frac{5}{8}$	$3\frac{1}{15}$	$4\frac{1}{8}$		$8\frac{1}{8}$
August,	$7\frac{1}{8}$	$3\frac{1}{4}$	$2\frac{7}{8}$		4	
Septemb.		$0\frac{7}{8}$	$2\frac{1}{8}$	$2\frac{7}{8}$		
October,	$3\frac{3}{8}$	$6\frac{1}{8}$	$4\frac{1}{8}$		$3\frac{5}{8}$	$8\frac{1}{8}$
Novemb.		$3\frac{3}{8}$	$3\frac{1}{8}$	$2\frac{1}{15}$		
Decemb.	$1\frac{7}{8}$	$2\frac{7}{8}$		$2\frac{7}{8}$		
	22.27	24.5	34.12	28.13	30.44	29.

Mean degree of Cold during winter, in

1790,	$39\frac{1}{2}^{\circ}$
1791,	$36\frac{1}{3}^{\circ}$
1792,	$33\frac{1}{4}^{\circ}$
1793,	$35\frac{1}{2}^{\circ}$
1794,	38°
1795,	$32\frac{1}{2}^{\circ}$

Mean degree of Heat during summer, in

1790,	$63\frac{1}{5}^{\circ}$
1791,	$61\frac{1}{4}^{\circ}$
1792,	$63\frac{1}{3}^{\circ}$
1793,	$63\frac{1}{4}^{\circ}$
1794,	66°
1795,	$60\frac{1}{5}^{\circ}$

N. B.—Observation of cold, at eight o'clock, A.M.; of heat, at two o'clock, P.M.

Number

Number of Days in which the S.E. and S.W. Winds prevailed every Month, at Crescent, during these six Years.

	1790		1791.		1792.		1793.		1794.		1795.	
	S.E.	S.W.	S.E.	S.W.	S.E.	S.W.	S.E.	S.W.	S.E.	S.W.	S.E.	S.W.
Jan.	1	10	3	9	0	6	1	14	1	16	0	7
Feb.	0	21	3	10	0	11	1	17	3	12	0	3
Mar.	0	7	0	13	2	10	3	8	1	10	1	9
Apr.	5	3	2	7	0	13	1	3	2	17	4	12
May	3	6	2	10	1	12	0	14	1	12	2	15
June	1	13	1	5	1	8	1	15	0	11	4	8
July	0	11	1	11	5	16	2	13	1	21	1	14
Aug.	2	7	2	8	0	9	4	18	1	9	3	21
Sept.	0	0	3	8	1	13	3	12	1	8	1	10
Oct.	5	3	2	5	2	3	1	24	3	13	2	5
Nov.	5	2	2	7	1	12	6	2	5	11	1	7
Dec.	0	13	1	7	0	11	2	13	2	11	1	19
	22	96	22	100	13	124	25	153	21	151	20	130

From this comparative statement, it appears, that there is a considerable difference in the temperature of the air, &c., in the Second and Fourth Districts. The south-east wind blows at Crescent, 21, and the south-west wind 109 days annually: whereas, at Belmont, the former prevails 85, and the other 138 days. About 28 inches of rain falls at this station, and 37 at the other. These differences, however, are partly owing to the peculiar positions of the stations where the observations were made. Crescent, half a mile westward of Dundee, lies at the foot of a ridge of hills, near the bank of Tay: and Belmont is situated in the centre of Strathmore, two miles distant from any eminence, and twelve north-west of Dundee.

Dundee. When the wind blows from a point east of south-east, its course is changed by the ridge of hills behind Dundee, and becomes easterly at the former station; while at the latter, having met with no interruption, it preserves its proper direction. But at Crescent, the south-west wind is less affected by that elevated ridge, as there is an open tract of country to the westward.— Again, all clouds and vapours from the south-west, are divided near the mouth of the river Earn, and attracted, partly by the Seedlay Hills, and partly by a ridge, stretching along the north coast of Fife; so that less rain from that quarter falls upon the interval between those mountains, and consequently upon Crescent, than upon the Hills of Seedlay, and the adjacent plain beyond them.

Mr Fairweather, at Crescent, in his register, has inserted several judicious remarks, an abstract of which he has permitted me to publish in this Survey.

REMARKS IN 1790.

THE end of the preceding year, and beginning of this, were remarkably mild, with hardly any frost or snow, which accelerated the blossoming of the wall-fruit: but the spring, particularly April, being cold and frosty, the blossom was almost entirely destroyed. Summer was cool and showery, with high winds and little sunshine. Though the crop of wall fruit was indifferent, yet there were tolerable crops of grass and grain; but in some parts of the county the harvest was late. Bees swarmed remarkably well in most places, but honey was scarce.

The weather in the latter part of the year was variable,—showers and high winds being frequent, with frost and some snow.

1791.

There was little frost in the beginning of this year; and the weather continued moderate during spring, so that there was a luxuriant foliage, and promising blossom on the trees; but the delicate kinds of fruit were greatly injured by a week of cold and stormy weather, in the beginning of June, when falls of snow with smart frost, prevailed all over the county. Summer was dry, and on the whole, more favourable than it had been for several years past. The crop of wheat was abundant, and that of barley indifferent: grass and fodder were scarce. An earthquake was felt at Lisbon, November 27.; and at that time there were several high tides on this coast, and blowing weather from the south and south-west.

1792.

A considerable degree of frost prevailed throughout the month of January; but the following month was more temperate and mild. Seedtime was much retarded by rain, and the blossom of fruit-trees was almost destroyed. The crop of grass was luxuriant, but hay-harvest proved indifferent, so that towards the end of the year the price of hay was 1s. per stone. Harvest, being rainy, was not concluded till the middle of November, in the lower districts. The straw was greatly injured, but the grain did not suffer materially by the rain. The gooseberry green caterpillar abounded this season, and continued to breed all summer. Bees did not thrive, and honey was scarcer than in former years.

1793.

1793.

There was little frost or snow during the early part of this year. Spring was cold, wet, and late. May was remarkably mild, till towards the end of it, when cold and stormy weather prevailed for several weeks, which destroyed a luxuriant blossom of all sorts of fruit. Gooseberry bushes were infested with the green caterpillar. Harvest was favourable, and all sorts of grain were safely gathered in; but the crop was not abundant. The concluding part of the season was damp and rainy, with little frost or snow in the low country.

1794.

The winter in 1793 and 1794 was in general mild, so that cualiflower plants remained without cover, and succeeded. Spring was agreeable and warm, but frost in May injured the fruit, which proved a scanty crop. The drought in summer parched the grain on the light soil along the coast, and in other parts of the county. In deeper soils there was abundance of grass, hay, and several sorts of grain. Harvest was early and propitious. Rain and moderate frost prevailed in the latter part of the year.

1795.

About the middle of January, heavy falls of snow covered the ground, and did not completely dissolve till the beginning of April. This, together with frequent showers of rain, retarded the seed time. Fruit suffered by cold weather in May and June, and late arrived at maturity. Few gooseberry caterpillars appeared this season. The mildness of the remaining part of summer was not

a quarter broad.—Most of these lakes contain marl, and several other lakes, as already stated, have been drained, in order to get at that substance. These lakes also abound in pike, perch, and trout of various kinds.—There are various other shallow basins, particularly in Strathmore, which hold water during the rainy season; and among the Seedlay Hills there are various tracts of hollow marshy ground, which were formerly lakes, but have either been wholly, or partially drained.

The principal rivers, or streams of water, in this county, are,

1. *North Esk*.—This river, or water, as it is more commonly called *, takes its rise from several mountain torrents which descend from the highest summits, towards the north-west of Lochlee, and being collected in the basin of the lake, the stream which issues from it assumes the name of the North Esk. Its course, at first, is chiefly towards the east; and a short way below its issue from the lake, near the old castle of Invermark, it receives the waters of the Mark, a stream not much inferior to itself. This latter also flows from the Grampian summits which are situated somewhat more to the north. The North Esk continuing its progress, chiefly in the same direction, and receiving innumerable mountain torrents, is joined by a stream called the Tarf, which is made up of many mountain torrents, flowing from the
northern

* *Water of Esk*, is a pleonasm, or rather a tautology; for the Gaelic name *Esk*, or *Uig*, means water. It is remarkable, that almost all the rivers, and many of the places in Scotland, are distinguished by Gaelic names, which are always descriptive of some striking peculiarity or local position, of the river or place. The name *Esk* is an exception to this, which only indicates running water, without any character of the stream.

northern summits of the county. Continuing its winding progress through Glen-esk, which now begins to be adorned with many beautiful tufts of natural wood, the river suddenly changes its course to a south-eastern direction. At Burn, where it issues from the Grampians, it has cut a deep chasm through the rocks, in the bottom of which it rages from rock to rock; and the late Lord Adam Gordon superadded all the refinements of an elegant taste, to heighten and give a picturesque effect to its natural beauties. Here the river becomes the boundary between the counties of Angus and Mearns; and having only about 200 feet of descent to the sea, it becomes generally more tranquil than it was among the Grampians. At the lower part of Edzel parish, it receives the West Water, a stream which rises in the higher parts of Lethnot parish; and a little farther down, it is joined by the sluggish Water of Cruick. Continuing its progress through a country generally fertile, and well cultivated, and adorned with villas and romantic plantations, it discharges itself into the British Ocean, about three miles north-east of Montrose. No part of North Esk is navigable.

2. *South Esk* takes its rise in the north-western part of the county, among the Grampian summits of Clova. A small lake amidst these mountains, called Loch Esk, is reckoned its source, though it receives many mountain torrents from a still higher level. Passing through Glen Clova with a sluggish motion, it winds through an extensive valley, which seems formerly to have been a lake, and is still partially overflowed, and the crops upon it destroyed, during heavy rains. The lower part of this valley is bounded by numerous hills, composed of sand and gravel, which seem to have been washed by torrents from the mountains on each side, and to have kept back the

water, until the river wore a channel through them for its discharge. It would seem possible, at a very small expence, to lower the channel still more in certain places, to widen and straight the course of the river; and thus to gain an extensive tract of rich soil, which at present is too wet for cultivation, or if cultivated, is in constant danger of being overflowed.—After the South Esk issues from the Grampians, it receives the waters of Prosen, a stream which descends through Glen Prosen, the Grampian district of Kirriemuir parish. It also receives the Carrity, a stream which is collected in the Grampian part of Lentrathen parish; and receiving many smaller streams in its progress, it passes by Brechin, and is discharged into the head of the bason of Montrose, in the parish of Maryton. The general course of this river is from north-west to south-east, and several of its falls are occupied by spinning-mills, and other manufacturing machinery.

The bason of Montrose is an extensive inland bay, of an irregular square figure, and contains an area of about four square miles, or upwards. The greatest part of this bason is dry at ebb tide, and the part contiguous to the town is called *Montrose Sands*. The channel of the South Esk runs chiefly along the south side of this bason, and it is navigable by smaller vessels to within about four miles of Brechin. The tide, and waters of the South Esk, flow through a narrow passage between the town of Montrose, and an island called Inch Bryock; and a little way beyond this, they empty themselves into the British Ocean, about five miles south from the mouth of North Esk.

Along the sands of Montrose, or a part of the bason left dry by the ebb tide, there are the remains of an embankment called *Dronner's Dike*. This is said to have
been

been constructed by one Dronner, a Dutchman, with a view to exclude the sea, and bring the land that was gained into cultivation. But before the work was completed, a high tide, accompanied by a storm, washed great part of it away; and the project has never since been resumed. It is supposed, that upwards of 8000 acres of very fertile land, might be gained by running a sufficient embankment from Montrose, up to the entrance of the South Esk into the bason, in the parish of Maryton.—On examining this ebb, along with Mr Young of Little Mill, we found, 1. A coat of loose sand, varying in thickness, from one to twelve inches, and sometimes rather more; 2. Below the sand, a bed of unknown depth, of a sort of carse clay, or sea-sleech, of a slate-blue, or greyish blue colour, which effervesced with acids, shewing that it contains lime. But this clay is also thickly studded with sea-shells, of various sizes, which are decomposed into a soft pulp. In many places this clay comes up to the surface, and it would not only make an excellent manure for the sandy soils contiguous, but were the sea excluded, they would only have to throw parts of this clay upon the surface, where it is sandy, in order to make highly fertile land. But to form an embankment, the sand must be removed from its base, and only the clay used; for were the embankment built upon sand, the sea would ooze through it, and soon undermine the structure. I suspect, that inattention to this circumstance, was the cause of the overthrow of Dronner's dike. Much staking would also be necessary, and a drain and embankment around the margin of the bason, to keep off the land floods.

3. *Isla*. The last stream of any note, which rises in the Grampians, is the *Isla*. This river flows from the summit of the glen which bears its name. Its general course is from north to south, bending a few points towards

wards the east. The mountain ridge to the west of it, as far as the waters descend into the Isla, is in this county; but where the waters descend into the Shec, which runs nearly parallel to it, is the county of Perth; so that the dividing of the waters, on this ridge, is the boundary of the counties. There is nothing remarkable in the course of this river, until it begins to escape from the Grampians. But below the Bridge of Craig, it meets with a barrier of hard porphyry, and gravelstone rocks, similar to those on the North Esk, at Burn, though more extensive. Through these it has cut a deep chasm, in some places more than a hundred feet perpendicular. In this chasm the river is precipitated from several barriers of rock, forming cascades of singular beauty. The principal cascade may be thirty feet or upwards, of perpendicular height; and the water being projected from a narrow aperture, spouts at all times clear of the rock, into the gloomy pool below. When the river is swelled by excessive rains, these cascades afford a spectacle of majestic grandeur; and this effect is not diminished by the local position of the spectator who views them from the south. As they can only be seen from certain projecting points of the rocks above, which considerably overhang their bases, the spectator is under perpetual apprehension of losing his hold, and of dropping into the horrible foaming cavern below.

The banks of the Isla continue to be steep, and about two miles further down, it is joined by the Melgam, a stream which is collected from the Grampian District of Lentrathen parish. These streams meet each other in a direction nearly opposite to each other's course, and on the high peninsula formed by their junction, are situated the extensive ruins of the ancient castle of Airly, belonging to the Ogilvys Earls of Airly. Here the Melgam
has

has also cut a very deep ravine, and the banks of both rivers, as far as the eye can reach, are adorned with natural woods. These venerable ruins, with a small modern house built in the midst of them; the great strength of the ancient buildings; their commanding and romantic situation, surrounded on three sides by deep ravines, and by the roar of streams, excite us to compare the peace and security of modern times, with the violence and barbarism of ancient feudal grandeur. These ancient chieftains seldom enjoyed a sound sleep, even within impregnable battlements, defended by their armed vassals. Their descendants may now sleep secure in this small house, without either battlements or guards. The Isla continues its romantic course, becoming gradually more sluggish in its motion; until at Ruthven, it bends to the westward; and after receiving several additional streams, by a slow and winding course, it is lost in the Tay, in Perthshire.

4. *Dean.* This stream flows westward from the Loch of Forfar, and is conducted by a deep and broad canal, through a tract of several miles, westward to Glamis. The object of this cut was to lower the Loch of Forfar, in order to get at the marl. After receiving many additions, from the Seedlay Hills on the south, and from the rising grounds on the north of Strathmore, the Dean discharges its sluggish and muddy waters into the Isla, near Meigle, about ten miles to the west of its source. Its whole declivity does not exceed forty feet, yet there are two mills upon it at Cookston, a mile west north-west of the church of Eassey, and two below Potento, near its mouth. It abounds with pike and perch, and with large trout, of exquisite flavour; but no salmon are known to enter it, though they abound in the Isla, and in the other rivers we have mentioned.

5. Lunan,

5. *Lunan.* This stream rises in the Loch of Restennet, north-east from Forfar, and running eastward, it passes through the lochs of Rescobie and Balgalvies, is joined by many smaller brooks, the principal of which is the Vinney, that flows from the Mire of Lower, on the south of Forfar; and descending by a gentle inclination, it falls into the sea at Lunan Bay. A few salmon ascend this stream at the spawning season; and it, as well as its branches, abounds with trouts of various sorts. Great quantities of eels are occasionally caught at Mill-dens, in baskets placed in the mill-leads, which intercept them in their descent from the lochs of Rescobie and Balgalvies. On this stream, and on the Vinney which joins it, beside corn-mills, there are several spinning-mills, and other manufacturing machinery.

6. *Digby.* This stream rises in Lundie Loch, eight miles north-west of Dundee, and receiving supplies from the other lochs in that neighbourhood, it runs eastward through the fertile vale of Strathmartine; and receiving some smaller streams, after a course of about ten miles, it falls into the estuary of Tay, about a furlong to the west of Monifieth. As this stream flows from lakes in the parish of Lundie, though the Loch of Lundie, its chief reservoir, be now drained, its current is more steady than those streams which are gathered on the mountains during heavy rains. From this circumstance, and its neighbourhood to Dundee, its fall is much occupied by spinning-mills, and various kinds of manufacturing machinery; there being upwards of fifty mills of various sorts upon it. Indeed machinery has been increased upon this stream, so as to exceed the power of the water to move it, and some have been obliged to construct steam-engines to assist the water.—It is surprising, that in Scotland, where manufacturing machinery is so often erected
upon

upon small rivulets which flow from lakes, they have never thought of managing the lake, or reservoir, so that it would discharge nearly the same quantity of water at all times of the year. This would only require a dam of a particular elevation, to be thrown across the mouth of the lake, to be furnished with a sluice running upon rollers, to regulate the discharge of the water. This sluice might be suspended to one end of a lever, while to the other end might be hung a floating weight, or buoy, acting in an inclosed space within the lake, to prevent the waves from disturbing its regularity. During heavy rains the surface of the lake would rise, and by its pressure increase the quantity discharged from the aperture in a given time. But the floating weight or buoy would be raised, as the water rose, while the sluice appended to the opposite end of the lever, would descend, so as to contract the aperture, and prevent more than the quantity of water required from issuing in a given time. On the other hand, after a long drought, when the surface of the lake was lowered, the floating weight would descend, and raise the sluice, so as to widen the aperture in proportion as the pressure of the water was diminished. The lever could easily be divided, upon the principles of hydraulics, so as to raise or lower the sluice in exact proportion to the fall or rise of the water, and thus cause equal quantities to be discharged in equal times. This would obviate the objections against the use of a water force, in manufacturing machinery, namely, its sometimes overwhelming them with excess, and sometimes making a total pause, or producing only a languid motion by its deficiency.

The two last mentioned streams flow from the Seedlay Hills, and they are mentioned here, not on account of their intrinsic importance, but on account of the manufacturing

facturing machinery they are employed to move. As they both flow from lakes, both may be regulated in the way we have described, so as to increase their power, and render it more uniform and steady.

Several other small brooks are employed to move manufacturing machinery, which are made to produce the effect through the intervention of gathered dams.—Thus a rill which flows from Loch Fithic, being united with a small burn, moves a spinning and a plash-mill. A brook which rises in Carbuiddo, and descends through the parishes of Inverarity and Kinnettles, where it flows into the Dean, moves several corn, lint, and plash-mills, and the extensive spinning-mills of Brighton. A similar brook moves a spinning-mill, and other machinery, at Glammis. But to enumerate all the brooks that are employed in this way, would be both a tedious and an unnecessary task.

SECT. VII.

FISHERIES.

CONSIDERABLE quantities of fish are caught in this county, both in the sea, and in the rivers, or in arms of the sea into which the rivers flow. Thus the fisheries may be divided into two branches, 1. Sea fisheries; 2. Salmon and river fisheries.

In the sea are caught podlies, (which seem to be the fry of cole-fish,) whittings, haddocks, cod, ling, and various others. It is only since stake-nets began to be erected in the Frith of Tay, that herrings were discovered in that frith, from some that were entangled in the
nets,

nets. Since that discovery was made, considerable quantities of them have been occasionally caught in the Frith of Tay, during the winter season. But they are then very lean, and seem to be in the act, or about to deposit their spawn. Of late years, the herring-fishery has been tried in the open sea, off the Hayne, (Haven) in the parish of Panbride, and considerable quantities taken in the months of June, July and August. Those earliest taken were plump and fat, and no way inferior to the best Lochfine herrings. This shews that all former theories concerning this most nutritive and abundant of all fishes, are erroneous, and how much it imports the interest, or, it may be added, the safety, of Britain, that the herring-fishery should be conducted, according to the Dutch method, in the deep sea. Another discovery has been made by these stake-nets,—that garvies* and spirlings† abound in the Frith of Tay. The garvies seem nearly allied to the pilchards, which are taken in great quantities off the coast of Cornwall. They resemble herrings, though of smaller size, and different flavour. They are taken in great quantities at Kincardine, and other places near the junction of the Forth with its estuary, by nets or wicker traps, sunk in the ebb of the tide. The spirlings are still smaller than the garvies, and when fresh, emit a smell resembling that of green rushes; but when fried, make delicious food. They are caught, during spring, along the Forth, often as far up as the Bridge of Stirling, by nets in the form of baskets, fastened to the end of long poles. Along with the spirlings, a proportion of garvies is commonly caught; and I have seen them sold in the neighbourhood of Stirling at a penny a peck.

* Sprats.

† Smelts.

coasting trade, next into foreign voyages, and ultimately into the Royal Navy.

One remark seems necessary to be added to what has been advanced concerning the sea-fisheries of Angus, namely, That though some individuals smoke haddocks, codlings, &c. for their private use, there is no establishment for curing fishes in this manner for general sale. The practice of curing fishes by smoke was adopted in Aberdeenshire only a *few* years ago, and it has operated as a powerful stimulant to the fisheries, because it renders the fishers certain of being able to dispose of any quantity they can take*. Smoked haddocks require no more salt than renders them palatable; the smoke conveys to them a most delicious flavour; and they are in such great request, that they are often sent from Aberdeen to Edinburgh and London by the mail-coach, and always bring a high price. This county seems well adapted for smoking fish in this manner, as swift smacks sail weekly from every port, which would generally convey them to the London market quicker than the mail-coach. This method of cure might be extended to large cod and ling, and various other fishes, as well as to codling and haddocks.—There is a species of fish called *cuddies*†, which abound in the Pentland Frith, in the sounds of the Orkneys, among the Hebrides, and all along the western shore of Scotland, which are universally esteemed incapable of being preserved by salt, even though they should be afterwards dried like tusk and ling. I have seen a man, with a small rod, on the
point

* The author of this, first suggested the idea of curing what are called *white fish* by smoke, in the same way as herrings are cured, in an Essay published by the Highland Society of Scotland.

† Young coal-fish.

point of a rock projected into the Pentland Frith, catch more of these fish in half an hour, than he could carry. But as they have not found the way of preserving them, some are caught except by individuals for their private use. But it may be proper to try if these fish can be preserved by smoking them; and the same observation may be applied to mackerels, and to a great variety of other fishes. These hints are thrown out, for the consideration of the Society about to be incorporated by act of Parliament, for the improvement of the fisheries. In order that the fisheries may be carried on with advantage, those who are afloat must have a regular and constant succession of work, in catching the various species of fish at the times when they are most in season; while those on shore are employed in curing, and preserving them for the market.

Salmon Fisheries have been carried to a very great extent, on all the eastern rivers and coasts of Scotland, ever since Mr Dempster of Dunichen suggested the plan of conveying fresh salmon to the capital of the empire, packed in ice. Those who first adopted this plan realized princely fortunes, and the proprietors of salmon fisheries have obtained rents which may almost seem incredible. Every salmon-fishery of any note, on the east coast or rivers, is now provided with an ice-house, in which a sufficient stock of ice is stored during winter, to serve during the ensuing fishing season. The salmon are packed in large oblong wooden boxes, with pounded ice interposed betwixt them, and they remain in the ice-house until they are removed on board the smack. They are conveyed to London as fresh as when they came out of the water; and the ice which remains unmelted is used by confectioners, and for cooling wine and various liquors. The fishers commonly contract with the London

fishmongers, to furnish salmon during the season, at so much a hundred weight. Thus they obtain one great advantage, that they are certain of disposing of any quantity of fish they can take. But these arrangements operate to the disadvantage of the neighbourhood, where only the inferior sorts of fish are sold; and when the London market is overstocked, they are often sold there at a much lower price than they can be procured for on the spot where they are taken. I remember when servants in the neighbourhood of Stirling used to stipulate, that they should not be obliged to eat salmon more than thrice in the week; but since this mode of conveying them was introduced, they are seldom troubled with them even once a-year.

The migratory propensities of salmon, their alternate changes from salt water to fresh, and *vice versa*, is the circumstance which renders them highly nutritive food, and brings them within the reach of man. In the sea, they neither take bait, nor leap at flies, and it would be next to an impossibility to surround, so as to take them with a net. But in the sea they are greedily devoured by seals, otters, porpoises, and all the larger fishes; and to escape from their attacks, they hasten into fresh water. In the sea too they grow rapidly, and soon get fat; and then their gills, backs, and sides become thickly studded with a small black animal, named by the fishers, the *sea-louse*; whose attacks seem to inflict upon the poor salmon excruciating tortures, and force it to have recourse, for relief, to the fresh water. A few gallons of river water, seem either to kill the sea-louse, or to deaden the pain it inflicts; for in some parts of the Highlands, where the mouths of rivulets had been shut by banks of gravel and rounded stones thrown into them by great storms from the sea, so that salmon could not enter

enter them, I have seen great shoals of these fishes raise their heads from the sea, and greedily gulp down the fresh water which spouted from a hundred crevices among the gravel, and thus catch it before it mingled with the salt water. Salmon never remain longer in fresh water than is necessary to effect the purposes which brought them there; but sometimes they are surprised in the rivers by long droughts, and cannot get over mill-dams, and other obstructions which lie between them and the sea. When this happens, they soon get lean and mangy, and die, their bodies covered with white worms. But in fresh water, they take various kinds of bait, and eagerly catch at flies, and hence become a source of amusement to the angler.

During autumn, the salmon always run up the rivers to deposite their spawn. There are certainly various breeds of salmon, as well as of herrings and other fishes; and experienced fishers can distinguish between the breeds of contiguous rivers, with which they are acquainted, with as much accuracy as a shepherd can distinguish sheep from goats. The three rivers, Forth, Teath, and Allan, unite their streams about two miles above the Bridge of Stirling. Each of the streams possesses a breed of salmon well known to the people there, and to all the fishers in the Forth. Yet no salmon of one river was ever caught in the other; though, when they run up these rivers, they are so muddy by excessive rains, that the animals cannot steer their course by their sight, but must be led by their smell, or taste of the water. At Berrydale, too, in Caithness the property of Sir John Sinclair, there are two streams, the Langwell and the Berrydale, which form a junction a few hundred yards above the place where their united waters enter the sea. A short way above the point of junction, there

is a cruive upon each stream, which only catch salmon during autumnal floods, when the water is excessively muddy. Yet experienced fishers there assured me, they never found a salmon in the Berrydale cruive that belonged to the Langwell, nor *vice versa*.—It is needless to multiply examples, those which are well authenticated being almost innumerable, whose united evidence establishes the fact,—that every river has its particular breed of salmon; that though when these fishes are roaming through the sea, they may drink fresh water in the mouth of any river that comes in the way: yet they never run far up any river but their own, and always return to their own river to deposite their spawn. Thus far the facts seem to be incontrovertible; but many are of opinion that every river has not only its peculiar breed, but that every place in that river which is adapted for spawning, has also its subordinate breed; and that salmon always return to the place where themselves were spawned, in order to deposite their spawn. If prevented from accomplishing this intention of nature, it is asserted that they drop their spawn at random, without suitable preparation; that it never comes to maturity; and their race soon becomes extinct.

The spawning of salmon seems to be a very slow and laborious process; and they get very lean, and even become unwholesome food, while they are engaged in it. The scene of this operation is generally where a stream begins to issue from a stagnant pool, over a sandy bottom. They begin by digging a hole in the bottom, by pushing the sand and gravel before them with their snouts, in the direction of the current, until they raise it into the form of a bank which checks the rapidity of the current, while it allows the water to percolate slowly. The male seems to exert himself most in this work; and
before

before its commencement his snout becomes longer and harder than usual, while before it is finished, it is often worn entirely away. While depositing their spawn, the male and female rub their bellies upon each other; the latter throwing out her roes, or eggs, while the male emits among them a milky juice, which seems to effect their impregnation. After one stratum of eggs is deposited in the artificial hollow described, they cover them with light sand, to prevent them from being washed away by the water; and thus they form alternate layers of eggs and sand, until the hollow be nearly filled up. The eggs being dropped in a hollow place, are warmed into life by the sun's rays, in early spring. The fry being then very small, easily escape from their covering of loose sand, and soon acquire the size of small trouts, and are called salmon fry, or smolts; which seems to be a contraction of *samlets*. The first flood now washes them into the sea; and they are generally swept from our rivers before the middle of May.

It has often been a subject of dispute, whether the salmon trout, or *grilse*s, as they are more frequently called, which ascend the salmon rivers towards the close of the fishing season, be salmon, or a different species of fish.—To settle this point, some experienced fishers at Berrydale in Caithness, assured me, that one spring they caught a considerable number of smolts, or salmon fry; and having clipped certain marks on their fins and tails, which they noted, they let them go into the sea. The same season, they caught a considerable number of the fishes marked in this way, grown to the size of grilse; and having let a number of them go again, they caught most of them, next season, grown to the full size of salmon. There can therefore be no doubt, but that grilse are salmon of one summer's growth.

There is a fish called the *whittling*, or *sea trout*, which frequents all our streams where salmon abound. This fish, though nearly of the shape, and often approaching to the size of salmon, is distinguished by its colour and spots from the other; and by its flesh not being so high coloured, nor so rich as that of salmon. There is some reason to suppose, that the fry of the sea-trout is the *par*, a delicious little fish which abounds in all our salmon rivers, and which remains in them a great part of summer. One reason for thinking so is, that where deep cascades occur, which salmon cannot pass, no *pars*; any more than smolts, are ever found in the waters above; and though they have been carried above these cascades, they did not continue or propagate, as those fishes do which never go to the sea. It would seem to follow, that as smolts go to the sea and become salmon, so *pars* go there and become whittlings, or *sea-trouts*.

The fresh water eels seem to follow a different order from those last mentioned, and to breed in the sea, while they thrive and fatten in the fresh water, but chiefly in lakes and ponds. During summer, myriads of their young fry are seen constantly ascending the fresh-water streams, where they keep near the sides, that they may avoid the current. Where they meet with interruption, such as behind a mill-wheel, they often accumulate in large masses; and frequently make their way up the crevices of the building, or over the dry land, until they reach the stream above, in which they continue their course. The larger eels are caught, in this county, while they are descending the streams during autumn, probably to deposite their spawn in the sea. After this is accomplished, they probably return to their usual haunts; though being endowed with more strength, they do not keep the edge of the stream like their young fry.

It

It is probable, that pikes, perches, and the various species of trouts, which frequent our lakes and streams, do not migrate, but breed in the places where they are found.

On the North Esk there are several coble fishings for salmon, some of which are carried to a considerable extent; but especially near the mouth, or discharge of the river into the sea. The proprietors on that river are supposed to draw about L. 1000 a-year for their salmon fisheries; but this does not all belong to the county of Angus, as a half, or more, belongs to proprietors in the contiguous county of Mearns.

On the South Esk, there are also several coble fishings, as far up as the tide flows, or there are deep pools, with smooth bottoms, which can be swept with a net. Several stake-nets have been lately erected upon the ebb of the bason of Montrose, but I have not heard they have been so successful as was expected. At the mill-dam of Brechin, there is a cruive for the accommodation of the proprietor's family; but few salmon are taken, because, in floods, when they are most disposed to ascend, they get over the dam, and are generally taken most successfully by a net in the pool above.—In the upper parts of both the Esks, in the Isla, and streams which flow into them, the angler always finds good amusement in catching trouts or salmon, at the proper season. The country people also kill the latter occasionally by spears, pock-nets, and other contrivances; but the practice of killing them by blazes, during the spawning season, ought to be severely prohibited.

A stake-net was lately tried at the mouth of a small rivulet, about a mile westward from Arbroath, and, as far as I could learn, with flattering appearances of success. But being exposed to the full swell of the ocean, violent
storms

storms shivered the net, and the stakes which supported it, all to pieces, so that they were obliged to give it up.—It appears to me, that at the mouth of several rivulets which discharge themselves into the sea, in this county, the method called *stell net fishing*, which is practised with so much success in Caithness and other parts of the north of Scotland, might be tried with favourable prospects. As great shoals of these fishes frequently come to the mouths of rivulets, and generally in a particular direction, with a view to taste the fresh water; a long net is carried out into the sea, and dropped in the form of a semicircle, having its curvature towards the line of their approach. One end of the net is fastened close to the land; while a man seated on the top of a rock, or high pole, descries their approach from a great distance, and makes a signal when they enter the curve. Instantly men who were concealed upon the beach, haul the open end of the net to land; while stones are thrown in at that part, to scare the salmon from escaping. As this net is only supported by floats, which yield to the violence of the waves, it is seldom injured by storms.

The greatest salmon fisheries in this county, are those carried on in the Frith of Tay, and chiefly by stake-nets. These fishings were formerly carried on chiefly by coble boats, and a sort of galleries extended into the frith, supported upon poles. But since the use of stake-nets was introduced into this country, a few years ago, by Messrs Halliday and Company, this mode of fishing has nearly superseded every other, upon the sands, which are left dry at ebb-tide, in the Frith of Tay. This mode has been adopted on the opposite coast of Fife, and in the western part of the frith which belongs to Perthshire, as well as in this county. Indeed, were I permitted to offer an opinion, on a point where I have no practical experience,

perience, it would be, that the stake-nets have been carried to an extreme, and that they are sometimes too much crowded upon each other. Where a great number of proprietors have each a small extent of ebb, with a right of fishing upon it, erecting a stake-net upon each, only tends to scare the fish from each others nets, and to diminish the produce upon the whole. I conceive it would be better for two or more of such proprietors to unite together; and that one net, judiciously placed, might take more than several of them do at present. By this plan, a great expence of nets and of servants might be saved; and thus one tenant might afford to give a much higher rent for one net, than a number of tenants could give for several nets.

The stake-nets have wide meshes, and are stretched upon tall poles, which are firmly fastened in the bottom. They enclose a wide area, into which there are two or three angular passages, behind each other, sufficiently wide to admit a man; but if salmon enter, they do not easily find their way out again. From the mouth of the outward entry, long angular arms are extended, to the land on the one side, and as far as the ebb admits on the other. These serve as conductors to lead the fish to the mouth of the inclosed area, where they are entangled. When the tide is nearly ebbcd, men go in, and kill the inclosed fish by a stroke upon the nose; and convey them to the ice-house, either by a boat or covered cart. They are careful not to bruise or dash them, nor to knock off their scales, nor to allow them to be exposed to the sun and air; as these injure the value of the fish, and hasten their putrefaction.

The greatest stake-net fishing in this county, belongs to the Honourable William Maule of Panmure, member of Parliament. As this is next to the mouth of the frith,
and

and is not annoyed by contiguous establishments of the same kind, it possesses many advantages, and rents for L. 1500 a-year. Above this there are five other stake-net fishings, chiefly crowded about Broughty Ferry, or on the spaces where the tide ebbs, between that and Dundee. The accumulated rental of all these fisheries, in 1810, was about L. 2500. The produce of the whole, and of each, being variable and uncertain, it is difficult to fix a value upon it. But from the best information I could obtain, the produce of these six fisheries, including their home sales, and what was exported to London, during the same year, might amount to about L. 7450.

A keen litigation is now carried on by the proprietors of fishings in the river Tay, against those who have erected stake-nets in the frith, the object of which is to oblige the latter to remove these nets, as nuisances and obstructions in the river. On what ground of natural justice, any man can be debarred from taking advantage of any new invention, so as to improve his property, I am yet to learn. But the merits of this dispute seem to depend upon settling what is river, and what is sea, or an arm of the sea. The proprietors up the country assert, that the Tay is all river, until it discharges itself into the Bay of St Andrew's. The other party assert, that the river ceases, and the sea begins, at the point where the sea-weeds (*fuci*) are seen to grow; or rather, at a line stretching across, where there is no sensible interval between the ebbing and flowing of the sea. In vulgar language, we call it the Forth, opposite to Leith, and all the way to St Abb's Head. But if any man should assert, that the *river Forth* extended all the way to Leith, or to St Abb's Head, we would think he had lost his senses. But supposing it were decided, that the river Tay extended

ted all the way to the bay of St Andrew's, the proprietors of stake-nets might still insist that they do not encroach upon the river. Every river has a *filum*, where it is deepest, and its current strongest. It has also an *alveus*, or *channel*, within which its waters are confined. This is remarkably the case with the Tay, where it passes through the frith, as shewn in several maps, but particularly in the very accurate one of Mr Bell. This channel receives all the waters which flow from the land, and is always full at ebb-tide, while there is a large extent of dry land on each side of it. If the river then be held to extend through the frith, this channel must be accounted the river. Were stake nets, or other engines, to be erected in the channel, they would doubtless be a nuisance, as they would not only obstruct the passage of salmon, but of shipping. but the present stake-nets are at a great distance from this supposed river, upon land occasionally covered by the sea, land from which the proprietors may exclude the sea, and convert it to any use they please. They cannot, therefore, be held to encroach upon the river Tay, even though this river should, (very absurdly) be found to extend to the Bay of St Andrew's.

We have been favoured with the following remarks by George Dempster, Esq; of Dunichen; and though we cannot help entertaining doubts if garvics be the same sort of fish, either with herring or pilchards, we are happy to be set right in points of fact, by a gentleman of his great experience, and who has laboured with so much success to improve the fisheries, both of the seas and of the rivers.

“ Garvics

“ Garvies are probably the spawn of herrings or of pilchards, and have been taken, long before stake-nets were introduced, mixed with smelts, chiefly at Balmerino in Fife. They come near that shore at a certain season of the year, and are then taken in small-meshed nets. Were smelts as much prized, and as high priced in Scotland, as in London, the same ingenious devices would be employed, and great quantities might be taken in the Forth and Tay. Some attempts have been made to convey them to London, along with salmon, in ice; but much of their delicacy was lost before they reached that market.

“ Smelts have been caught, and sold in the market of Dundee, beyond the memory of man. Their usual price is fourpence per hundred.

“ Salmon are caught in the Baltic open sea, with bait. The bait a bit of fresh or salt herring: See the *Bee*. It is mere conjecture that the sea-louse drives them into fresh water. It is certain they spawn among the gravel of our rivers, where the water is shallow.

“ All fishes are lean after spawning, and are supposed to be best when the roes are half formed.”

SECT. VII.

NATIVE PLANTS AND ANIMALS.

WE have been favoured by Mr Don of Forfar, with a list of the more curious plants which are natives of this county, distinguishing the places of their habitation; to which

which is added a short account of its native animals *. In particular, he has favoured us with an account of such grasses and other plants as might be cultivated with advantage; together with a list of those native plants that are hurtful to cattle, and therefore ought to be extirpated from pasture land. As this gentleman has been unwearied in his exertions to cultivate his favourite science of botany, and has had his exertions rewarded by ample discoveries, which are too well known to need any eulogium of mine, he has been much employed in stocking gentlemen's parks with such native grasses as are most productive of sustenance to cattle. It will be seen, that he does not esteem the *forin* grass, which is general in this county, deserving of the high praise it has lately received. Indeed, such persons as I have consulted, have assured me, that cattle will not eat it if they can get any other food, and that when cows are confined to it, they lose part of their milk, while what they give is of inferior quality. It is possible, however, that the character which this grass has acquired, may be owing to its being watered, or treated with other rich manures. It is well known, that these have a powerful effect in changing the qualities of grasses, and rendering those that in their natural state were unsubstantial, both palatable and nutritive.

* See Appendix, B.

BOOK II.

STATE OF PROPERTY.

SECT. I.

ESTATES, AND THEIR MANAGEMENT.

ABOUT a century ago, a great proportion of this county was in the hands of a few ancient families. The most conspicuous of these were of the names of Lyon, Douglas, Ogilvy, Maule, and Carnegie. But since the introduction of trade and manufactures, property has undergone many changes, and has been more minutely divided. Of forty barons mentioned by Edward, in 1676, not one third of their descendants now possess any lands in the county. Of those ancient families which still remain, some possess considerable estates in this county, and some have great properties in other districts, and do not reside here. But excepting the estates which are still possessed by these ancient families, landed property has fluctuated so much, that in the parish of Dundee there are only two estates which have been an hundred years in the families of their present occupiers. Landed property has changed its masters nearly as rapidly in other parishes, and the average

average term of possession, for one family, is rated sufficiently high at forty years.

The money value of estates has also been undergoing a very rapid change, and has been hitherto increasing. This is owing to two causes, 1. A more improved style of agriculture has been rendering the lands more productive, so that when leases fall, great rises of rent are obtained: 2. The value of money, from the quantity in circulation, has been rapidly falling, though this has not been accompanied with a proportional rise in the money price of land produce. From the frequent changes of proprietors, and the parcelling of greater estates into smaller divisions, joined to the fluctuation of the returns from the estates themselves, we have not been able to obtain the number of estates in the county, which are of all dimensions, from one to many thousand acres, nor of the annual value of these estates respectively. Nor does this seem necessary, in a work of this kind; and entering into such an investigation would look too like an officious intermeddling with the private circumstances of individuals. In general, with regard to the size or value of estates, it may be sufficient to mention, that in both these particulars, there is much variety. A great proportion of them are from L. 100 to L. 1000 a year. Some are from L. 2000 to L. 6000; and one, or perhaps two, are reckoned to exceed L. 12 000 a year.

Several estates, belonging to landlords who are generally absent, and some of the greater estates of those who reside, are under the direction of stewards, who are here distinguished by the names of factors or chamberlains, according to the idea entertained of the dignity of their employers. But proprietors who reside in the county, in general, manage their own affairs. Among them, a solitary instance or two may perhaps occur, of the re-

mains of ancient aristocratic ideas, when ignorance and pride were held to be the distinguishing marks of a gentleman. But the great body of proprietors, even those who employ factors, converse freely with their tenants, and are distinguished by their politeness and affability. Many of them have farms of considerable extent, under their own management. A free intercourse between landlord and tenant is certainly for their mutual advantage. By this the landlord acquires the confidence and esteem of his people, without lessening his dignity. He has an opportunity of knowing their wants, and the means by which he may encourage their exertions. The tenant may profit from his more enlarged and liberal views; while his theoretical speculations may often be corrected by the practical experience of the tenant. A great proportion of the proprietors employ a writer to the Signet at Edinburgh, to manage their charters and onerous deeds, and to assist them in cases where law may be thought necessary. These gentlemen are usually distinguished by the epithet of *Their men of business*; and of several properties they have acquired the entire management. These gentlemen have contrived to establish their influence over a great proportion of the proprietors in Scotland; and seem to have fortified themselves in the ground which was occupied by the clergy during ages of ignorance and barbarism. During the dark night of superstition, a man could take no step respecting his property, or his domestic concerns, without having half a dozen, or a score of priests to advise him: and he was obliged to compound for the safety of his soul, and the security of his property, by ample donations to the church. When a man died, without granting these donations, it was presumed to be his intention to do so; and what was originally an alms, or favour, was claimed as a right.

right. In our days, a man can hardly venture upon any step of importance without having a posse of lawyers at his elbow, and after all, often finds himself as far from his purpose, as if he had not employed them. We mean no reflection upon these gentlemen, while they confine themselves within their proper sphere; but certainly, conveying extensive estates to the sole management of persons who reside in Edinburgh, is attended with the most pernicious consequences; especially in remote parts of the country. But we do not know of any such cases here, because most of the proprietors manage their own affairs; and even those who employ factors, are at great pains to select respectable characters, who reside on the spot, and who have abundant opportunity of knowing what should be done, in every case that occurs. Vesting the sole management of extensive estates in persons who reside at a great distance, be their skill and abilities what they may, seems as absurd, and attended with as pernicious consequences, so far as the effect extends, as the conduct of the Aulic Council of War at Vienna, who undertook the command of their armies upon the Rhine, at the distance of several hundred miles; so that, whatever the enemy might do, no movement could be made, and no position occupied, without their special orders.

SECT. II.

TENURES.

THE greatest part of estates in this county are freehold, that is, held by charters from the Crown. In Scotland, a freehold property of forty shillings value, old extent, that is, which was so valued when a land-tax was first imposed in this country; or a property of L. 400 Scots, by a subsequent valuation, entitles the possessor to vote for a member of Parliament. This shews, that the constitution of Scotland, in respect of the elective franchise, was originally the same with that of England; but that, in its progress, by raising the elective qualification, it had become more aristocratical. But in Scotland, houses and buildings were never valued, and no elective franchise was ever attached to them. The probable cause of this is, that when these institutions commenced, houses were of little value, and they were guided by the maxim of the Roman law, *Domus cedit agro*.

Several properties, but none of any great extent, are held in feu, that is, they are held by charters from a baron, or subject superior, for payment of a trifling, often an illusory feu-duty. The granter of the charter is called the Superior, and the holder of the lands is called the Vassal. In addition to the feu-duty, or quit rent, originally agreed upon, the proprietor is commonly entitled to a full year's rent of the property for admission of singular successors, when the property is alienated beyond

yond the lineal heirs, and many other prestations which are now generally become obsolete.

When these tenures were first introduced, the great barons were a sort of petty princes, and the object of these grants was to keep men always in readiness to fight for them. In those disorderly times, even persons who held allodial property, often preferred becoming the vassals of some potent chief, to whom they united their strength, and from whom they derived protection. Fighting being the chief object in view, many of these tenures could not be possessed by women, and they reverted to the superior during the minority of the heir. So much did the *delectus personæ* figure in the eyes even of our judges, that a lease is not transferable, except by express stipulation. Although this tenure be now, to all practical purposes, a full right of property, yet it has always been regarded by our law as a lease, on condition of military or other services. Although the superior receives little or nothing from the lands, the right of property, and all political privileges, are considered to be vested in him. It has hence happened, that persons of extensive property are excluded from voting for members of Parliament, and in some counties a few persons can controul the elections, who have no other property in them but a few illusory quit-rents.

These tenures have been employed, in this county, for a very different purpose from that which was in view during the reign of the feudal system. It is a very common practice for landlords to feu out waste land, in small allotments, to bring it into cultivation. In this sense, the feu may be considered as a perpetual lease, not only with a full rent, but even with a much greater rent than could be obtained in any other way. In some cases, it is common to grant a lease of twenty or thirty years, which

is convertible into a feu, at the option of the occupant, with double rent, at any time during the currency of the lease.

A considerable proportion of the property in this county, is held under deeds of entail. The effect of these is to reduce the proprietors to the condition of mere life-renters, with very little power over their property. We have not heard that there are any hurtful limitations in these entails upon the power of granting leases. But they render it the interest of the occupant to let his farms for a fine, or sum of money per advance, which withdraws from the farmer the capital by which he should improve, rather than for an adequate yearly rent during the currency of the lease. The possessor by entail having no interest in the subject, except what he can levy from it for immediate use, cannot be supposed to adopt arrangements, and to enter zealously into plans by which its future value may be increased. If he has a numerous family, his chief object must be to make provision for his younger children, as the eldest succeeds to the estate. It is true, indeed, that an act of Parliament was passed, empowering the occupant by entail, to burden the estate with two-thirds of the expence of any improvement he might execute. But this legislative relief is clogged with so many vexatious formalities, that there are examples of great and expensive improvements being executed upon entailed estates in this county, without taking advantage of it.

The sole object of these entails is to keep up a name, and they are as frequent with men who have made their fortunes, as with men of ancient family. There are even examples of their being executed by persons who had no heirs of their body to whom they might transmit their estates. When all the heirs mentioned in the deed of entail

entail become extinct, they cease to operate, and the last possessor may dispose of the property as he pleases. But as there are, generally, more than one series of heirs mentioned, it seldom happens that an entail expires for want of heirs. These entails lock up land from commerce, and hence operate as a bar to its improvement. When a man, who has made his fortune by trade purchases an estate, he generally exerts himself in some permanent improvements, which may prove beneficial to posterity. But a possessor by entail is reduced to the condition of a *fruges consumere natus*.

BOOK III.

BUILDINGS.

SECT. I.

HOUSES OF PROPRIETORS.

THERE are upwards of sixty seats, or residences of proprietors, in this county. Some new ones are nearly finished, and others are projected, which will unite elegance with magnificence. Some of these houses are highly ornamented, and surrounded with pleasure-grounds, (here called policies,) which are laid out with great taste. A short account of a few of the more remarkable of these houses may be expected in a work of this kind.

1. Glammis Castle, the residence of the Earls of Strathmore; is placed in a low situation, on the bank of the Water of Dean. The original building was a masonry quadrangular tower, adorned with round turrets at each corner. It had been surrounded by water, which has been drained, and very extensive plantations placed around it in all directions. The late Earl made many
extensive

extensive additions to the building, but was prevented by death from completing his designs. This appears to have been a royal residence, probably before the Scottish monarchy extended beyond the Frith of Forth. In the minister's garden, about a mile south from the castle, there is a very large obelisk, said to have been erected on the spot where one of the Malcolms, king of Scots, was murdered. The stone is adorned with symbolical figures, which are thought to express, that the murderers there conspired the death of the king, and that after the deed was done, attempting to escape across the Loch of Forfar on horseback, while it was covered with ice, the ice gave way, and they were all drowned.

2. Lintrose, Murray; two miles south of Cupar.

3. Haliburton, one mile south-east of Kettins, at the foot of the Seedlay Hills.

4. Isla-bank, Ogilvy; two and a half miles north of Meikle, not far from the left bank of the Isla.

5. Airly Castle, the residence of the Earls of Airly, situated on a promontory at the confluence of the Melgan and Isla, five miles north of Meikle. This castle has been spacious and magnificent, and its situation is very picturesque.

6. Lindertis, Fletcher; five miles north north-east of Meikle, on a declivity fronting the south.

7. Brighton, Douglas; two miles east of Glamis.

8. Kinnettles, Bower; near Brighton.—The two last are in a romantic glen, between hills.

9. Logic, Kinloch; on a plain three miles north of Glamis.

10. Balnaboth, among the Grampians; the Honourable Walter Ogilvy; ten miles north-west of Kirrymuir. This house is situated in a narrow glen watered by the Prossen.

11. Kinordy,

11. Kinordy, Lyall; one mile north-west of Kirrymuir.

12. Pearsie, Wedderburn; four miles north north-west of that town.

13. Cortachie, Earl of Airly; an old castellated house on the South Esk, four miles north of Kirrymuir.

14. Downie Park; an elegant mansion, lately built by Colonel Rattray, on the north side of the river, opposite to Cortachy.

15. Powrie, Fotheringham; four miles south from Forfar.

16. Lower, Carnegie; two miles south from Forfar, on the declivity of a round hill. This house was built by an Earl of Northesk, of which the family of Lower is a branch.

17. Kerse, Grey; two miles north from Forfar.

18. Dunichen, George Dempster, Esq; on the southern declivity of the hill. The plantations on the hill have a picturesque effect when this house is seen from a distance.

19. Burnside, Hunter; on the north side of Dunichen Hill.

20. Carraldston, Skene; in a well cultivated tract, four miles west of Brechin, and surrounded by extensive plantations and pleasure grounds.

21. Eskmount, Hunter; one mile west from Brechin, on a bank overhanging the North Esk.

22. Brechin Castle, the spacious and hospitable mansion of the Honourable William Maule, representative of the county in Parliament. This castle is situated upon a steep perpendicular rock, which overhangs the North Esk, and it is separated from the town of Brechin by a very deep ravine. From the remotest period of its history, it has always been possessed by the Maules, Earls of Panmure,

Panmure, of whom the present proprietor is a lineal descendant, although the title is extinct. From its local position it must have been a place of great strength, before the modern improvements in artillery were introduced. It was besieged by Edward III. in 1303, and resisted all his efforts for twenty days, until the brave governor, Sir Thomas Maule, being killed by a stone thrown from an engine, the castle surrendered on August 20. James, Earl of Panmure, built a spacious house in front of the ancient castle, in 1711, and made many repairs and additions to the old buildings.

23. Panmure, another seat of this family, is about ten miles north-east of Dundee, and was built about 150 years ago. The house is situated in a very extensive park, surrounded by stately plantations, the extent of which the present owner has very much increased. It is a venerable fabric, and is kept by the proprietor in the same state in which it descended from his ancestors. Here, a considerable collection of paintings and fine portraits are exhibited, together with the ancient armour of the Barons and Earls of Panmure. The state bed is shewn, which was occupied by the unfortunate son of James VII. of Scotland, when he attempted to recover the throne of his ancestors by the insurrection of 1715, headed by the Earl of Mar.

24. Balnamoon, Carnegie; three and a half miles from Brechin.

25. Strickathro, Cruickshank; four miles north north-east of Brechin.

26. Kinnaird Castle, Sir David Carnegie; is the most elegant and magnificent modern house in the county, and is finished and furnished in a style suitable to the ample fortune of its owner. It is situated three miles south-east of Brechin, in a highly fertile and improved territory.

ry.

ry, amidst extensive plantations and pleasure-grounds, which are laid out with great taste. It is of a parallelogrammic form, castellated, with turrets at each corner, and commands a fine view towards Montrose, and of the fertile and highly ornamented country which slopes into the bason on each side.

27. Dun, Erskine; three miles west of Montrose.

28. Langley Park, Cruickshanks; near Dun.

29. Charleton, Carnegie; one and a half mile north of Montrose.

30. Gallery, Lyall; five miles north north-west of Montrose, on the North Esk.

31. Auchterhouse, Earl of Airly; six miles north-west of Dundee, on the road to Meikle.

32. Strathmartine, Laird; four miles northward of Dundee.

33. Tealing, Scrymgeour; near Strathmartine.

34. Carbuddo, Erskine; five miles north-east of Dundee.

35. Middleton, Gardyne; eight miles east south-east of Forfar.

36. Guthrie,— six east by south of Forfar.

The following houses are situated in the lower district of the county :

37. Gray, Lord Grey; four miles west of Dundee.

38. Lundie House, Lord Duncan; three miles north-west of Dundee. The late Admiral Lord Duncan, employed much of his leisure time in improving his property, and embellishing his paternal mansion.

39. Invergowrie, Clayhills.

40. Balgay, Anderson.

41. Blackness, Hunter.—These three seats are to the westward of Dundee, and from the two latter there is a noble prospect of the Carse of Gowrie.

42. Craigie,

42. **Craigie, Guthrie**; two miles east from Dundee. This is a commodious mansion-house, situated amidst pleasure-grounds, which are laid out with great taste. It looks down upon the Frith of Tay, and the opposite coast of Fife. The plantations are so artificially disposed, as to hide all those parts of the frith where the tide leaves the bottom dry, and to give it all the effect of an artificial lake. The constant plying of boats and shipping, seen through these openings, gives them all the effect of figures in the magic lantern.

43. **Fintry**,— four miles east from Dundee.

44. **Grange, Ker**; six miles east from Dundee.

45. **Ballumbie**.— four miles east by north from Dundee. A commodious house, contiguous to the ruins of an old castle of the same name; not yet completed.

46. **Kelly, Honourable Major Ramsay**; two miles west from Arbroath. This house is adorned with plantations, and commands a fine view of the ocean.

47. **Guynd Cottage, Oughterlong**; two miles west by north from Arbroath. The proprietor is doing much to embellish this place.

48. **Kinblethmont, Lindsay Carnegie**; four miles north of Arbroath.

49. **Ethie, Admiral Lord Northesk**; five miles north-east of Arbroath.

50. **Annieston, Rait**; one and a half mile north of Ethie.

51. **Dunninald**,— two miles south of Montrose.

52. **Rossie, Ross**; one and a half mile north-west of Dunninald. This is a spacious and elegant house, in a well cultivated territory adorned with plantations, and commanding an extensive prospect of the bason of Montrose, and the adjacent country.

The above is an enumeration of the principal noble-men and gentlemens seats in this county, which occur

at

at present; and we are sensible, that several have been omitted, which might well deserve a particular description. One remark seems applicable to the country-seats of the gentry in this county, and indeed in the greatest part of Scotland, that, owing to the constant variation of the surface, they are generally seen to the best advantage. In England, where level plains often extend farther than the eye can reach, and where the surface is too much encumbered with hedge-row trees, country-seats, even of great magnificence, can seldom be seen from a distance. But in this county, where the surface swells into hills, and sinks into dales, every proprietor has it in his power to choose a situation for his house, which is not only well-aired, and enjoys fine prospects, but where his house and its embellishments cannot fail to attract the notice of the passing stranger. The great exertions that have been made by proprietors within these twenty or thirty years, to adorn their family mansions with plantations, judiciously arranged, have already done much to increase the natural beauty of the county; and if persevered in, are likely still farther to increase it, while embellishment and utility go hand in hand.

Several handsome country houses, upon small properties, in the neighbourhood of towns, are here omitted, and several houses upon considerable properties, which do not add much to the embellishment of the country, are also omitted. There are also a considerable number of houses recently built, or building, where the effect of the embellishments cannot be ascertained, which are not mentioned.

SECT.

SECT. II.

FARM HOUSES, OFFICES, AND REPAIRS.

FROM what still remains of the old farm-offices in this county, some idea may be formed of the wretched situation of cultivators half a century ago. The walls of these houses and offices are composed of stone and turf, arranged in alternate layers. In constructing these, the cupples, or principal supporters of the roof, and indeed of the whole fabric, are first erected in a perpendicular position, and at equal distances, resting on the ground. Between these the walls are built, to the height of about five feet. The cupples are joined together by a few cross beams, fastened to them by wooden pins, in a horizontal position, upon which branches of trees, and twigs, called *cubres*, are laid in a slanting position. Over these again, a thick coat of turf is laid, and the building is completed, unless it afterwards receives a covering of thatch, which is fastened by ropes, like a hay stack. The internal accommodation resembles the external structure. It appears, that originally the cattle entered by the same door with the family, though this is now disused, and they are confined in a house by themselves. But the fire was kindled on the floor, round which the family slept, and the smoke escaped by a hole in the roof, which also served to admit light; and when greater light was necessary, it was admitted by the door. The next improvement was to put up a screen between the door and fire-place,

to

to divert the current of cold air from those who sat round it. This screen next received a wooden window, and lastly, a pane of glass, to admit light when wanted. Lastly, a window was placed in the outer wall, varying from one to four panes. A great many farm-houses continue in this state to this day, particularly in the Grampian districts. The beds are of close boards, which form a division between the fire-place, and another apartment where lumber is commonly deposited. In the progress of improvement, this other apartment received a chimney, built with stone and clay, and became the chamber where the farmer and his family commonly reside; the other end, or kitchen, being occupied by the servants. Such houses were long considered as conferring distinction upon their occupiers; and to have, what is provincially called a *but* and a *ben*, is, in some districts, still regarded as a mark of dignity.—Such habitations are damp, smoky, and dirty in the extreme, and it is hard to say, whether their occupants, or their cattle, be worst accommodated. A considerable number of such houses are commonly arranged together in clusters, with intermediate houses for their cattle, forming a sort of village, without symmetry or plan. The dung is commonly thrown into a sort of hollow, in front of each dwelling-house, which it is difficult to enter without going to the knees in filth; and the nostrils are regaled with perfumes not altogether so agreeable as those of Arabia.

The cause which seems to have led to these arrangements, was the disorderly state of former times. When they were exposed to the depredations of banditti, they were obliged to be near each other, for mutual protection. The Cattarine, a set of robbers from behind the Grampians, were wont to come down and carry off, by fraud or force, every thing they could remove, and many
farmers,

farmers, and even proprietors of estates, were glad to compound for the safety of their property, with these predatory associations, by paying them a tribute called *black mail*, so late as the beginning of last century.—The inhabitants of these small villages cultivated the contiguous land in the way called *runrig*, that is, patches scattered here and there, with *baulks* or intervals betwixt them, which received no cultivation; while their cattle and sheep grazed promiscuously on the neighbouring waste. What has once been introduced, is often continued, from inveterate usage, after the cause which produced it has ceased to operate. In most parts of the county, the intermixture of farmers houses and offices continues more or less, though the land has been divided, and even inclosed, and *runrig* abolished. But in some of the Grampian districts *runrig* still continues, as well as the intermixture of houses.

The next step in the progress of improvement, was to throw aside turfs as cement in the building of houses, and to substitute wrought clay, in which the stones are imbedded. Accordingly, many of the farm-houses and cottages are still built in this manner. After the roads became so far improved that they could have access to lime, it became a frequent practice to point the outside of these buildings with lime, having small chips of stone thrust into the interstices between the larger stones. This mode of building is very frequently practised; but all buildings of consequence are now wholly built with lime cement, and they are lathed and plastered on the inside. In some parts of the county where stones are scarce, cottages, and even small farm-houses, are frequently built with clay, which is wrought and mixed up with straw. Spars of wood are first erected, to mark out and support the walls, between which the clay is laid in

alternate layers, smoothed, and allowed to dry in the air. Such buildings, if in a dry situation, are very warm and comfortable, and if whitewashed they may even be rendered elegant. But they cannot support any great weight of roof, and are commonly covered with thatch, fastened to rafters by cords. The roof is made to project somewhat over the walls, in order to throw the water off them, which would wash down the clay.

All the buildings in which lime is used as cement, and even many of those which are only pointed, are covered with the sandstone flags, described under the article of Minerals. These are fastened by wooden pins, upon rafters laid across the cupples, and have fog (*sphagnum palustre*) or plaster-lime interposed between the interstices. As these flags, (here called slates) from their great weight, require much wood to support them, with great strength of walls, and frequently to be relaid and the fog or plaster replaced, and after all seldom make a dry roof, it seems doubtful if genuine slates would not be more economical. The only objection to this is the duty on slates water-borne, which could be obviated by bringing slates from the Grampians. In the towns, and for gentlemens houses, slates are chiefly used. When the walls are too weak to bear the weight of these flags, thatch is used, or heath, and in many places, instead of binding down the thatch with ropes, wroucht clay is mixed with the outer coating. This is thought also to enable the thatch to resist the weather for a much longer time.

In those districts of the Grampians, where the arable land still continues to be runrig, and the mountains common pasture; and where the occupants have either no leases, or leases of very short endurance, the farm-houses and cottages are generally wretched, dark, and sordid
huts,

butts, hardly fit to accommodate swine, far less human beings; and exceeding even the worst description of houses already detailed. In other districts, where the arable and pasture are allotted into separate farms, held under lease, the case is very different. Even in these unfrequented wilds, we behold the natural instincts of man, where not nipped in the bud, operate in producing, if not splendid, at least wholesome and comfortable habitations. In the other districts, we behold the farm-houses and offices, always to correspond to the length of the lease, or to the encouragement given by the landlord for the construction of these necessary accommodations; and, in many cases, even to go beyond these

If it be true, as generally supposed, that the improvement and opulence of a country may be estimated from the neatness and cleanliness of its buildings, and of its inhabitants, this county is not behind its neighbours in these particulars. The greatest part of farm-houses recently built, are substantial, and conveniently situated. On a farm of from 100 to 200 acres, there is a dwelling-house, built with stone and lime, of two stories, roofed with flags or slate, often lathed or plastered on the inside, and decently furnished. The offices commonly form three sides of a square, built of the same materials, and of size corresponding to the extent of the farm. Of this square, the dwelling-house commonly occupies the fourth, or southern side. In different parts of the county, on some old leases, there are farm-houses that emulate the seats of proprietors, and seem to surpass what is necessary for the comfortable accommodation of the farmer, and of his utensils and animal stock. But the late Mr Hunter of Blackness, at Eskmount, near Brechin, planned and erected a farm-house and offices, sufficient to accommo-

date a farm of from 150 to 200 acres of arable land, in which every thing was consulted for conveniency, but nothing admitted for pomp and ostentation. Of this steading, a plan and description were inserted in the Farmer's Magazine, before they were finished; and, as this worthy gentleman, now no more, granted permission to insert them in this work, they are here exhibited as a specimen of the improved farm-houses and offices in this county*.

With regard to the mode by which farm-houses and offices are built and repaired in this county, the practice is very various, and no general rule is followed. These things are commonly settled by special pactions at the entry to a lease. When it is necessary to build a new house and offices, sometimes a certain sum is allowed to the tenant, and he is permitted to build in any way he thinks proper. Sometimes one, or two, and in certain cases, three years rent are allowed, according to the extent and expence of the buildings deemed necessary. In these cases, the tenant furnishes all carriages, and to get accommodation to his mind, generally goes considerably beyond what is allowed by the landlord. In other cases, the landlord allows what sum the tenant thinks necessary, and receives 7 or 7½ per cent. of additional rent for the money expended, while the tenant keeps the buildings in repair. This seems to be the most advantageous mode, and least productive of disputes, both for
landlord

* See Appendix C.

landlord and tenant. The landlord sinks money on heritable security, at a high interest, upon his own estate, and gets the average return of money laid out in building houses in towns. The tenant, knowing he is to pay a high interest, will seek no more than is absolutely necessary for his comfortable accommodation, and will take care that what is laid out be as frugally expended as possible. When the landlord is bound to lay out a specific sum, the tenant has little interest in economizing the expenditure. But in this case, their mutual interests harmonize. In other cases, the buildings are valued to the tenant at his entry; he is permitted to make what additional buildings he pleases, and the landlord is bound to pay the increase of value at the expiry of the lease. But this mode is pregnant with disputes; for though no specification of the additional buildings should be entered in the lease, the law would refuse the tenant indemnification for all buildings not deemed absolutely necessary for the farm; a point, which being merely a matter of opinion, it is not easy to ascertain. But though there should be no dispute on this head, and the buildings were found to be within, rather than to exceed, what the farm required, from the rapid rise in the price of materials, and of tradesmens wages, buildings constructed towards the beginning of a lease, would be very much enhanced in value before its close, which would be against the landlord.

When no new buildings, and only repairs are necessary, the houses are put into a tenantable condition, and delivered at an appreciated value to the tacksman, who is bound to uphold them, and to leave them of equal value at the expiry of his lease. With regard to neatness, cleanliness, and conveniency, in the houses of the mid-

dling class, much has lately been done ; but much more still remains to be done.

The value of farm houses and offices, accommodated to the size of particular farms, owing to the rapid rise in the price of materials and wages, it is difficult to assign. Most of the small farmers, and those who have short leases, build and repair their houses themselves without employing tradesmen. The most valuable part of their time, as well as that of their working stock, during summer, is thus employed in patching and preparing their houses to shelter them from the rigours of winter : When they should be collecting manures, cleaning their drilled crops, working their fallows, and preparing for the succeeding crop. All the tenants, when either new buildings or repairs are necessary, lend a helping hand in digging stones, clay, sand, and in conveying wood, and all other materials needed to the spot; the value of which labour cannot be estimated, as it varies with the distance, and state of the roads. But setting these particulars aside, the value of farm-steadings, as they now exist, may vary from about L. 20 to L. 1000. A few upon extensive farms, held under old leases, could hardly be constructed at present prices, under L. 1500, or even L. 2000.

There is a general complaint among the farmers, against the backwardness of landlords, in affording them the necessary accommodations in respect to houses and offices. Upon several properties this complaint is but too well founded. People, by advertisements in the newspapers, are induced to bid against each other for a farm, without ever thinking whether the accommodations be sufficient to enable them to do justice to the farm, and to pay the rent. After the successful candidate is preferred, he finds there is no allowance for necessary
buildings

buildings or repairs. He is therefore under a necessity of sinking part of his stock, and diverting a great part of his labour, in making such unsubstantial additions and repairs to the buildings, as may enable him and his cattle barely to exist. After all, he and his cattle are perpetually wallowing among filth; while his implements, from want of proper shelter, are exposed to rottenness and decay. It is not possible that a man, in such a situation, can do proper justice to his farm, or raise it to the highest possible state of production. Damp, nasty, and unwholesome habitations, depress the spirits, and enfeeble the exertions, not only of man, but of brute animals.

On the other hand, landlords often complain, that tenants demand much more costly accommodations than are necessary. There may be cases where this complaint is too well founded. Expensive buildings, which are more calculated for shew than for use, are unsuitable to the condition of a farmer. But it is the manifest interest, as well as the bounden duty of the landlord, to have his farmers lodged in wholesome and commodious habitations, with all the conveniences which the nature of the culture, and the size of the farm require. We conceive this would be best accomplished in the way we have proposed, which has been actually adopted on some properties in this county. After agreeing about the rent in the existing state of the farm, allow the farmer the expence of the additional buildings he may think necessary; he being bound to pay 7 or 7½ *per cent.* of additional rent for the money so expended. This seems to be the best mode of executing, not only buildings, but all permanent improvements, such as draining, inclosing, &c. In such case, the landlord has only to take care that these buildings be placed in the most commodious position,

tion, and executed in the most substantial manner. The farmer will have nothing to divert his attention from his proper business, increasing the fertility and productiveness of the soil; and when the lease expires, the landlord will find the outlay returned, with compound interest, in the rise of rent.

SECT. III.

COTTAGES.

THESE have been greatly improved of late years. They are generally built with stone and clay, with clay floors, and thatched roofs. A house of this sort, thirty feet in length, and sixteen in breadth over walls, may be constructed for about L. 15. Many of them are floored with broad flags, or with wood, have the walls pointed with lime, and are roofed with flag slates, and may cost, according to their dimensions, from L. 30 to L. 50. But in the progress of improvement, fewer hands are needed for the ordinary operations of agriculture than formerly. This has occasioned a gradual diminution in the number of cottages, and their inhabitants have been constrained to resort to towns in quest of employment and lodging. Some of the manufacturing class have voluntarily abandoned the country, partly from the scarcity of fuel, partly to be near a market. Others have been removed by the enlargement of farms, and the disuse of employing cottagers as farm servants. The consequence is, a scarcity of hands, and a great rise in the price of labour;

hour; as the scarcity of a commodity proportionally tends to enhance its value. This is often severely felt by the farmers during the time of harvest, especially if it happen to be rainy, which is too often the case.

Cottagers are collected in small villages, called *cot-towns*, where they occupy a house and garden, and sometimes keep a cow, under the farmer. Their rent is paid in labour and services to their master, and they only possess their houses from year to year. Hence any little improvement they may make, only subjects them the more to the will of their master. Personal services must be abolished before this useful and industrious class of men can be rendered comfortable. Were the landlords to grant them leases of their tenements for a reasonable term of years, their situation would be meliorated, and their inducements to industry much increased.

Villages built on a dry situation, and depending entirely upon a landlord, would answer the same purposes to the farmer with his *cot-towns*, and would be a greater nursery of robust and healthy children, to cultivate the soil, or to recruit our armies and navies, than great towns, which are commonly the *fomes* of depravity and disease. A village on this principle was planned at Letham, A. D. 1788, by George Dempster of Dunichen, Esq; the enlargement and prosperity of which he has promoted with much zeal, and with much success. Lots of various extent are let in perpetual lease or feu, at L. 2 per acre; or at L. 1 per acre, during nineteen years, with option to the occupant to convert his holding, at any time during that period, into a perpetual lease at L. 2 per acre. Already a great many houses are erected, a stamp-office has been long established, and a weekly market for the sale of flax, yarn, and green cloth. They have even proceeded to root out an extensive plantation of firs, situated

to the west of the village; and neat cottages, pointed and plastered with lime, rising amidst trees, excite a lively idea of the back settlements of America. It would very much promote the prosperity of this village, were a good and easy road made to Dundee; and were it to become the centre of communication between Dundee and Brechin. Before these operations commenced, the ground was among the worst in the estate, and it brought only L. 5 of rent, which the tenant was unable to pay. It now yields the proprietor L. 200 *per annum*, and upwards.—Were villages on a similar plan, erected in different parts of the county, great benefit would accrue to proprietors, to farmers, and to the community at large.

Another kind of cottages are very frequent in various parts of this county. These are constructed by weavers and other kinds of tradesmen, upon allotments of waste land, which they occupy either upon a long lease, or a feu. Some of these are only temporary erections, built of turf, with a mixture of stones, and are meant to accommodate their families and their looms, until they get their lots of land reduced to cultivation. Upon these lots, which are trenched at first with the spade, they raise potatoes, clover, turnips, and a little corn, to keep a cow. Their rural operations are carried on during the intervals of their professional work; and the size and accommodation of these cottages varies with the wealth and taste of their owners. Neighbourhood to a town, or to a public road, is a great inducement to set down these cottages, and they are also much influenced by their position in respect to a peat moss, or other fuel.

SECT.

SECT. IV.

RELIGIOUS BUILDINGS.

Churches.

THE Christian religion was first introduced into this country by the Culdees, who had been banished beyond the pale of the Roman empire during the several persecutions to which Christians were subjected. It would seem that they acquired this name from their living together in cells, which seem to have been established in places which had been already consecrated in popular estimation, by having been the chief seats of the Druidical worship. There they established seminaries of education, in which young men were instructed in the principles of religion, and in the sciences then in vogue, and were sent to convert the people in the neighbouring districts, and to administer the ordinances of religion to those already converted. It was not until long after the Scottish Church fell under the dominion of the Romish, and after many violent struggles on the part of the Culdees to maintain their independency, that the Episcopal form of Church government was introduced. At first the Bishops were ambulatory; but in process of time, the places where the Culdees chiefly resided, and where their schools were situated, grew into cathedral churches, or into monastic churches, whose Abbots enjoyed Episcopal jurisdiction. This was not carried fully into effect until after the reign of David II., who appears first to have assigned to each Bishop a particular diocese, and to have

have conferred ample endowments from the Crown lands and revenues to support their dignity.

A considerable part of this county was annexed to the diocese of St Andrew's, and part of it to that of Dunkeld. But Brechin was the seat of a bishoprick, of which, though the diocese does not seem to have been extensive, the revenues seem to have been very ample. At the Reformation, they are said to have amounted, in money and kind, to L. 700 a-year; a sum which, in those days, would be equal to as many thousands now. Here was situated, on the edge of a deep ravine, a very venerable building, called the Cathedral of Brechin, part of which was demolished at the Reformation. The western part of it has been lately repaired, and converted into a very elegant and commodious parish church. The steeple is partly detached from the body of the church, on the west end, and is a very handsome massy tower, 120 feet high. South from the steeple, and originally detached from the other buildings, is situated one of those curious round towers, of which, though they be common in Ireland, there are only two to be found in Britain, namely, the one of which we treat, and another similar to it at Abernethy, in the county of Perth. From its appearance, this tower seems to be much more ancient than the contiguous buildings. The height from the ground to the roof is 80 feet. The roof consists of an octagonal spire, 23 feet high, which makes the whole height 103 feet. The interior diameter, a few feet from the bottom, is 8 feet, and the thickness of the wall at that part 7 feet 2 inches; so that the whole diameter is 15 feet 2, and the circumference nearly 48 feet. At the top, the inner diameter is 7 feet 8; the thickness of the walls 4 feet 6, and the circumference 38 feet 8 inches. These proportions give the building an imposing air, not only

of strength but elegance. In the spire are four windows placed alternate on the sides, resting on the top of the tower; and near the top of the tower are four other windows facing the four cardinal points. What seems to have been the arched door, or entry, from the west, has been built up, and carved stones, representing a crucifixion, and other religious emblems, inserted. Another door had been opened communicating by a low gallery with the church, to admit the ringers; for it seems the bells had been placed in this tower until lately, when they were removed to the steeple. Another circumstance deserves attention respecting this building, that the massy stones of which it is composed, are not placed in horizontal layers, one above another, from the bottom to the top; but the layers are placed in a spiral form.

What was the use of these buildings, antiquaries are not agreed. Some think they were watch towers for decrying, and making signals at the approach of enemies. Some think they were brought from Ireland by the followers of St Columba, who is said to have converted the Picts; and that they were penitentiary houses, where the culprit was first lodged at the top, and worked his way downward through the lower stories, according as his penitence seemed to be sincere, and his reformation complete.

It is a common error, which has been even adopted by all our historians, that the destruction of our magnificent religious buildings was effected by an outrageous mob, instigated and hounded on by the declamations of our fierce reformer, John Knox. It is true, indeed, that this destruction first commenced at Perth, where a numerous audience had been inflamed by a violent declamation of our reformer against *the abominable idolatry of the mass*;
but

but it was not owing to any hint thrown out by John Knox, who deprecated these outrages as much as any man could do. It arose from the folly of a priest, who, in contempt of the inflamed state of the peoples minds, began to celebrate mass after John Knox had finished his declamation against its idolatry. With regard to the observation in the History of the Reformation, usually quoted a proof of his approbation of these demolitions, "That if the nests were herried (destroyed) the rooks would flee away," it is now ascertained that John Knox did not compose that book, but that it was done by his secretary, who carried his reforming zeal much farther than his master, and who published it in John Knox's name after his death.

The Reformation in Scotland was carried by the people, or rather by a combination of the gentry and nobility, who envied the enormous wealth and splendour of the Hierarchy, and thirsted for their spoils, against the supreme authority. The destruction of magnificent buildings was not effected by the sudden impulses of mobs, but by the slow and regular operation of orders from the Privy-Council of Scotland, under the direction of Regent Murray, who contrived to make the people believe, that stone and lime were tainted with the hated errors of Popery. So far was John Knox from being the wild reformer he is commonly esteemed to be, that in his *Platform of Discipline*, which was passed unanimously in the Scottish Parliament, for whose sanction it was presented, in place of the Popish Hierarchy, he instituted a moderated Episcopacy. In place of giving the Chiefs, or Magistrates of his new Reformed Church, the ancient name of Bishops (*Overseers*), he designated them by the name of *Superintendants*, which was nearly
of

of the same import. At least, as Hudibras expresses it,

*Put them in a pock and shake them,
Of a sudden you'd mistake them.*

But when honest John, with his assistants and coadjutors, applied to the same Parliament, who had passed his Platform of Discipline *sub silentio*, praying them to annex the lands and revenues of the Church which they had abolished, to the maintenance of the ministers and officers of the Reformed Church which they had established, they said it was a *devout imagination on the part of Jobn*; and like the French Convention, in similar cases, passed to the order of the day.

In fact, these gentlemen had already, in reality, or in contemplation, vested themselves in all the revenues of the Church which they had abolished; and all they allowed for the maintenance of the Reformed Church, which they put in its place, hardly exceeded L. 32,000 Sterl. a year; a sum, as the late Dr Robertson, in his History of Scotland, remarks, which seemed to be an insult on a National Establishment. Even this pittance, small as it was, was often withheld by the lordly patrons, from the ministers of their districts; who having no legal means of redress, severals of them, with their families, literally died of want. It so happened, that these gentlemen contrived to stir up clamours, and to lay all the odium of withholding the scanty allowances from the Reformed ministers upon the unfortunate Mary Queen of Scots, which terminated in her ruin. Had our Sovereigns of the race of Stuart taken the lead in the reformation of religion, when the nation was ripe for it, they might have even carried their arbitrary principles of government, and prevented the Reformation from degenerating

rating into the excesses which marked its progress in Scotland ; but their obstinate attachment to the superstitious tenets of the Church of Rome, occasioned their expulsion from the throne of three kingdoms, and the extinction of their family.

Next in dignity to the Cathedral of Brechin, but far surpassing it in extent and magnificence, was the Monastery of Aberbrothwick. It is situated on a rising ground to the north of the town, which commands a magnificent prospect of the ocean, St Andrew's, and the coast of Fife, and of the county towards the west. Although great masses of the buildings are occasionally falling down, and they are very much defaced, in many places wholly razed for stones to build houses ; yet what remains strikes the beholder with surprise, not unmixed with religious awe. The church has been a most magnificent building, in the form of a cross, about 275 feet in length within the walls, and 67 feet in breadth. The length of the transept is 165 feet ; and its breadth 27. A lofty spire is said to have stood in the centre, supported on pillars ; and there are the remains of two magnificent towers at the west end of the church. To the south-west is a strong massy building, which is said to have been their baronial prison, where malefactors were confined.

This Abbey was founded by William the Lion, in 1178, and it might vie with the most magnificent establishments of the kind in Europe. The house is still inhabited in which this King is said to have lodged when he resided here ; and he is said to have been here interred, though no memorial of his grave remains. It was dedicated to Thomas-a Becket, which must have been done to shew William's spleen against Henry II. King of England, or he would not have heaped honours upon a hypocrite,

hypocrite, who was the common enemy of all kings; and laboured to exalt the crosier above the sceptre, the altar above the throne. Such, however, was the veneration entertained for this saint, in that stupid age, that because he had been adopted as the guardian genius of this abbey, King John granted to the traders from Aberbrothwick an exemption from all tolls and customs in every part of England, except the port of London.

A very large proportion of the lands in this county, at one time, belonged to this Abbey; but it is difficult to ascertain their extent, as great alienations were made when they felt their influence beginning to decline. They also possessed lands and tithes in various other counties. When these lands were conferred upon them by the munificence of our kings, and of the nobles, it appears they were in a wild and uncultivated state, and that they laboured successfully to promote their improvement. In fact, some of the best lands now in the county, are known to have belonged to this monastery. In those days our nobles were merely ring-leaders of gangs of ruffians, and they did not keep men upon their estates for the purposes of cultivation, but in order to fight for them. But when men were more afraid of the censures of the Church, than of violating the rules of justice and humanity, the ecclesiastical vassals were allowed to carry on their agricultural operations in peace.

What may have been the exact amount of the revenues of this abbey, it is now very difficult to ascertain, as they were chiefly paid in land produce, and in services of the vassals. In 1562, they were reckoned L. 2553 Scots in money, besides what was levied in kind; and a pound Scots then was nearly equal in value to a pound Sterling now. In 1530, there were bought in

800 weathers.	82 chalders of malt.
180 oxen.	30 of wheat.
11 barrels of salmon.	40 of meal.
1200 dried cod-fish.	

This great store of provisions was over and above what they received from their tenants, and it appears that neither the King nor the Archbishop had visited the place this year, while it also appears that their visits were frequent. This profusion may seem the more extraordinary as the number of monks did not exceed twenty-five. But these religious fraternities had no other way of spending their revenues, but in charity and hospitality. These places served all the purposes of inns in more moderate times, where the high and the low, the rich and the poor, found an hospitable reception, and had all their wants supplied gratis. In the reign of Elizabeth, the abolition of monasteries brought such discredit upon the reformed religion, that they were obliged to compensate their loss to the poor, by establishing a poor rate. A similar effect took place in Scotland, and it was found necessary to enact laws imposing a forced assessment for the maintenance of the poor. Happily the establishment of parochial schools, the most substantial benefit Scotland derived from the reformation of religion; and the bounden duty of charity, always inculcated by the Established Church; have hitherto superseded the necessity, in general, of enforcing the laws imposing a legal assessment for the maintenance of the poor.

In this monastery several Parliaments were held; and here was held that Parliament under King Robert Bruce which addressed the famous letter, or remonstrance, to the Pope, that breathes the spirit of a free and independent people. The Pope, whose curses in those days

were

were more formidable than embattled legions, had excommunicated Bruce, for the slaughter of John Cummin in a church; had laid his nation under an interdict, for their adherence to him; and had been induced to exert all his influence in support of Edward's pretensions to the Scottish crown. But this Parliament assert the ancient immemorial independency of their kingdom, which they say had been maintained free, through a succession of 113 kings, and disclaim the right that Edward pretended to their crown. They entreat his Holiness to admonish Edward to desist from hostilities; and even throw out some broad hints, that if he should side with him, they would withdraw their submission from the Pope, as well as from Edward. So little idea had men in those days of the divine, hereditary, indefeasible right, which was claimed by Bruce's successors of the race of Stewart, that they tell the Pope, should Bruce desert their cause, they would choose another leader. "To which Robert, for the protection of our liberty, from his right to govern, and his meritorious services, we are bound, and will adhere, in all things, as to the person through whom the safety of the people is secured. But if he should desist from his undertakings, and wish to subject us and our kingdom to the English King, or to the English, we would instantly endeavour to expel him, as our enemy, and the subverter of his own and of our rights, and would make another person our King, who should be sufficient for our defence. Because, while an hundred men remain alive, we never will submit to the domination of the English; for we do not fight for glory, for riches, or for honours, but for liberty alone, which no good man resigns but with life." This remonstrance seems to have produced a great change in the policy of the Pope, perhaps through fear of his lo-

sing the whole Scottish nation; for we find him endeavouring to persuade Edward to desist from his schemes of conquest, and labouring to effect a reconciliation between him and the Scotch.

In this enlightened age, when knowledge is so generally diffused among all ranks, we are apt to sneer at the folly of our ancestors, in erecting such magnificent establishments, merely for the purpose of supporting what we hold to be superstition and absurdity. But we do not consider the barbarous and disorderly state of the times when these establishments were founded, or in place of sneering at their folly, we would be disposed to applaud their wisdom. The pompous ceremonies of their worship, were calculated to make an impression on a rude people, on whom reason and argument would have been lost. The little learning of those times was confined to monasteries, where ancient manuscripts were preserved, and multiplied. Ecclesiastics generally went abroad for their education, and often travelled to Rome, either from curiosity or business. They thus had opportunities of seeing countries more civilised, and better cultivated than their own. The great estates that were annexed to them, were at first barren and unproductive; but they laboured to improve them, at first with their own hands, and afterwards by their directions. They introduced most of the garden fruits and vegetables yet known in this country; together with the cultivation of wheat, and the more valuable species of grain. It is true, that from small beginnings they acquired enormous wealth and power; and then conducted themselves as men in such circumstances generally do. They were distinguished by their lazy sensuality; their ostentatious vanity; their disgusting pride and arrogance; which hastened their downfall.

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There were small monastic establishments at Brechin, Montrose, Dundee, and other places, but their buildings are now entirely effaced. There are the remains of a priory at Restennet, about a mile east from Forfar. It is built upon a peninsula projected into the lake, now drained for its marl, and seems to have been wholly surrounded with water, and accessible only by a draw-bridge. This priory is said to have been a detachment from the monastery of Jedburgh, and to have been chosen as a place of safety, where they might deposite their more valuable effects and records, as its name (*res tenet*) imports. As the clergy in those days were the most strenuous asserters of the independency of their country, we find the English Edwards, after they claimed the crown of Scotland, burnt and destroyed their records, and often demolished their buildings, wherever they went. Jedburgh, being situated on the border, was often exposed to these calamities, which induced the monks to remove their records, and more valuable effects, to this place. The church of this priory is said to have been the parish church of Forfar, before that community was in a condition to build a church for themselves. Its walls and spire still remain, and it is now the burying place of the families of George Dempster, Esq; and of General Hunter.

At Dundee there are the remains of a very magnificent church, which was built by David, Earl of Huntingdon, brother to William I. of Scotland, and dedicated to the Virgin Mary. This is said to have been done after his return from his third crusade against the Saracens, in which he accompanied Richard I. of England, with 500 Scots, in 1180. Being in great danger of perishing by shipwreck, he is said to have vowed to build a magnificent church to the Virgin at the first place where he

should effect a landing. Having landed at Dundee, the Pope is said to have ordered contributions to assist this pious work, to be levied through all his spiritual dominions. The original building was in the form of a cross, and is represented by old historians to have been very large and magnificent. It is supposed to have been demolished by Cromwell's forces, under the command of General Monk, when the town was taken by storm, and the inhabitants put to the sword; great numbers having fled to the church, and there continued to defend themselves. All that lately remained of the ancient building was the choir, which has been pulled down, and a new church built in its place, and a very massy and magnificent tower, now detached from other buildings. From the ruins of this superb edifice, other churches have been built, without much regard to symmetry.

Parochial Churches and Manses.

In the towns these have lately undergone great improvements. The churches are generally provided with elegant spires, and are adapted for the accommodation of numerous audiences. It would seem, that a great proportion of the country churches were originally intended as tombs, or places of interment by their founders, where priests were employed in saying masses for the benefit of their souls. They are dark and dismal fabrics, resembling barns, extending from west to east. Some of them are in the form of a cross, and to others additions have been made, without any regard to regular proportions. Although the law of Scotland strictly prohibits all interment in churches, yet many of them are still used for this purpose; and from the immemorial interment of dead bodies in the church yard, the external earth is often considerably

ably raised above the floor of the church. The consequence is, that such buildings are not only dark and dismal, but damp and unwholesome; and fainting fits are frequent when the congregation is assembled. It may be truly said of many of our congregations, when they appear before God, that, like Job, "they roll themselves in dust and ashes," even the ashes of their fathers. Our southern brethren have often reproached sister Peg, with associating gloom and filth as necessary appendages of devotion. But the reproach is very far from being well-founded; for some of the churches in this county, which have been lately rebuilt, are neat and commodious. Some, in place of the miserable belfry which still disgraces the greatest part of them, are even furnished with elegant spires, in which clocks are placed. This is particularly the case with the parish church of Craig, which is an elegant structure, on a rising ground south from Montrée, and is a very great ornament to the country. The great body of our people are as much in love with elegance and cleanliness, in the buildings appropriated to public worship, as our southern neighbours, were it in their power to attain these conveniences. In proof of this, it may be observed, that the churches which are built by dissenters, provincially called *Meeting Houses*, by voluntary subscription of the people, generally very far surpass the old buildings for public worship on the establishment, in these particulars.

The manses, or residences of the parochial clergy, which have lately been rebuilt, are, in general, sufficiently commodious. They generally contain two public rooms, four or five bed rooms, with suitable closets and conveniences. The offices consist of a small barn, stable, cow-house, cart-house, washing-house, and some-

times more or less of other accommodations. Some of the older manses are sunk in a bog, in the midst of springs, immediately below and contiguous to the public burying ground; are miserably damp; and are annoyed with perfumes which are neither so agreeable nor so wholesome as those of Arabia.

The law imposes the building and repairing of churches and manses as burdens upon the land; and where proprietors are blind to their own interest, or adhere to a communion different from the Established Church, they are seldom disposed to do any thing in these matters except what they are forced to do by legal compulsion. In these buildings and repairs they commonly adopt the cheapest estimate; and, in consequence their buildings and repairs are often ruinous in a few years, and they have the work to begin again. As this is a source of disagreeable altercation between ministers and their heritors, and not seldom of expensive litigation, it would be desirable to have the law so far altered as that it might more effectually accomplish the objects, without exciting any irritation between the parties.

School-Houses.

Every parish is provided with a school-house, and a schoolmaster for the instruction of youth. The school-house is generally situated near the church; but when the latter happens to be on the outside of the parish, the school-house is placed in a situation more central for the attendance of children. The school-house is generally of one storey, having the dwelling-house on one end and the teaching room on the other. Sometimes the school-house is of two storeys, having the dwelling
house

house above, and the teaching room on the ground floor. Many of the teaching rooms are damp and unwholesome, and it would be a great improvement to have the floor somewhat elevated above the external surface, and floored with wood. Every country schoolmaster has a garden adjoining to his house, and some have a piece of land annexed to the office, sufficient to maintain a cow. In the towns, the schoolmasters salaries are paid out of the town revenue, and partly from pious donations and mortifications from individuals. In Dundee, an Academy is established, where not only the languages, but the sciences, which qualify men for active life, are taught. There is an approach towards this in all the other towns, where one or more masters, besides the branches they officially teach, have classes for the Elements of the Mathematical Sciences, and their application in Mensuration, Geography, Astronomy and Navigation. In these there are also masters for Drawing, and various branches of the elegant arts. But in the country schools, the subjects chiefly taught, are English, Latin, and sometimes French, if required, together with Writing, Arithmetic and Book-keeping. Along with these, the principles of religion and morality are instilled into the minds of youth, and they are trained up in habits of order and good behaviour. The building and repairing of school-houses, as well as of churches and manses, is a burden fixed upon the land. Such manses and offices as prevail in the county may cost from about L. 300 to L. 700; the school-houses from about L. 100 to L. 200. The same observation applies to ministers' stipends and the salaries of schoolmasters; with this difference, that the former are only a part of what belonged to the clergy from the first commencement of property in land, the latter are the result of positive legislative enactments. These burdens

burdens are no injury to landed proprietors, because, when an estate is purchased, they are always appreciated, and deducted from the free rental.

The establishment of parochial schools was carried by our zealous reformers, who strenuously impugned the Popish maxim, "That ignorance was the mother of devotion." It is true, that an approach towards public instruction had been made by the Bishops of St Andrew's, Glasgow, and Aberdeen, who established our three first Universities. But their object was to inculcate the nonsense of Aristotle's logic, in which the clergy might find weapons to defend the still more palpable nonsense of their religious tenets, against the attacks of heretics. It was reserved for our reformers to devise and carry into effect a plan, by which the poor might be instructed as well as the rich; those who followed secular employments, as well as those who prosecuted learning as a profession. The effect of the parochial schools has been, to diffuse a taste for learning among the whole body of the people. Even the meanest cottager thinks it a sacred duty incumbent on him to have his children instructed in reading and writing, and many of them push their children into higher branches of education. In places that are too remote from the parochial school, private schools are established, by subscription or otherwise. But the effect of the public schools has been, to keep down the emoluments of teaching far below what that species of labour, if left to find its level, would naturally obtain. This, although it keeps education within reach of the poor, tends to the depression of persons engaged in that employment; and to counteract this effect, it seems expedient to permit parochial teachers to increase their fees in proportion to the decrease in the value of money. The late addition to their salaries fell short

short of raising them to the same rank in society, which they occupied when schools were first established; and a suitable increase of fees seems not only just, but necessary.

Our Scottish aristocracy long looked with a jealous eye on parochial schools, and foreboded the subversion of all order, and the extinction of all industry, from instructing the lower classes of society. but the fact has turned out to be the very reverse of their predictions; for since knowledge was generally diffused, the people have become much more orderly and industrious; agricultural improvements have advanced with unprecedented rapidity; while the value of land has received a proportional increase. Since the establishment of parochial schools operated its full effect, great numbers of ingenious artists have been trained for every branch of manufacture; numerous are the improvements which have been made in every species of machinery; while abundant supplies of well qualified persons have been found for the naval and military services. It has often been asserted, that a great proportion of the serjeants in our armies, and of the pursers and paymasters of our ships of war, are Scotchmen. There is hardly a head gardener in all England but who is a Scotchman, or the son of a Scotchman. They owe their promotion to the education they received at our parochial schools, which qualified them to understand botany, and the sciences connected with their profession. It does not seem possible to procure teachers sufficiently qualified, unless their circumstances be so far improved, that they may maintain that respectability in society, which they enjoyed at the first commencement of this establishment.

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MILITARY STRUCTURES.

Of these the most ancient are certain vitrified forts, of which the remains of three are still distinctly visible; and there is reason to suppose that several others once existed, though their ruins are now covered over with grassy turf.

The first of these vitrified forts is situated on the hill of Finhaven, in the parish of Oathlaw, about a mile N. W. from the village of Aberlemno. It is of a quadrangular figure, of considerable extent, being 137 yards in length, and 37 in breadth, constructed along the edge of a precipitous puddingstone rock, which is accessible by a narrow isthmus from the east. The walls of this fort have been of considerable thickness; though being now much demolished, their dimensions are concealed by rubbish. Towards the west, or lower end of the fort, there are the remains of a deep excavation, from which it is probable some of the materials had been taken, of which the fort is composed. This excavation also served the purpose of a well, to collect water for the use of the garrison. Mr Pennant, (*Tour in Scotland 1772*, p. 165.) mistook this fort for a volcano, and the excavation for the crater from which the lava had been ejected. When these vitrified forts were first brought into notice, they were universally reputed to have been volcanoes, and are by many esteemed to have been such to this day. But had they been volcanoes, we might expect to have found the

the hole, or crater, from which the lava had been ejected, situated in the centre. Yet in all of these forts which I have examined, this hole is always situated towards the lowest part of the rock on which the fort is placed. It must therefore have been excavated there on purpose, as the most convenient situation for collecting the rain-water that fell within the fort, for the use of the garrison. This fort is called the Castlehill of Finhaven, and the greatest part of them are designated by names which indicate places of strength, though none of them have acquired names which have any reference to volcanic eruptions. There are the remains of another vitrified fort on the summit of a mount in Drumsturdy Muir, parish of Monyfieth. The Law * of Dundee is a remarkable conical hill, which overlooks the town on the north, and on its summit there are the remains of a vitrified fort. On the ruins of the latter there have been built, at a subsequent period, a fort composed of dry stones, without any cement. This fort is about 40 yards in length, from north to south, and 25 in breadth, from east to west, within walls. There are remains of round towers at each angle, and of an outer rampart along the edge of the hill, which is strongest on the east, where was the entry, through a long narrow passage, winding among turrets, and passing into the body of the place at the middle of the east side of the quadrangle. There are terraces lower down the hill, which seem to have been out-works.

Vitrified

* This is probably *Dun Tau*, from which the town of Dundee derived its name. The term *Law* shows, that in after times it had been used for holding courts of justice.

Vitrified forts occur in various parts of Scotland, but they abound chiefly in the northern districts. A chain of them runs along the rising grounds to the south of the Moray Frith, from near Peterhead to Inverness, from whence they pass into Ross-shire and Sutherland. From Knockphadrick, near Inverness, another chain passes along the track of the Caledonian Canal, which is said to extend to the Island of Mull. They are always placed on high, pointed, and detached rocks. That on Knockphadrick, and another near Dingwall, at the mouth of Strathpeffer, are of very large dimensions. The size of the others is very various; and some are so small, that they seem only calculated to accommodate from a dozen, to a score of men. Along the Moray Frith, and the Caledonian Canal, they are generally in view of each other; and the smaller ones seem to have been intended to keep up communication with the larger ones by means of signals.

At what time, or by what hands, these forts were constructed, is now unknown. They seem to be the most ancient military defences in this country; and to have been erected before the art of building, or tools for quarrying stones, were known. On examining several of these forts in the north, and the Castlehill of Finhaven, in particular, it appeared evident that the vitrification was only superficial, seldom extending beyond two feet into the wall, and often only forming a thin coating on its external surfaces. Another remark occurred, that either in the hills where these forts are placed, or not far distant from them, a ferruginous, sandy species of clay-marl abounds, of a dark-red colour, being a compound of siliceous sand, clay, iron and lime. This compound is known to soften with a low red heat. I remarked also, that for the outer facings of these walls, the most vitrifiable

able stones had been carefully selected, which being broken very small, had their interstices carefully filled up with this easily vitrified marl. In parts where the fire had not produced its full effect, this marl still effervesces with acids, owing to carbonate of lime in its composition. In the interior parts of these walls, which are generally of great thickness, the stones are of larger size, and seem to have been gathered at random from the land. Many of these are only partially singed; and towards the centre of the building, they seem not to have been at all affected by the fire. This distinguishes these forts from volcanic rocks, which abound in the Island of Skye and other places. The latter consist of a vast congeries of various kinds of stones, which are cemented together by means of a vitreous matter that had been injected among them, in a liquid state. In these, the vitreous matter passes through the whole body of the rock, which is often more than a mile in extent; while fragments of basalt and other more fusible stones are often found partially vitrified. But in the forts, the vitrification is always superficial; though, as already said, according to the intensity of the fire at the several parts, and the skilful selection of the materials, the vitrification extends to various depths within the walls.

These facts lead to an irresistible conclusion. That the heat by which these walls were vitrified, had been applied externally. They seem first to have erected two frames of wood, parallel to each other, their distance being the thickness, and their height that of the intended wall. Between these frames, the materials being properly arranged, and piled up, a great mass of billets of wood seems to have been built up, on each side, and above the wall. These billets seem again to have been covered with a wall of turf, with air-holes at proper distances,
and

and sods above all, to confine and render the heat equable. On applying fire to the billets through the air-holes below, and restraining the free admission of air at first, the billets would soon be charred. Then by a more free admission of air, a very intense white heat would be raised, which would liquefy, or soften the contiguous stony materials, according to the circumstances already pointed out. That the vitrification of these walls was not the effect of accident, as is commonly supposed by all who do not esteem them volcanic, appears from this circumstance, that the whole effect does not seem to have been produced at once. In all of these vitrified walls I have seen, where a considerable extent is uncovered by rubbish, there are perpendicular fissures, commonly at equal distances, shewing that they had not been vitrified all at once, but in successive masses, or compartments, contiguous to each other; where the new vitrified mass had not joined or coalesced with that which had been executed before.

It seems, evident, therefore, that these vitrifications had not been produced by volcanoes, nor by kindling fires as signals, as conjectured by George Chalmers, Esq; in his Caledonia, nor by the attempts of enemies to burn out the garrisons, by kindling great masses of wood along the outside of these walls, as is supposed by many. Against these suppositions, the fact, that the walls are vitrified on both the outer and inner sides, stands as an invincible argument. It would also be impossible, unless supported by logs or billets of wood, to construct a perpendicular wall of such small stones as generally compose the vitrified sides. Add to this, the arrangement of the most fusible materials on the sides most exposed to the heat; and we must be convinced that these forts have been the result of great labour and art. We may also observe,

observe, that no open fires would produce the effects we actually see to have been produced. The heat must therefore have been confined, and modified, in some such way as we have described.

Hill Forts.

Next to the vitrified forts, these seem to follow in the order of antiquity. Their construction seems to point at a more improved period than the former, when some progress was made in the art of building, and when men had acquired some knowledge in the use of tools, perhaps even of those which are composed of metals. These hill-forts are constructed of mounds of earth, with one or more deep ditches and corresponding mounds, without the central fort; or they are composed of rude stones, very skilfully built, without any cement whatever. This shews they were constructed long before the use of lime, or even of wrought clay, as cement, was understood. They are always placed on steep detached hills, which command an extensive prospect all around; and their original object seems to have been the protection of particular tribes against the violence of their neighbours, with whom they exercised deadly feuds. When the Romans invaded this country, these forts were used as places of defence against their attacks.

The most magnificent of these forts in this county, is *Cater-thun**, in the parish of Menmuir, north-west from Brechin. It is situated on the summit of a very steep conical hill, whose strata are rube sandstone and gravelstone, nearly in a vertical position. The interior fortress

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consists

* Probably corrupted from *Cader*, or *Caer Dun*, a hill camp, or fort.

consists of a very broad wall, built with great art, without any cement. Its figure is oval, except at the east and west ends, where there are entrances, and the wall is projected into angles, in order to render the entrance more difficult to be forced. The greatest length within the walls, from east to west, is about 134 yards, without including the angular projections; and its greatest breadth from north to south, is about 60 yards. Near the west end, there are the vestiges of a broad and deep pit, now nearly filled with rubbish, which seems to have been dug for collecting the water that fell, for the use of the garrison. In the body of the place are numerous vestiges of houses, the dwellings of the garrison, all of loose stones. A deep ditch and mound of earth, surrounded the stone parapet on the outside; and three concentric mounds are partially visible lower down the hill. It is probable that within the latter, people drove their cattle in times of danger or alarm. Several outworks defend the principal entrance, which is from the east; and here are several large heaps of rounded stones, which seem intended to have been rolled down upon enemies who should attempt to ascend the hill.

The fort we have described is called *White Cater-tbun*, on account of the lichen with which the stones are encrusted. But on a similar hill to the east, which is separated from this by a deep ravine, there is another fort, composed entirely of earth. This, from the colour of the earth, is sometimes called *Brown Cater-tbun*, and from being clad with heath, it is sometimes called *Black Cater-tbun*. This fort commands a most extensive prospect of Strathmore, in both directions; and it overlooks the county, until the view is bounded by Fifeshire and the ocean. It also looks down upon the romantic vale of Lethnot, on the north, and up through the Glen of West
Water,

Water, which, at no very remote period, was one of the passes by which the Cattarine, or mountain thieves, made their inroads into the low country.

Denoon * Castle is very similar to Cater-thun, and is situated about two miles to the south-west of Glamis, among the Seedlay Hills. It is of a semicircular form, its circuit about 335 yards; its wall about 27 feet high, and 30 in thickness. On the north are two or three rows of terraces, and the entrances are on the south-east, and north-west. Within are vestiges of buildings, and the remains of a well. The approach is difficult, and it is almost entirely surrounded with steep rocks.

A similar fort once stood upon a shoulder projected from the south side of the Hill of Dunichen †, from which the parish derived its name; but it has been demolished for stones to build fences. The hill of Dumbarrow ‡, in the same parish, is a round, detached, and abrupt eminence, composed of whinstone rock; and on it are the remains of an oval fort.—There are the remains of similar forts on the Hill of Carbuddo, on that

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of

* Hill or castle of birds.

† The learned Mr Chalmers derives the name of this parish from Nechtan, a Pictish prince, who built and resided in this fort. But it is probable, these forts were constructed before the Pictish tribes acquired this name; and Mr Chalmers seems to have forgotten what he elsewhere states in his *Edinburgh*, that it was not usual among the Celtic tribes to name places from persons; though it was very common to give persons names from their places of residence. The more natural etymology is, *Dun-Achan*, the hill or fort of the valley. This corresponds exactly to its local position, having an extensive valley, sloping eastward to Lunan Bay on one side, and westward through Strathmore to the Perthshire Grampians, on the other.

‡ *Dun-dar*, Fort on the precipitous rock.

of Lower, and on many other hills in this county, where only heaps of loose stones shew the places where they stood.

It is a melancholy, but too well founded reflection, that man, whether in a rude or in a civilized state, always exerts the greatest efforts, both of labour and ingenuity, for the destruction of his species, or for defending himself from their attacks.

Roman Camps.

The indefatigable Mr Chalmers appears to have demonstrated, that Agricola did not extend his conquests beyond the Tay. It is possible he might have made a few excursions beyond that river, with a view to explore the country; and he sent his fleet to circumnavigate the British Isles. Colonel Mudie of Melsetter in Orkney, has a Roman sword, composed of a hard species of bronze, which was found in a peat bog, in the northernmost of the Shetland Isles, and is supposed to have been dropped by some of Agricola's soldiers, who had landed there to procure provisions. Mr Chalmers has also demonstrated, that the battle of *Mons Grampius*, where Galgacus commanded the Caledonians, was fought at Comrie, near the head of Strathearn. Many years ago, I saw there a Roman encampment, which is now much defaced; and the nature of the ground, and aspect of the neighbouring mountains, corresponded exactly with the description of Tacitus.

The same author shews, that it was Lollius Urbicus who first extended the Roman conquests to the north of the Tay, during the reign of the emperor, Antoninus Pius. He received the command in Britain, A. D. 139. He first constructed the famous wall between the Forth
and

and Clyde, along a chain of military posts which had been established by Agricola, and then advanced to a military post which had also been established by him, at Orrea, a short way above Perth. Having crossed the Tay by a wooden bridge, his army seems to have separated into two divisions. The main body seems to have passed along the north of the Carse of Gowrie, by the base of the Seedlay Hills, which is the old road *ad Taum*, that is, to Dundee. From thence they advanced to Harefaulds, in the muir of Lower, north of Caerbuddo, where there is a Roman encampment, still pretty entire, which covers a considerable extent of ground, and is supposed capable of containing from 50 to 60,000 men. Like all Roman encampments, this is of a quadrangular figure. It is surrounded by a deep ditch and mound of earth, and there are various interior and outer works, the object of which I do not pretend to understand. On the north it is defended by a lake, and morass, and it is probable the water was made to fill the ditches all around. On all the other sides there are gates, which are also defended by outworks. Here, it is probable, the Caledonian fort on the Hill of Caerbuddo, on the right, was reduced; and that outposts were advanced in this direction to Carnegie, (a farm from which this surname derives its origin), and to Carmylie, which is now the name of a parish. It is probable these were Caledonian forts, which were subdued, and Roman garrisons put in their place. On the other hand, it is probable, that the post on Lower Hill was subdued, perhaps demolished, and that no Caledonian strengths were left, which might annoy the Roman army, or interrupt its communications, when it advanced towards the north.

The camp of Harefaulds is exactly midway between Dundee and the muir of Forfar, in the direction in which this army marched. In this muir there is a very exten-

sive Roman camp, and very strongly fortified, about a mile north from the town; but being planted with firs, its dimensions cannot easily be ascertained. It is probable that the division which advanced through Strathmore, formed a junction with the main body, either at this camp, or at that of Battledikes. The first station of the Strathmore division, in this county, is near Cupar-Angus, where there are still some vestiges of a Roman camp, though much defaced by the plough. Their next station seems to have been at Castleton, in the parish of Eassey, about midway between Cupar and Forfar, where there is a high quadrangular mound of earth, which seems to have been the pretorium or interior fortification; and this is surrounded by deep ditches and mounds of earth. From this station the Strathmore division appears to have digressed north-eastwards towards Kirriemuir, and the parish of Oathlaw, where there is a camp called Battledikes, well situated to command the passes of Glen-Prosen, and Glen-Clova. According to Roy, its mean length is 2970 feet, and its mean breadth 1850.

The camp near Forfar was defended by a morass, which was probably a lake at that time, towards the north. It is not far from the vitrified fort on the hill of Finhaven, and a ridge of steep rocks extends from this fort to the front of the Roman camp. On these, it is probable, the Caledonians assembled to obstruct the farther advance of the Roman arms; and though no pitched battles might have ensued, it is probable many skirmishes took place. On Carse-bank, opposite to this camp, a Caledonian hatchet was lately picked up, which is now in my possession. It is of an oblong figure, like a wedge, ground to a fine edge; and is composed of a hard species of mica schistic stone. It much resembles some of the instruments of the South Sea Islanders; does not

seem formed for cutting wood ; but being fastened in the end of a stick, would give a deadly blow in battle. My worthy friend, the late Reverend David Ure, minister of Uphall, near Edinburgh, had collected a considerable number of ancient Caledonian weapons, all made of stone, and of various forms. In some of his hatchets there was a hole, in which the handle had been inserted ; in others there was a hollow, which admitted the hatchet to be wedged into a hole in the handle ; and, in others, the hatchet had been bound into a cleft in the handle, by means of the tendons of animals. Of this last species is the hatchet now under consideration. This leads to an observation, that though the Romans did not surpass their Caledonian antagonists in courage, they far excelled them in military skill and discipline ; and their superior knowledge of the use of metals, gave them the same superiority over rude tribes, that the use of fire arms has conveyed to the European nations, over those who are unacquainted with them.

From Battledikes, or from the camp near Forfar, the last stage of the Roman army in this county, was at a place called War-dikes, or Black-dikes, near the mansion-house of Keithock, two miles and two-thirds north from Brechin. Colonel Imrie, who examined this camp, found it to be a rectangular parallelogram, whose sides are 395 yards, by 292 yards, and comprehending 25 English acres. Two of the sides are nearly defaced by the plough. This camp was well situated for bridling the fortresses of Cater-thun, and for commanding the passes of Glensk, and West Water. All these camps had roads of communication, extending from the south of Britain, to Ptoroton, (now Burgh-head) on the Moray Frith, which was the boundary of the Roman empire on the north east of Britain. After Lollius Urbicus ceased

to command in Britain, it appears that the Romans abandoned the conquests, and military positions which he had established in the north of Scotland, and withdrew their forces within the wall they had constructed between the Forth and Clyde.

The Caledonian tribes, having recovered their independence, seem to have taken advantage of the dissensions which prevailed in the Roman empire, during the contests of competitors for the imperial purple, and to have carried their depredations within the wall. But Severus, having prevailed in the contest, hastened to Britain, and led a powerful army into the Caledonian regions, A. D. 209. Following the footsteps of Lollius Urbicus, he repaired his roads, and garrisoned all his military posts, and restored the empire to its former extent. Severus is said to have lost upwards of 50,000 men in the expedition, which was followed by no permanent effects, the Romans soon after evacuated Caledonia, and retreated within their former limits. The Caledonian tribes, although divided amongst themselves, and composed of numerous hostile clanships, uniformly displayed an unconquerable antipathy against foreign invasion. The Romans never penetrated far within the barrier of the Grampians; and their conquests were chiefly confined to the level country between the mountains and the sea-shore.

Baronial Castles.

These are of much later date than the structures we have been considering, and seem to have been built during the times when the magnificent religious buildings we have described, were erected. They seem chiefly to have been executed by foreigners, whom the policy of our kings, and the magnificence of the dignified ecclesiastic

siastics, encouraged to settle in this country; and who gradually changed the speech and manners of the people from Celtic, to Saxon or Gothic.

Our ancient kings had hardly any other revenues except what arose from numerous manors, or baronies, which remained in their natural possession. As the rents of these were chiefly paid in kind, it was necessary that they should move from place to place, in order to consume the produce. This also afforded them an opportunity of settling disputes, and of distributing justice among a rude people; while they and their retainers had a perpetual succession of fresh grounds where they might enjoy their favourite amusement of the chase. But in order to this, it was necessary they should have houses where they and their retainers might be accommodated, and which might be of sufficient strength to repel any sudden attack upon the royal person, and to enforce obedience to his decisions. Some of the royal residences in this county, such as the castles of Glammis, Dundee, and Brechin, with the lands annexed to them, were afterwards converted into private property, in favour of the Lyons, the Douglasses and Maules. In the gradual progress of the feudal system, those inferior barons who had acquired the right of civil and criminal jurisdiction on their domains, rivalled the kings in the strength and magnificence of their castles, and in the number of their armed retainers.

It is probable the Romans first introduced into this country the knowledge of the use of lime as a cement, in the construction of their bridges, and other buildings. All buildings, before their period, as already remarked, were constructed of rude stones, without any cement whatever; unless vitrification may be considered as a substitute, which seems to have been resorted to on account

count of their wanting tools adapted for raising and dressing stones, which might make buildings of the requisite strength. But in the period now under consideration, we observe a knowledge of the use of lime as cement, which far surpasses modern practice; for in these buildings the cement is generally much harder than the stones it was intended to unite; and we also discover a great progress in architecture, and the art of building. Many of the churches of those times, in particular, display a progress in architectural science, which it seems doubtful if any modern professor could emulate.

Where a town arose around a royal residence, it was incorporated by charter, and the castle was kept up as a place of defence. This was the case with Forfar, where a royal castle long stood upon a round hill, which was wholly surrounded by water. It is now razed to the foundation, and in its place has been erected a turret, which was once the market cross of the town. Near the north side of the adjoining lake, there is an artificial island, which has been formed by throwing in immense quantities of stones, which after being sufficiently raised above the surface, had been covered with a considerable depth of earth. This island was accessible by a narrow causeway, over which only one person could pass at a time. To this place the kings and their children, while they resided at Forfar, are said to have retired in turbulent times, or to have conveyed thither their more valuable effects. On it are the foundations of a house and small nunnery, where a queen of one of the Malcolms is said to have died, and to have been interred.

These artificial islands are frequent in lakes through most parts of Scotland, but especially in the Highlands; and they are pointed at here as marking the barbarous manners of our ancestors. The most remarkable of them

I ever observed is in a lake in Badenoch, belonging to J. P. Grant of Rothiemurchus, Esq. It is placed in very deep water, and the stones are kept together by vast frames, composed of logs of oak of great size. On it are the ruins of a Gothic castle, which was long the residence of that ancient family.

The Castle of Dundee has long been razed. There are the remains of a castle at Montrose, which had been raised on an artificial mound of sand, so situated as to command the passage into the town from the south; but all the parts of the building which were above the sand are demolished.

At Broughty there are the ruins of a very magnificent castle, consisting of several massy towers, (one of which only is entire,) with a fortified area towards the land, and seated on a whinstone rock, which juts into the sea at the narrowest part of the frith. This castle was seized by the English during the wars of Edward Longshanks, in prosecution of his claims on the Scottish Crown; and long remained in their possession, as they could communicate with it by sea. On a high whinstone hill, about a mile to the north of this castle, there are the remains of a fort, which is ascribed to Wallace. This hero being unable to take the Castle of Broughty, is said to have constructed this fort with a view to mask it, and to restrain the garrison from committing depredations on the neighbouring country. This castle was betrayed into the hands of Henry VIII. during his *rough courtship* of Mary Queen of Scots, for his son Edward, by the treachery of the governor; but was afterwards restored by treaty. On its site might be erected a battery, which would effectually command the navigation of the Tay. The vaults of this castle are now used as icehouses, in
which

which ice is deposited for conveying fresh salmon to the London market.

On a rounded insular hill, at the head of Lunan Bay, are situated the ruins of Redcastle, so called from its colour, being built of red sandstone. It consists of a large, massy, quadrangular tower, with vestiges of out buildings, of considerable extent. This castle is said to have been built by the same Alexander the Lyon, who founded the monastery of Arbroath, the contiguous lands being then a royal domain; and the object of it is said to have been, to keep in check the Scandinavian rovers, who were accustomed to land in Lunan Bay, and to draw up their vessels upon the sandy beach. This ruin, with the lands annexed to it, are now the property of the Honourable William Maule.

Of all the private baronial castles, the most magnificent in point of extent, and of romantic situation, seems to have been that of Airly, already described, long the residence of the Ogilvies Earls of Airly. This castle is said to have been burnt and demolished by order of the Duke of Argyll, when he advanced to the north, after the battle of Sheriff Muir, 1715. The Earl, with his armed followers, had fled; but the troops who came to execute the order found his lady and children at home. She is said to have requested they would convey her to a place, where she could not see the destruction of her castle. But they are said to have conveyed her to a high hill, situated to the eastward, where she was forcibly held until she saw the castle burnt and demolished. In the upper part of Glenisla there are the ruins of a smaller castle, belonging to the same family, which is said to have been burnt and demolished at the same time. The Earl of Airly is said to have returned the compliment, by advancing with a party through the mountains, and burning
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ing the Duke of Argyll's castle of Lochow, or Inverary. In fact, the Ogilvys and Campbells had long exercised deadly feuds against each other, and it was very common among the Scottish chieftans, to make political differences the pretence for gratifying their private revenge.

There are the ruins of a considerable castle among the Grampians, at Invermark, near the head of Glenesk, now the property of the Honourable William Maule. The ruins of Edzel Castle, in the parish of the same name, and the property of the same gentleman, are still more extensive and magnificent. These two castles were long the seats of the most ancient branch of the Lindsays, and were acquired by a marriage of one of their ancestors with the heiress of a Stirling, several centuries ago. This Lindsay built the castle, and was Lord of Glenesk, which accrued to him in consequence of his marriage. As a proof how much the Scottish chieftans affected the parade of royalty, it is mentioned, that less than a century ago, the head of this family always went to church attended by a band of armed men; and that a laird of Edzel bestowed on one Durie, a barren knoll near the castle, and by charter constituted him and his family hereditary beadles of the parish, with a perquisite annexed of two bannocks, for ringing the bell at the funeral of every farmer, and one for that of every cottager. This right continued in Durie's family, until it was purchased by the late Earl of Panmure.

The castle of Finhaven is situated on a peninsular knoll, in the parish of Oathlaw, near the place where the North-Esk was formerly crossed by a ferry-boat; and from this circumstance, it is supposed to have derived its name. All that remains of it is a lofty quadrangular tower, with extensive vestiges of out-buildings. This castle was an ancient seat of the Lindsays, Earls of Crawford,

Crawford, who seem always to have been rivals of the Gordons, Earls of Huntly, and in civil commotions to have taken opposite sides. It is mentioned, that in the Rebellion 1452, raised in consequence of the murder of Earl Douglas in Stirling Castle, the Earl of Huntly commanded the royalists, and the Earl of Crawford the malcontents, at the battle of Brechin. The latter being entirely defeated, the Earl of Crawford fled to his castle of Finhaven, declaring he would willingly pass seven years in hell, to obtain the glory which fell to the share of his rival in that battle. In times of danger, this family is said to have retired occasionally to the vitrified fort on the neighbouring hill, already described.

Kelly Castle is a gloomy ruin, near Arbroath, embosomed among ancient trees, the property of the Honourable William Maule. Affleck * Castle, in the parish of Monikie, consists of a high massy tower, whose walls are of uncommon thickness. It commands a most extensive view of the ocean, the Isle of May, Fifeshire, &c. &c. This castle was long inhabited by a family of the same name, who made a conspicuous figure in the ancient history of Scotland. In later times it has been inhabited by the Yeaman family, who have built a commodious house contiguous to the castle. The roof of the latter is still preserved, being covered with flags, supported by massy joists of oak. These castles had always one or more floors, which were vaulted with stone, and the upper floors were of oak. Small pigeon-holes or recesses within the walls served as bed-rooms. One or two great halls occupied the body of the castle. Massy doors of oak and iron defended the entrance, where were
holes

* Gaelic, Field of flag-stones.

holes for shooting arrows and other weapons. The windows were small, and defended by bars of iron. In a turret at the top were placed the warders, or watchers.

It seems unnecessary to enumerate all the inferior baronial strengths, which are scattered through the county. Most of them consist of only a single tower, and a few of them still continue to be inhabited, not by potent barons, but by honest farmers, or day-labourers. Of this description is the castle of Clay-pots, near Broughty-Ferry, now the property of Lord Douglas. It is said to have been built by the celebrated Cardinal Beaton, for the accommodation of one of his mistresses.

These buildings mark the ferocious manners of the times in which they were constructed, when men found no protection from the strength of general law and government, but from private associations, and the strength of their bulwarks. The rage for castle building, which has prevailed in modern times, has always appeared to me to be a violation of the principles of true taste. The ancient castles were dictated by necessity, and were efficient for the purposes intended. A modern castle is unnecessary for defence, in a civilized period, when the law protects every man's person and property; and it is ineffectual for this purpose, as it could not resist a single field piece. We may apply to castles what Dr Johnson said of blank verse. That it should never be attempted except by him who can astonish. A small house, affecting the castellated form, is ridiculous; and the effect of a castle upon the beholder should be to astonish by its magnitude, while its comfort or conveniency are overlooked.

To the military structures already enumerated, may be added two small batteries of cannon; one at the mouth
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of North-Esk, south from Montrose ; another at the harbour of Arbroath. These were erected in consequence of an attack made upon these towns by a French privateer, in a former war.

Druidical Remains.

It appears to be ascertained, that the first inhabitants of this country were different tribes of the Celtæ, who had passed over, at different periods, from the opposite coasts of France, and had spread themselves northwards until they peopled the whole British islands. Among these tribes Druidism was the religion which universally prevailed. At first, this religion seems to have consisted in the adoration of one God, though in progress of time many other objects of worship seem to have been adopted as symbols of the Supreme Being, or divinities subordinate to him. Esteeming the universe the only real temple of God, their worship was always conducted in the open air. But as particular places and periodical times were necessary for worshipping in a social manner, circles of stones, or shady groves of oak, or other grand natural objects, were fixed upon to mark the places of worship. We have already hinted the probability, that many of the first Christian places of worship had been erected in situations already consecrated in popular estimation, by having been the seats of Druidism, which would naturally be followed by a destruction of their monuments. The progress of agriculture has destroyed many Druidical monuments in the low country ; but they still abound in various parts of the Highlands and isles. There we find Druidical circles of all dimensions, from four rude stones placed in the four
cardinal

cardinal points, to circles of large dimensions, which have stones marking many subdivisions of these points; and sometimes there are concentric circles, and stones placed at a great distance, in particular directions, for purposes it is not now easy to explain. The most superb of these Druidical monuments I ever had an opportunity of examining, is one at Stennis, near Stromness, in Orkney *, and one on the north shore of Loch Roag, in the island of Lewis. From a careful examination of various Druidical circles in different places, I was led to conclude, that they were originally intended to serve the purpose of rude astronomical observatories; and in many of them that are tolerably entire, it would be easy to mark the hours of the day, and even the seasons of the year, by observing when the sun shines in a line with particular stones. It would seem that the sun was the great object of Druidical devotion, as an emblem of the Deity, and to observe his apparent motions was a principal business of the officiating priests. In some of the Druidical circles, such as that at Corrymony, Inverness-shire, there is a great heap of stones, with a large stone on the top, which seems to have been an altar on which sacrifices were offered. In others, such as that in the island of Lewis, the altar is a huge mass of stone, placed at a distance from the circles, and due south from their centre. In this, too, there is a long avenue between upright stones, from north to south, and a shorter avenue from east to west.

The only Druidical circle I have observed in this county, is one at Pitscanlie, about two miles north-east from Forfar. It is composed of huge stones, twelve feet and upwards in height, and from eight to ten across at

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* See Barry's Orkney.

the broadest part. Some of these stones have been demolished, so that the circle is not now complete. They surround a great rounded heap of stones, which is now the stack-yard of the farmer near whose house it is situated.

To a much later period we must refer the monumental stones, which occur in some parts of this county. Near Cupar-Angus there is a monument of this kind, called Arthur's Stone; from which the property on which it is situated derives its name. This stone, with a large cairn connected with it, are said to have been erected in memory of the celebrated Prince Arthur, who is supposed to have been here slain by the Picts. But the exploits of this Prince are so much obscured by fable, that no reliance can be placed on any accounts concerning him. In the church-yard of Meigle, there are several curiously carved stones, which are supposed to have been erected on the grave of Vanora, the wife of King Arthur; a lady who is supposed, neither in theory nor practice, to have ranked chastity among the virtues.

According to popular tradition, (which is the groundwork of Shakespeare's Tragedy of Macbeth), when this tyrant saw the wood of Birnam approaching, as he thought, his castle on the top of the hill of Dunsinane, he sallied out, with what forces he could collect, to fight his enemies. Being worsted, he fled with the shattered remains of his army, expecting to reach some of his fortresses in the north, where he might collect his friends, who were numerous in those quarters, and try the issue of another battle. To prevent this, he was hotly pursued by Macduff and young Seward, son of the English General, who came to restore Malcolm Kenmore to the throne of his ancestors. Macbeth, finding his purpose impracticable, is said here to have made his last
stand

stood. At the commencement of the action, he is said to have singled out, and to have slain young Seward with his own hand. When Macduff approached, and required him to yield, we may suppose him to have replied in the magic words of Shakespeare :

I will not yield
 To kiss the ground before young *Malcolm's* feet ;
 And to be baited with the rabble's curse.
 Tho' Birnam wood *be* come to *Dunsinane*,
 And thou, oppos'd be of no woman *born*,
 Yet I will try the last. Before my body
 I throw my warlike shield. Lay on, *Macduff* !
 And damn'd be he that first cries,—“ Hold ! enough !”

Here is an artificial mound of earth, called *Duff's Know*, and another of much larger size called *Belly Duff*. Some think that the hero died of the wounds he received in his encounter with Macbeth, and is here interred, and that his antagonist is here buried along with him, or in the smaller tumulus called *Duff's Know*. But this seems inconsistent with the historical accounts of the honours which were heaped upon Macduff and his posterity, by the grateful Malcolm, when placed upon the throne. It seems more probable, that *Belly Duff* is the same with *Bellum Duffi*, and that this mound contains the bodies of those who were slain in this battle. As to Macbeth, it is possible that the prediction which Shakespeare puts into his mouth, should he fail in this enterprise, was fulfilled :

“ our monuments
 “ Shall be—the maws of kites.”

Whatever foundation there may be for these conjectures, there is a large standing-stone, which is universally believed to have been erected in honour of young Seward, on the spot where he was slain, and is supposed to have been interred. Mr Pennant states it to be 12 feet high above ground, 2 feet eight inches below; and that its girth at the thickest part is $18\frac{1}{2}$ feet. He adds, that its weight is computed to amount to 20 tons; and that no stone of the same species is known to be nearer than twenty-miles. This agrees with observations I made on Druidical circles and other monuments, in the island of Arran, and in various parts of the Highlands and isles. That they generally exhibit stones of enormous magnitude, which must have been conveyed from a great distance, and over roads, too, which seem utterly impracticable. These monuments are contiguous to Belmont Castle, in the county of Perth, and are noticed by the learned Dr Robertson, in his Agricultural Survey of that county.

We have already hinted at the large standing-stone in the minister's garden at Glammis, which is supposed to commemorate the assassination of Malcolm II. On this and the other stones now under consideration, the figures that are cut are supposed to be symbolical representations of the events they are meant to record. This method of recording events has been adopted by all nations, in the first dawn of art, when writing is unknown, or not generally understood. Thus, on one side of this stone, two human figures shaking hands, with each a battle-ax in the other hand, are supposed to represent the murderers in the act of conspiracy. A wolfe's head and other emblems are supposed to denote their unrelenting cruelty. On the other side an eel, and another fish, are supposed to represent the loch of Forfar, in
which

which the murderers were drowned, after they had accomplished their wicked purpose. Accordingly, in draining this loch, some battle-axes are said to have been found, such as are represented on this stone, together with some brass kettles, supposed to have been part of the spoils the assassins had carried off with them. There are, however, other figures, the meaning of which no one pretends to explain.

In the park of Glamis there is another symbolical stone, upon which, among other figures, are two men with the heads of hogs, supposed to be a satirical allusion to Sweno (*the swine*) King of Denmark, who fitted out the last great northern expedition for the conquest of Scotland, as we shall afterwards more fully explain. Another figured stone, about a mile west of the castle, is called St Orland's stone, and is supposed to commemorate a saint of this name.

The curiously figured stones, in the church-yard, and on the side of the road, near the village of Aberlemno, are supposed to commemorate a signal defeat of the Danes at this place about A. D. 1010. Their King Sweno, is said to have fitted out this expedition for the entire conquest of Scotland, which he entrusted to the command of Camus, the ablest of his Generals. They landed at the Haine, in the parish of Panbride, and having penetrated thus far into the country, they were encountered by the Scots, under their brave King Malcolm II. and were entirely defeated. Camus tried to escape to the north, but finding his passage obstructed, he endeavoured to reach his ships with the remainder of his forces. He was pursued, and his skull cleft with a battle-ax, in the parish of Monikie, where a curiously figured stone, called *Camus' Cross*, marks the spot where he fell. In 1610, his grave was discovered by the
M 3 plough,

plough, near this cross, and examined by Commissary Maule, who found an huge skeleton, with part of the skull cut away. As these stones commemorate events which happened in this county, so the curiously figured stone near Forres, is supposed to commemorate a treaty between Malcolm and Sweno, by which the Danes evacuated Burghhead, on the Moray Frith, which they had retained as a place of safety for themselves and their booty. Thus was this country, which had been harassed by the incursions of these *vikingr*, or sea-kings, during several centuries, finally relieved from them; and neither the north men, who acquired permanent settlements in several countries, and kept all Europe in terror and alarm; nor the Romans, nor any foreign nation, ever acquired permanent settlements be-north the Friths of Forth and Clyde, through the medium of conquest.

Whether the traditions concerning these stones be well or ill founded, it is certain they have been erected since the introduction of Christianity into this country. All of them exhibit crosses, of different kinds, elegantly carved, and adorned with various devices. But the Druidical monuments exhibit no trace of sculpture whatever. Of this kind there is a rude stone at Aberlemno, contiguous to those already described; and there are a few scattered in different parts of the county. They seem to have been set up to commemorate important events, or the fall of great men; but having neither symbolical figures, nor inscriptions, the purpose for which they were erected is concealed in the mist of antiquity.

From all that can be collected concerning the Druids, they seem to have been a well compacted hierarchy, divided into different orders, each subordinate to the order above it, and all recognising the authority of one supreme chief, whose place, during the dark ages of Christianity,

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the Pope of Rome seems to have assumed. The highest order was that of Priests, who presided in the performance of religious ceremonies. Next to them were the Vates, who studied the secrets of nature, and instructed youth in the knowledge they had attained. Last of all were the Bards, who studied music, and committed to memory the songs of illustrious bards that had already been composed, while they composed others to celebrate the exploits of distinguished warriors. This last order long survived the overthrow of the Druidical institution, and were held in such veneration, that contending armies would suspend the work of death while they were passing; and they were always welcome guests in the halls of the chiefs, where a hundred bards often struck their harps at once, accompanied with song. The Druids inculcated a firm belief in the immortality of the soul; but the ghost was supposed to wander in misery, until raised to the ærial regions by the songs of the bard. This seems to have given rise to the doctrine of purgatory, from which the soul can only be extricated by the manual operations of a priest. In the Highlands, where Druidical superstitions are not yet obliterated, "May he be unrecorded, or may he be reproached in the song of the bard," was long considered as a most formidable imprecation. Julius Cæsar informs us, that the Druids, (perhaps the higher order of them,) used the Greek letters. But they seem to have discouraged the use of letters among the people at large, perhaps as an unmanly occupation, and tending to cramp the exertions of the mental powers. For the same author informs us, that they obliged their pupils to commit to memory a great number of verses, which doubtless contained their religious tenets,—their moral maxims,—together with their laws, and rules of government. This circumstance may

account for so many Celtic poems being handed down by oral tradition ; and to insist there can be no poetry but what is written down in a book, is an assertion as pedantic, as it is contrary to fact.

The Druids were not only the priests, philosophers, and poets, of the times in which they flourished ; but in them was vested the judicial authority, and they exercised the supreme powers of such government as was then practicable. It appears that they governed more by the terrors of religion, than from maxims of civil policy ; and that criminals were punished, rather because their actions were offensive to the gods, than injurious to human society. This may account for the multitude of their human sacrifices, where the victims were in fact criminals ; but the pretence for putting them to death was some supposed offence they had offered to the gods, to whom they were sacrificed. It would doubtless frequently happen that the Druids would gratify their spleen and revenge, under the colour of zeal for the honour of their gods ; and infidels and heretics are not likely to have been numerous in a community, where the priest had only to pretend an order from a deity to knock them on the head, or consign them to the flames.

Their courts of justice, like their religious solemnities, were always held in the open air ; and in fact their laws and judicial proceedings, were only a part of their religion. For this purpose a great cairn, or mound of earth, which had been heaped upon the ashes of heroes slain in battle, was always chosen ; that to the sanctity of the Druids, might be superadded the religious awe entertained for the ghosts of those whose ashes were there deposited. On the top of this eminence the presiding Druids sat, while the people gathered around. After the Druids were abolished, and the judicial authority came to be vested in the chiefs of tribes, courts of justice
still

still continued to be held on these artificial, or sometimes natural eminences, to no very remote period of our history; which, from that circumstance, came to be distinguished by the name of *Laws*. Where such tumuli happened to be contiguous to a royal residence, they were distinguished by the name of *Mote Hills*, where the king conversed with his barons, and received their oaths of fidelity and homage; and where he, or his deputies, distributed justice to his vassals. It is probable the Moot or Mote Hill of Scone was an appendage of a Druidical establishment, before a monastery, or a royal residence, were erected there*. At Redcastle, in this county, there is a mote hill, and other appendages of ancient royalty. With regard to those eminences called *Laws*, which are commonly truncated cones, they are so frequent in this county, that their enumeration would be tedious, and we shall only hint at a very few.

We have already noticed the remarkable Law of Dundee, a hill which is a land-mark to mariners from a great distance at sea. Oathlaw, or Hill of Oaths, an artificial mount, from which the parish derives its name. Bracktie-law, on the estate of Idvies, parish of Kirkden. The hill of Dumbarrow, on whose top was a fort, was also used, like that at Dundee, for holding courts of justice. Green-law, in the parish of Fernal, near the toll-road between Dundee and Brechin, is the most remarkable of these laws I have anywhere seen in the county. It is wholly artificial, of great magnitude, and must have required the persevering labour of a great multitude of hands. Its original intention was probably to honour the ashes of heroes who had fallen in some great and decisive battle; but whose names and exploits it has not been able to snatch from oblivion,

BOOK

* There are two Druidical circles in the parish of Scone. Statistical Account, vol. XVIII. p. 81.

BOOK IV.

TOWNS AND VILLAGES.

THERE are five royal burghs, or boroughs, in this county, and a considerable number of villages and hamlets. The royal burghs, are, 1. Forfar, the county town: 2. Dundee: 3. Aberbrothwick, commonly pronounced Arbroath: 4. Montrose: 5. Brechin.

A royal burgh is so called, because constituted into a body corporate, with certain rights and privileges, by charters from the Crown. According to the ancient feudal ideas, the king was held to be proprietor of all the lands of the kingdom; and none were esteemed to be free men, or entitled to exercise any political rights, but those who held by charter from him. On this account, the royal burghs were early required to send representatives to Parliament. In early times, the kings had no way of getting their authority recognised, or of carrying salutary laws and regulations into effect, except by procuring the consent and approbation of all the leading men in
Parliament.

Parliament. They were therefore always anxious to have as full an attendance as possible, in this great national council. At first, every vassal of the king was bound to give personal attendance, when summoned to this assembly. But as this was impracticable with respect to the boroughs, the idea of representation was early adopted, and they were required to send persons duly authorised to vote and act in their name. This idea was soon extended to the smaller barons in the counties, who were also required to send representatives, or commissioners, as they were called, in Scotland. During a long period, both the counties and the towns paid, what was then a very handsome allowance, to their commissioners, as a compensation for their trouble and expence in attending Parliament. Hence, in place of considering this as a valuable right, they generally regarded it as a grievance, and wished to evade attendance, unless it was enforced by penalties. Thus, we find several towns in Scotland petitioning the Crown, and obtaining exemption from attendance, on account of poverty, and inability to pay their commissioners the necessary expence. But now, *Tempora mutantur, et nos mutamur in illis*. At every election there are always abundance of candidates, who, in place of seeking any thing from the electors, are sometimes said to kiss their wives and daughters with guineas in their mouths.

Before the Union, each burgh sent one or more commissioners, according to its wealth and population. Since that time, Forfar and Dundee are joined with Perth, Cupar-Fife, and St Andrew's, in choosing a representative; while Arbroath, Montrose, and Brechin, are joined with Inverbervie and Aberdeen. The mode of proceeding is as follows: Each town-council, having fixed upon the person it wishes to represent them, sends a delegate

gate to the returning borough, instructed to vote for him. Each town is the returning borough by rotation, which it is of the greatest importance to gain, because, in case of a division, where only four are joined, it has two votes.

With regard to the *sett*, as it is called, or constitution of our boroughs, it is very similar to that of the other burghs in Scotland. There can be no doubt, but at one period, every free resident burgess had a vote in the election of those who were entrusted with the management of their affairs; and they might be called to account for their proceedings before the king's chamberlain. But during a long period, our town-councils have been self-existent, self-perpetuating oligarchies, who are accountable to no one for their conduct in office. A town-council varies in its number of members in the different towns, of which a certain proportion, (generally two) goes out annually by rotation, having first elected others to supply their places. The council then presents a *leet*, or list of persons to exercise the offices of magistracy, being two of each, to the deacons of the incorporated trades, and these deacons vote with the council in their election. The leet for the Lord Provost, or chief magistrate, is limited to those who had formerly been bailies; that for bailies, to former councillors; that for Dean of Guild, to present bailies; and that for treasurer is unlimited.—Thus these bodies, as they exist in a great measure independent, may seem to have an interest directly opposite to that of the community over whom they preside; and this has been a subject of much complaint, and of proposed reformation. But many persons insist, that, in fact, these oligarchies manage the funds of the burghs, and conduct all the operations that are subjected to their authority, as well as any other magistracy which could be procured through a more democratic form of election; and

and they deprecate keeping a whole community in a constant political fever, as inconsistent with their industry, their sobriety, and morals.

Forfar.

This is a very ancient town, and seems to have arisen under the wings of the royal castle, formerly described. Like most old towns, it has been built without much regard to regularity of plan; and consists of a main street, along the road leading from the west, and of another projected towards the north; together with some smaller streets or lanes. Here several hundred looms are employed in weaving coarse linens, or osnaburgs, a considerable proportion of which have been worked by women, since the spinning mills deprived them of what was formerly their peculiar share of the manufacture. The tanning of leather, dressing of white skins, brewing of porter and ale, are also carried on to a considerable extent. The manufacture of thread was formerly carried to a considerable extent, but is now on the decline. Being the seat of the county courts, there are a considerable number of practitioners of the law here, called proctors, or writers. There is a considerable retail trade, in groceries, cloths, &c., for the supply of the town, and of the neighbouring country. The revenues of the corporation arise chiefly from landed property, and from customs at markets; of which there are four great fairs held here annually, for cattle and sheep, together with weekly markets. The town-house is placed in the centre, where the street is broadest; and besides a prison, and rooms and offices for the courts, contains an elegant hall for the meetings of the freeholders, justices of the peace, and commissioners of supply, &c., and is occasionally used for dancing and other amusements. The
parish

parish church is a spacious modern building, but is disfigured by a ruinous old tower, which was the spire of the former church. A subscription is on foot for building an elegant new spire. There is also a chapel for the episcopalians, and another for the seceders.

The population of Forfar, in 1755,	was	2450.
	in 1790,-98, —	4756.
	in 1800,	5165.
	in 1811,	5652.

Dundee

Is situated in a hollow, having the Law and other hills on the north and west. It is supposed to have obtained its name (*Donum Dei*) from David Earl of Huntingdon, having landed there in the twelfth century; but the more probable supposition is, that the name is of Gaelic extraction, *Dun Tau*, the hill or fort of Tay. This town is very ancient, was formerly walled, and stood several sieges. In 1651 it was taken by storm by Cromwell's forces, under the command of General Monk. Its shipping was then said to amount to a hundred vessels, not very far short of their present number, though they were probably not of such large size as they are now; and it is said that sixty ships were taken in the harbour, together with a large booty; many persons of distinction having taken refuge in the town, with their most valuable effects. This town exhibits many good houses, but few good streets. The entrance from the west is particularly narrow and incommodious; though the magistrates are correcting this evil by pulling down several old houses. The town-house is a spacious and elegant building, surmounted by a handsome spire. The Trades' Hall

Hall is used as an exchange, and as a reading-room. A spacious street has been cut through the rock on which the castle stood, to open a convenient access to the harbour; and in it an elegant Theatre has been built, where the heroes of the sock and buskin exhibit some months during summer. Beside the churches stated to have been built on the site, and from the materials of that built by David Earl of Huntingdon, St Andrew's Church is a very elegant building, on a rising ground towards the north of the town. There are also chapels for a great variety of sects, none of which are any way remarkable.

On a gentle declivity to the east of the Law Hill, in an airy situation, has been lately built an infirmary or hospital, which promises to be of great use, not only for the improvement of medical science, but for relieving the sick and maimed poor of the town and neighbouring country. Here also is the house which belonged to James Graham of Claverhouse, afterwards Lord Viscount Dundee, celebrated for his military talents, and for his outrageous fury against the Presbyterians, during the reigns of Charles II. and James VII. He was slain at the battle of Killycrankie, in the moment of victory, and a rude obelisk marks the spot where he fell. This house is now converted into barracks for soldiers, and a spacious building to the eastward has been constructed for the same purpose.

This town has long been a place of considerable trade. The whale fishing, the foreign and coasting trade, are carried on to a considerable extent. Armed smacks sail twice a-week to and from London, carrying salmon packed in ice, and all sorts of goods, and have excellent accommodation for passengers. Beside salmon, the exports are chiefly grain, osnaburgs, sail-cloth, and various other

other manufactured goods. The imports are Baltic produce, wines, spirits, teas, sugars, and other groceries; beside woollens, cotton stuffs, and various articles not manufactured in the county. There are 153 vessels belonging to this port, a few from 300 to 400 tons burden; but the greatest proportion of them are sloops and brigs, from about 50 to 100 tons and upwards. The whole shipping at present, amounts to about 13,103 tons; and it was rapidly increasing before Bonaparte's outrageous decrees began to operate on the Baltic trade. The harbour is very commodious, and a place of recreation for the inhabitants; but it is dry at low water, and getting too small for the trade. To obtain more room, and greater depth of water, the magistrates have in contemplation to extend a pier to some rocks situated in the channel, beyond its mouth.

Ship-building is carried on here to a considerable extent. They have no dry docks for repairing the bottoms of ships; but accomplish this object by floating docks, a contrivance which seems peculiar to this place. The floating dock is a large and strong flat bottomed vessel, which having water admitted through holes in its bottom, is sunk in a convenient corner. The ship to be repaired, having every heavy article removed, is floated into the dock at the stern, which is low for that purpose. At ebb-tide, the water which sank the dock is allowed to run out, or is pumped, and the apertures closed. Meanwhile, the ship being secured upon her keel by planks and props, is raised or lowered by the changes of the tide; while her bottom is examined, and her damages repaired.

At a place called Craig, to the west of the harbour, there is a sloping pier, for the use of the passage-boats between this and the opposite coast of Fife. This passage

sage is much annoyed by a large sand-bank, in the middle of the frith, which renders it impracticable except at particular times of the tide. Pinnaces, however, can go round the bank, which is often a tedious voyage. This ferry is the property of Lord Douglas.

The principal manufactures in this place are coarse linens, or Osnaburgs, which are wrought not only in the town, but in many villages and hamlets through the country, on account of merchants here. Sail-cloth and cordage is also manufactured to a considerable extent. There are several large mills, moved by steam, for spinning flax; and some smaller ones, which are moved by a rivulet which descends from the hills through the eastern part of the town. Two glasshouse cones were constructed here, but for some time have not been occupied. There are also tan-works, breweries, iron and brass foundries; and there is a considerable retail trade with the neighbouring country. Some of the drapers, jewellers, and apothecaries shops, may vie with those of London. There are three banks established here, namely, the Dundee, the Dundee New, and the Union, which have branches in the neighbouring towns. There is also a branch of the Bank of Scotland established here; and a Dundee Assurance Company against Fire, with agents for similar establishments in other places. There is an annual fair here, at which the customs on cattle and other animals belong to Lord Douglas. There are also weekly markets.

The town revenues arise partly from land, and from salmon-fishings in the Tay; partly from customs on articles brought to the town for sale, partly from harbour and anchorage dues, of which they possess the sole right from above the town to the mouth of the frith. They have increased very much of late, so that some branches

which sixty years ago did not exceed L. 40 or L. 50 now let at L. 1400 or L. 1500 a-year. The whole is now supposed to exceed L. 4000 a-year.

The prosperity and population of this town have undergone many vicissitudes during the Scottish and English wars, and during the contest of rival families within the country itself.

The population in A. D. 1775,	was	12
1790-98,	—	23
1800,	—	26
1811,	—	29

Several villages and hamlets have arisen near spinning-mills, bleachfields, and other public works, on the Duff and other streams near Dundee. But the most thriving village in this quarter is that of

Broughty Ferry,

About three miles below Dundee. This village of very late origin, is rapidly increasing, and it owes its rise to its having become a fashionable resort for bathing. The sea-water is here very pure, with a sloping beach. The village is built upon dry sand, and in some places, is blown by the wind; and it admits of unlimited extension. It is the centre of salmon-fishing, and the fishers settled here supply Dundee, and Perth, with sea fish. Beside the resort for sea-bathing, which only takes place during summer, weavers and other mechanics are building houses, and settling. Behind the rock on which the old castle is built, there is an excellent situation for a harbour, where vessels can always ride in deep water. But as all harbour and anchorage dues belong to the town of Dundee, there is no possibility of its becoming a regular port.

possibility of creating a fund to defray the expence of a harbour. General Hunter is superior of this village. The frith is here contracted to about a mile of deep water; but only boats from the opposite village of Parton Craigs are allowed to carry passengers; and there is no shipping place for cattle or goods.

Tay Lights.

The navigation of the Tay is much intommoded by a bar stretching across its mouth, which is called the *cross sand*; and there are a great extent of shallow sands, both on the Angus and Fife sides of the entrance to the frith. As these were the cause of numerous shipwrecks, the Town of Dundee has constructed two light-houses on the sands of Barry, contiguous to the frith. The first is about sixty feet high, and is built of stone. The second is a few hundred yards farther advanced towards the sea, and consists of a lantern supported on a large frame of wood, and is about forty feet high. Both lights are produced by oil lamps, with metallic reflectors. The rule is to keep both the lights in a line, or, as seamen express it, *both in one*, at their entrance, and until they get considerably within the frith. As the cross sand is apt to shift, the small lantern is placed upon a frame of wood, that it may be moved so as to correspond with its variations. These structures being white-washed, point out the channel during the day, as well as the night; and the lights shew the right channel in the upper parts of the frith. Vessels of great depth should not enter this frith unless there be a sufficient depth of tide, as, by neglecting this precaution, a large ship was lately wrecked in mild weather. For these lights, the Town

of Dundee is entitled to a tonnage on all vessels which enter the Tay.

Aberbrothwick or Arbroath.*

This town appears to have arisen under the wings of the monastery, formerly described. Like most old towns, it cannot boast much of regularity of plan; but has been built at random along the different roads which conduct into it, and along the road which leads through it towards the north. An elegant Town-house has lately been

* This name indicates the situation of the town, being built at the mouth of the Broath, or Bruth, a rivulet which here discharges itself into the sea. Many writers, and among others George Chalmers, Esq; agree in thinking, that *Aber*, meaning the confluence of one river with another, or with a lake, or the sea, is exclusively a Pictish word; and that the word *Javer*, meaning the same thing, exclusively belongs to the people whom they characterise as Irish Scots, or a colony from Ireland. In one point I cordially agree with Mr Chalmers, that the Picts were a tribe, or rather a congeries of tribes of the Celtæ; and I also conceive, that their language did not differ more from the Gaelic than the vulgar dialects of London or Yorkshire differ from the broad Buchan of Aberdeenshire. If the Scots came originally from Ireland, they must have brought their name along with them, and left traces of it in their new settlements. Yet the Highlanders do not call themselves *Scots*, to this day, but *Gael Albinach*; and the terms *Scot* and *Pict* were never heard of among them, except by persons who had learnt English, and imported them from the south. These facts seem to prove, that the names *Scots* and *Picts*, applied to these congenial classes of people, were originally terms of reproach, imposed by the Britons who lived within the Roman wall; and that they were indicative of the wandering and predatory habits of the one people; and the practice of tattooing and painting their bodies; or the thievish disposition of the other.—In much later times, we have seen the terms *Whig* and *Tory*, which were originally terms of high reproach, expressive of the contempt which each party entertained for its antagonist, assumed by each, and gloried in as a title of honour. During the effervescence

been built here, and the hall of the old Town-house is converted into a reading-room. The church has but a mean appearance on the outside, though it is very commodious within. Its spire is a low tower, and is said to have been a sort of porter's lodge at the principal gate of the ancient abbey. There is a handsome chapel on the establishment, in the upper part of the town, near the abbey; an Episcopal chapel in the lower part of the town, and some other places of worship noway remarkable. There are three large spinning-mills for flax, moved by steam, and a considerable number of plash mills, and other manufacturing machinery on the water of Broth. The harbour is small, and of difficult entrance, but secure. It is wholly artificial, being cut out of ledges of red sandstone, or loose earth, and the stones used for building the piers, and a high parapet to defend it from the waves. It is defended by a small battery; and they are now employed in enlarging, by scooping out a great body of earth from the upper part of it. This harbour

of the French Revolution, because Mr Burke happened to use the expression *Swinish Multitude*, we saw many of his opponents endeavouring to distinguish themselves, and glorying in being swine. The terms *Sots* and *Picts*, then, though originally terms of high reproach, thrown upon them by their enemies, seem early to have been assumed as titles of honour, by those independent tribes which lay contiguous to the Roman provinces in Britain, and which they continually harassed by their predatory incursions.

But that *Aber*, though not so frequently used as *Inver*, is originally a Gaelic as well as a Pictish word, appears from the following, out of many examples that might be adduced. We have *Aberfoil*, within the Grampians, which were the boundary between the Gael and the Picts. On the tract of the Caledonian Canal, near Fort Augustus, and in the very centre of the Gael, we have *Abertarff* and *Aberhalder*. Near the latter Invergeary. On the same tract, towards the west, we have *Lochaber*, or mouth of Loch Lochy. Near Fort William, again, we have the castle of Inverlochry, an ancient residence of the Caledonian kings. Thus we have *Aber* and *Inver* in contiguous places.

is said to have been originally begun at the joint expense of the town and the Abbot; but they failing to advance their share, the Abbot drew the whole harbour-dues. Here is a weekly market, and an annual fair. The revenues arise from harbour-dues, customs on articles sold in the town, and land, of which they have some valuable farms to the west of the town. The town moor, a very barren tract, great part of which had been planted with firs, is now converted into tillage by feuars. They pay L. 10 *per* acre down, and 40s. *per* acre of perpetual rent. Several elegant villas are already built upon it; and it is surprising to see what well directed industry can do, upon land that was reckoned good for nothing.

The manufactures here are nearly the same with those of Dundee, of which coarse linens form the staple. Besides these, the principal exports are grain, flag-stones, &c and the imports are flax, coals, lime, groceries, cloths, &c. As a considerable part of the town is without the royalty, in the parish of St Vigean's, which incloses it on three sides, it is not so easy to ascertain the population. But in

1755, the town, within royalty, contained	2098.
1790-98,	4676.
In 1800, the numbers were	4943.
1811,	5280.

At the same time, the population of St Vigean's was 4953, and allowing 1000 for the country part of this parish,

There remains for the town,	3953.
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Total population of Arbroath,	9233.
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Bell-Rock Light-House.

This rock is situated about twelve miles off from the harbour of Arbroath. It has long been the terror of mariners; and is said to have derived its name from a bell which had been fixed there by the Monks of Arbroath, which was so contrived as to ring by the motions of the sea, and thus served to warn the mariner of his danger. A tradition prevails here, that this bell was removed by a Dutch skipper, who was wrecked on this rock during his next voyage to the North Sea. Whatever may be in this, the rock long remained without any distinguishing mark, and was the cause of numerous shipwrecks. After several applications by the Commissioners of the Northern Lights, Parliamentary aid was at last granted. The plan adopted was that proposed by the ingenious Mr Stevenson, in conformity to the Eddystone light-house, constructed by the celebrated Mr Smeaton; but modified according to the difference of circumstances, and later improvements in science. Great praise is due to Mr Stevenson, and to his assistant Mr Logan, who superintended the execution, for the zeal and ability, with which they brought to a happy conclusion, much sooner than was thought possible, the most arduous undertaking of the kind that ever was attempted by any nation on earth. Along with the correctness and regularity which were made to pervade every branch of the operations, so that they all moved in unison, like a well contrived machine, this must be ascribed to the construction of a wooden house upon the rock, for lodging the workmen, so that no time was lost in going backwards and forwards; and to the ingenious machines they contrived for conveying the stones, and other materials,

and placing them in the same position on the building which they occupied when tried in the yard at Arbroath. The light-house has now been tried more than a year, and has been found completely to answer the purpose. A commodious house for the manager, and for holding the necessary stores, is nearly completed, to the west of the harbour of Arbroath; together with a high cylindrical tower, by which the manager may communicate with the two men who are lodged in the light-house, by means of a telegraph. But for a more particular account of this great achievement, we must refer to Appendix D; and as the plan of this work only admits of a very imperfect sketch, we are happy to be informed, that Mr Stevenson, the architect and executor of the whole, means to favour the public with a very full and accurate account of it, illustrated with drawings.

There are a few small fishing villages along the coast, from Arbroath to Montrose, situated in creeks where their boats find shelter. The principal of these, are,

Auchmithie.

Ethie Haven.

Usan, called also Ulysses's harbour, from a fancy that this Grecian hero had touched there during his wanderings.

Ferryden is the principal of these villages, near the mouth of the South Esk. There is also a thriving inland village at Inverkeillor, and several hamlets, which are rapidly growing into villages, scattered in various places, in this part of the county.

Montrose *.

This town, as its name imports, is situated on a level promontory, interposed between the bason formerly described, and the ocean. It extends nearly from south to north, the south end appearing to be the most ancient part, and to have been huddled near the castle, which defended its approach in this direction. Farther on, it forms a broad and elegant street, having the town-house at the south end, and dwelling-houses on the north, where this street branches off into two narrower streets. Here we see several examples of the ancient Scottish manner of building, with the ends of the houses towards the street. The house was but lately pulled down, in which the celebrated James Marquis of Montrose was born and educated. Several smaller streets and lanes communicate with the main street.—This town is of great antiquity, and was defended by walls in ancient times. It might still be made a place of great strength. It was long resorted to by persons in easy circumstances, for education to their children, or as a place of cheap and wholesome retirement. It is built upon a dry bottom, and there are extensive links, or sandy downs, very favourable for exercise, and for that peculiar Scottish amusement, the golf. It formerly enjoyed a greater comparative share of trade than it now enjoys.—The town-house is a handsome building. The parochial church is adapted to contain a very numerous audience,
and

* *Monroes*, Gaelic, the point or promontory of the muir.—To the north is Heatherwick, famed for its limestone quarries; and though the land be now very fertile, and carries luxuriant crops, the names shew it had been covered with heath, (*erica vulgaris*), when the town, or rather the promontory on which it is built, acquired its name.

high, the exported grain is chiefly carried coastwise. There was formerly much salmon sent to Holland, and up the Streights, in barrels, which were caught in the two Esks. But whether it be owing to the application of calcareous manures to the land, or to the multiplication of mill-dams, which prevent these animals from indulging their natural propensities in running up and down the rivers, the salmon are not so abundant as formerly. What are caught are chiefly sent to London in ice, or in pickle.—The principal trade now consists in the importation of flax, hemp, and other goods from the Baltic, sometimes from Archangel and Holland. The whale-fishing is also carried on to a considerable extent. The neighbouring seas abound with fishes of various sorts, and some salted cod has lately been sent to London. The white fishery is almost unlimited, but hitherto has not been prosecuted with an energy equivalent to its importance. Groceries and other goods are imported from London. Much porter was formerly imported, but the town and neighbourhood is now supplied from Brechin, which sends much porter to London, and partly from Forfar.

The harbour consists of a breast-work, carried along a bight of the river, not exposed to the current, at the south end of the town. It is dry at ebb-tide, and the earth which has been scooped out of it is formed into a beautiful green hill, on which is erected a flag-staff. Ship building is carried on here. A dry dock was constructed on Inch Bryock, but from the porosity of the ground, they found it impossible to exclude the water. It has often been observed, that there is no good harbour on the east coast of Britain, from the mouth of the Thames to the Orkney Islands. The mouth of the South Esk is much incommoded by a sand bank, which frequently shifts, and on which there is a great swell
with

with an easterly wind. This renders its entrance always difficult, and often dangerous. But were a pier thrown out, similar to that at Aberdeen, so as to contract the channel, this bank would be cleared away, and vessels of 500 tons or upwards, might enter, and ride in perfect safety in the bason of the harbour. The custom-house here, has also the harbour of Arbroath annexed to it; and in the year 1808 there were 144 vessels belonging to these ports, manned by 692 men and boys, and whose tonnage amounted to 10,168 $\frac{1}{4}$ ths.

The town is governed by a provost, three bailies, a dean of guild, and council, nineteen in all, who elect one another annually. Their revenues arise from the same sources with that of the other burghs, and all of them have been for some time increasing, at least in numerical money value. Here is a weekly market, but no annual fairs.

The population in 1755,	was	4150 souls.
1790-98,		6194.
1800,		7974.
1811,		8955.

Brecbin *.

This is a very ancient town, though we have not been able to trace any memorials of its first commencement. We have already hinted the strong probability that the places which were occupied, first by the Culdees, and afterwards by bishops and mitred abbots, had previously been consecrated, in popular estimation, as the chief seats,
or,

* *Brechan*, Gaelic. The rise of the valley.

er part of the town would be very inconsiderable. This would combine the advantages the town derives from being in the heart of a fertile country, with those arising from a sea-port. The town revenue arises partly from land, partly from customs, &c. and has long been in a progressive state of improvement.

The population in 1755,	was	3181.
1790-98,		5000.
1800,		5466.
1811,		5559.

There are several small villages scattered in the north-eastern part of the county, which do not seem to require a particular description. We shall therefore pass on to

Kirriemuir.

This village is situated on a declivity, about five miles north-west from Forfar. It might verify the verdict which was pronounced by an Englishman upon a town in the north, that had been represented to him as having been built upon a very regular plan,—“ That the only plan which seemed to have regulated the building of this town, was a total defiance of all plan.” This is a burgh of regality, where the baron, or his bailie, formerly exercised both a civil and a criminal jurisdiction. But since the repeal of heritable jurisdictions, the power of baron-bailies is strictly limited to matters of police. Most of the royal burghs had the power of punishing capitally conveyed in their ancient charters; but there is hardly any instance of their attempting to interfere with what are called the Pleas of the Crown; and their punishments have been confined to imprisonment
for

for petty offences, whipping through the town, putting offenders in the stocks or pillory, or banishing them from their precincts.

The only buildings of any note here are the parochial church, which is very spacious, and furnished with an elegant spire. There is also a handsome Episcopal chapel, likewise adorned with a spire. There are two meeting-houses belonging to the Seceders; and their multiplication seems to have been owing to a schism in that sect, about the power of the civil magistrate in matters of religion. Much coarse linen, such as osnaburgs, sheetings, packing cloths, &c. are weaved here. On the rivulet which runs below the town, there are several plash mills for scouring the yarn, and performing other operations in the manufacture. This town, being situated near the foot of the Grampians, there is a considerable retail trade with the mountaineers, who repair hither with their wool, sheep, yarn, &c. and receive in return cloths, groceries, and such articles as they want. There are weekly markets and annual fairs here.

The population in

1755,	-	was	-	3409
1790-98,	-		-	4358
1800,	-	-	-	4421
1811,	-	-	-	4791

Cupar-Angus.

This is a considerable town, but very irregular in its structure. It seems to have owed its commencement to a Roman military station in its neighbourhood; and afterwards to its having been the seat of a monastic establishment. It is a burgh of barony, where the baron or his bailiff, in former times, exercised the power of pit
 o
 and

and gallows. It is hence as much famed for its justice as Jedburgh, on the Borders; which consisted in first hanging a man, and then trying him. Another expression is current in this country:—"He that *will* to Cupar, *will* to Cupar." Which, we suppose, means, that if a man be resolved on hanging, he will accomplish his object in spite of all advice to the contrary. The manufactures are chiefly the weaving of coarse linens. There is a weekly market, and some annual fairs. This town is the first stage from Perth, on the Strathmore road, and the greatest part of it is situated in the county of Perth; the counties being separated here by a small rivulet. The population of the Angus division of the town,

In 1800,	-	was	-	247
1811,	-	-	-	244

Glamis

Is a small village on the Strathmore road, contiguous to the ancient castle formerly described, where there is a spinning-mill, and some other branches of manufacture. Here are annual fairs.

Douglstown

Is a small, but handsome village, in the parish of Kinnethles, which was built for the accommodation of the workmen at the extensive spinning-mills in its neighbourhood.

Letbam

Is a village in the parish of Dunichen, which is entirely a creation of George Dempster, Esq; as formerly described. It is chiefly inhabited by weavers of coarse linens,

linens, and other tradesmen, who have feued, and reduced into cultivation, lots of waste land, of various extent. Drumetiremon *, a straggling village to the north of Letham, indicates, by its name, the condition of the land before it was subdued by the patient hand of culture. In 1811, Letham contained

161 males.
183 females.

344 persons.

From which it appears, that there has been an increase of 184 persons, in the course of eleven years. This increase is chiefly owing to new families having settled on lots of waste land, contiguous to the original village. Here a stamp-office is erected; and there is a weekly market for yarn and unbleached linens. There are two small spinning-mills, two corn-mills, a lint-mill, and two plash-mills for cleaning coarse yarn, upon the rivulet of Vinney water, which runs below the village.

There are several other villages in the county, which might well deserve a particular notice, were not this branch of the subject already extended to too great a length. We shall only add, that these villages have been chiefly set down upon tracts of land, which, at their commencement, were wholly waste and unproductive, so as hardly to be worth a shilling *per* acre of rent. They have been chiefly built on lots of land, varying in extent from less than one to five or six acres, which are either held in leases of a hundred years, or in perpetuity, at a rent, the average of which is 40s. *per* acre. These original lots are afterwards subdivided, as the demand increases for building new houses; or they may be sold or mortgaged, being to all intents and purposes real property.

* *Drumetiremon*, Gaelic, the ridge, or back of the moorland.

ty. But when those which are held in perpetual feu so disposed of, the landlord is entitled to a year's rent the actual value, for admitting singular successors in possession, according to the old feudal ideas concerning the *deictus personæ*, which a superior was held to possess in the admission of a vassal. The effect of these *vilages* is not only to bring waste land into cultivation, but to enhance the value of the contiguous land. They relieve the farmer from the necessity of keeping unnecessary hands upon his farm, as he can always have work for labourers he wants in any emergency. This increases the amount of his disposable produce, and enables him to pay a higher rent. The only bar to their increase is the scarcity of fuel; and were the county intersected by canals, a considerable proportion of it would become a continued village.

BOOK V.**MODE OF OCCUPATION.**

SECT. I.**SIZE OF FARMS.**

In this county, farms are of all dimensions, from small pendicles, to several hundred acres. The small pendicles are chiefly occupied by weavers and other tradesmen, and are held in feu, or by a long lease, which induced the present occupiers, or their predecessors, to reduce the ground into a state of cultivation; chiefly by trenching it with the spade. As the occupiers of these pendicles have other sources of subsistence, besides what arise from their land, such as the trades they exercise, acting as carriers of goods, labouring on the roads, &c., they can only be considered as occasional farmers. Where farmers follow no other calling but agriculture, the average size of arable farms may be from about 100 to 150 acres. But there is a very considerable number of farmers whose possessions vary from about 20 to 50, or 80

acres. Those which exceed a hundred acres, are numerous as those which fall short of this extent; a considerable number amount to 500 acres, some or 800 acres.

In the Grampian district, farms are not estimated by acres, but by the numbers of cattle and sheep they are capable of maintaining. Excepting some small portions in the western division, the Grampians are chiefly divided between two great proprietors. There is no cultivation, excepting in valleys at the sides of rivers, the declivities of the mountains, where there is a great depth of soil. In the eastern district, each farm has a great extent of mountain pasture annexed to it, of many thousand acres; and the farmers are making considerable progress in the cleanliness and comfort of their habitations; in improving their arable lands by liming, turnips, and sown grasses. But in the western district, the arable lands being chiefly runrig, or mixed, and the mountains common, with no leases, exceeding nine years in duration, no such exertions can be expected. These circumstances also render it difficult to form any correct idea, either of the size or value of farms.

Perhaps it may be more proper to estimate the value of farms by the rent they pay, than by their superficial extent. It is well known, that one acre of land, in a favourable situation, is of more value, and will yield a higher rent, than a hundred acres of barren or muir, whose situation prevents it from being cultivated to account. The one ought therefore to be reckoned not a larger, at least a more valuable farm than the other. But in estimating the size of farms by their rent, there are many circumstances which it is difficult to ascertain and to appreciate in the calculation. Many farms

held upon old leases, and their rent is far below what would now be obtained were they to come into the market. There may also be others, which, during the late rage for farms, have been let too high; or, at least, at rents, which the existing condition of the land will not enable the tenants to pay, from its present disposable produce. When leases fall, or are purchased by proprietors or others, constant alterations are also making in the size of farms. Sometimes a large farm is subdivided; and sometimes two or more small ones are thrown into one. All these circumstances render it impossible to obtain any thing but an approximation to the truth in cases of this sort. But we flatter ourselves, that the following statement will not be far from the truth, for the year 1808 :

Number of farms whose rent is under L.20 <i>per annum,</i>	1574
Number of do., from L. 20 to L.50 <i>per annum,</i>	565
Number of do., from L. 50 to L. 100 ————	682
Number of do., from L. 100 to L. 300 ————	315
Number of do. above L. 300, ————	86
	<hr/>
Total number of farms,	3222

Much controversy has taken place among political economists, concerning the particular size of farms, which is most advantageous to the public. One party cries out against the enlargement and engrossing of farms, as tending to depopulate and ruin the country; and they call loudly for legislative regulations, which may counteract the mischief. Another party insists, that the enlargement of farms tends to render them more productive, and to furnish a greater amount of disposable produce

for feeding those who are engaged in manufactures and trade. They therefore call for regulations of a contrary tendency, which may discourage small farms, and increase their extent. But it appears to us, that the soundest policy consists in leaving these matters to regulate themselves. The size of a farm must be regulated by the skill and capital of its occupier; and a corn farm does not admit of being extended beyond what the farmer can conveniently superintend. If too large, a great part of the time and labour of his working-stock must be consumed in travelling to and from the distant extremities, and in the distant conveyance of the manure and produce. If too small, the horses and bestial will eat up a great part, if not the whole of the produce, and the farmer will be in a worse condition than a day-labourer. It is true, indeed, that were the country subjected to that sort of culture which prevails in China and Japan, which is more correct than that of the finest gardens in Europe, and is chiefly executed by the hand, every man might become a farmer, who could get possession of a spade and a few trifling implements. But in the present situation of things in this country, where a man depends entirely upon his farm, without other sources of income, it must be disadvantageous to have one smaller than will afford constant work to a pair of horses, with a suitable proportion of labourers, either constantly or occasionally employed. The conflicting interests of landlords and tenants will always regulate the size of farms, more for the public advantage, than any regulations that can be framed. It is the landlord's interest to shape his farms so as to answer the demands of the greatest part of his customers, the farmers; and so as he may obtain the highest rent for the same extent of surface. The interest of the farmer, again, consists in not taking a larger farm
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than he has capital to stock sufficiently, and skill to manage properly. Accordingly, in this county, farms below L.150 rent, have many more competitors, and are understood to bring a higher rent in proportion, when they fall out of lease, than those above this extent. The reason seems obvious, That there are a greater number of competitors, or of persons qualified to stock and manage such farms, than those of a greater extent.

SECT. II.

CHARACTER OF THE FARMERS.

THERE can be no doubt but mens situation in life has a great influence upon their character and conduct. A man who is set down in a barren joyless spot, with bad accommodation, and without the means of improvement, cannot be expected to make any spirited exertions, let his skill and dispositions be what they may. What little he may have, he is afraid to risk; and he creeps on with wariness and caution. Draining, inclosing, and bringing manures from a distance, cannot be expected from such a person; and he is strongly impelled to content himself with keeping his little possession in the state in which he found it. Though these adverse circumstances may be supposed powerfully to influence the sentiments and conduct of small farmers, yet there are very numerous examples in this county, where by persevering labour and assiduity, they have surmounted them all. Many examples may be quoted, where they have not only drained and inclosed their small possessions, but have improved them

them by lime or marl, and by a proper intermixture of green crops and sown grasses.

With regard to the greater farmers, they are generally distinguished by their intelligence, their industry, and attention to business. The style of living of many of them, though not so shewy, is equally substantial with that of the proprietors. The obstinacy of farmers, and their attachment to old usages, has often been exclaimed against, and is even become proverbial in some districts of the island. There is, however, no reason for blaming an aversion to change, before persons are satisfied that the change will be for the better. But this charge is not applicable to the farmers of this county, all classes of whom are abundantly sharp sighted, and disposed to adopt any improvement which they either see executed by others, or hear described, if their situation and circumstances admit of its adoption. In general, too, they are much attached to the constitution, both civil and ecclesiastical, under which they live, and are not much disposed to lend a favourable ear to innovators in either. All of them have had the benefit of an education suitable to their situation and circumstances in life, which excites, in early youth, the habit of exercising their rational faculties on all those objects which are connected with their profession. With regard to superstitions, I have not observed that they are tainted with any. Witches have long ceased to be feared, or even to be talked of. The water kelpie, a mischievous being, who was supposed to frequent the rivers, and who first seduced the unwary into the stream, and then carried them off to the sea, has fallen into oblivion, since bridges were constructed in all convenient places. Fairies are now forgotten; and ghosts are only supposed, by a few old women, to lurk within the precincts of a church-yard. Even the officious brownie,

brownie, who was wont to indulge lazy farmers, by doing their work while they were asleep, no longer continues his operations, and they are satisfied no work will be done, except through their own exertions. In general their minds are so far opened and enlarged, that they are satisfied all things are conducted by a wise superintending Providence, who acts by general, not by partial laws; and that no inferior agents have power to counteract or subvert the rules which are prescribed for the government of the universe.

The policy of granting small lots, of from five to ten acres, to manufacturers, which is frequent in this county, has often been questioned. On the one hand, it is alleged, that this practice has a tendency to spoil good tradesmen, and to make bad farmers: That a man whose attention and labour are divided among too many objects, never can excel in any of them: That division of labour is the great secret for making it produce the greatest possible effect; and that subjecting a man to a complex system of operations, is highly prejudicial to his true interest: That for tradesmen who live in the country there is no occasion for this diversion from their proper business, in order to promote their health, because they have frequent occasion to go to market, and have always one day in seven, in common with others, of relaxation from their ordinary work; and that in fact, such tradesmen, and their children, even without this diversion, are as robust as those of farmers. On the other hand, it is alleged, that the pendicles occupied by tradesmen, either were, or are still in part, in a waste and unproductive state; and that their labours have added so much productive surface to the general stock of the nation, which would not otherwise have been acquired: That operative manufacturers are much better scattered over the
surface

surface of the country, where they acquire strength of body, and fortitude of mind, than cooped up amidst the physical and moral pollutions of great towns: That this object cannot be accomplished without allowing them to gratify a propensity so congenial to man, by furnishing them with a piece of land to cultivate: That tradesmen could not well exist in the country, remote from markets, without cows to yield milk to their children, and potatoes and pot-herbs, and a little corn raised on their own premises: That this is not so great a diversion of their professional labour as might at first be supposed; because a great part of the farming operations are performed by their wives and children, when they would otherwise be idle: That manufactures being exposed to great vicissitudes, and not seldom to a total stagnation, it is a great consolation to a man to reflect, that he has provided another source of subsistence for himself and family, should that on which he chiefly relied entirely fail. On this point, though not on every other, we are disposed to be of opinion, "That whatever is, is right." Whatever landlords and tradesmen find most for their mutual advantage, we are inclined to think, tends most to promote the public good. We shall only add, that such of the tradesmen farmers as have fallen under our notice, are distinguished by their sobriety, industry, and good conduct. Many of them have been set down upon land that was good for nothing, which they occupy by a long lease, or perpetual feu, and which they have brought, or are bringing, by persevering industry, to a highly productive state; to the joint advantage, we hope, of themselves, of their landlords, and of the public.

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SECT. III.

RENT.

In this county, as in every other, the rent of land varies according to the intrinsic quality of the soil; its propinquity to a town or sea-port; the mode of cultivation to which it has been subjected; the degree by which it has been rendered accessible by roads, by which extraneous manures may be procured, and the produce conveyed to a market; its being inclosed or open; drained or undrained; and a variety of other circumstances too tedious to be enumerated. The rent of land has been rising in a very rapid progression during several years past, which has been partly owing to the improvement of roads and means of communication; partly to inclosing, draining, &c.; but chiefly to a more improved and efficient system of agriculture, by which the land has been rendered more productive. Part of this rise may also be esteemed rather nominal than real, in so far as it may be ascribed to a depreciation in the value of money, a commodity whose value rises or falls, like that of all others, according to the quantity in circulation, balanced with the demand. In illustration of this, it may be observed, that since the rise in the money value of land produce, some farms which had been long in cultivation, and are occupied on long leases with a victual rent, are now nearly, or even fully as high rented, as similar farms which were taken not many years ago at a money-rent, which was then thought most extravagant.

About twenty years ago, inclosed arable land was let at from 20s. to 35s. per Scotch acre; and inclosed pasture

ture land at 30s. to 50s. The average rent of uninclosed land was from 2s. 6d. to 10s. per acre. At that time land which had formerly been rented at 4s. 6d. per acre was relet at L. 1, 5s. and upwards; and farms which formerly gave L. 50 were raised to L. 800. In A. D. 1790, the learned Dr Playfair calculated that the mean rent of arable land, taking good and bad over the whole county, did not exceed 6s. per acre. But as the rent of many farms has been greatly augmented since that year, and there still remain a considerable number of old leases, which are occasionally expiring, and on which a great rise of rent may be expected, the average rent of arable land may now be safely stated to exceed 20s. per acre.

In the neighbourhood of towns, and of considerable villages, good land rents at from L. 7 to L. 8, and in some cases L. 9 an acre. But a part of this rent may be considered as paid for conveniency, by persons who have other employments. But within the distance of from two to three miles from these towns, such arable farms as have been lately let, average about L. 5 per acre. At a considerable distance from towns, such inclosed arable farms as have lately been let, average from 30s. to 50s. per acre, according to the quality and condition of the land. In such situations, land of good quality, which is inclosed, drained, and in good condition, will fetch from L. 3 to L. 4 per acre.

On some estates, where long leases had been granted, there is a progressive rise of rent, at the end of every seven or fourteen years. This seems to be an excellent method for bringing waste lands into cultivation, and for increasing the productiveness of those already cultivated, in all cases where the proprietor does not choose to undergo the expence and trouble of doing so himself. Examples might be quoted of long leases having been granted,

granted, in contemplation of great improvements, without any progressive rise of rent. But the occupants only advanced so far as to secure to themselves and families a genteel income, and then stopped short. With a progressive rise, the case is different, as the tenant is not distressed, in the mean time, with a greater rent than the subject can bear; and as he foresees the rise that must take place, he is excited to double his diligence, that he may be prepared to meet it when it comes.

The rents of a considerable proportion of the old leases are paid in grain or oatmeal; or partly in money, partly in grain. In ancient times, the greatest part of rents were paid in produce; but this practice has long fallen into disuse, and money-rents have been generally adopted. Corn-rents have, however, been somewhat revived of late; but in place of the corn, the fiars' price, or the price in the nearest town, on one or more market days that are specified, is agreed to be paid. The money-rents are paid at Whitsunday, or one-half at Martinmas, and the other half at Whitsunday, after reaping the crop. Corn-rents are generally delivered in February or March, for the preceding crop. Rents for pasture are sometimes paid before the stock be wholly removed; but generally about the beginning of the succeeding year, after the grazer has had time to realise the produce of his stock. In Lochlee the rent was wont to be paid per advance, that is, the half at Whitsunday, the other at Martinmas, for the ensuing year.

At no very remote period, what was paid in money or corn, bore but a small proportion in its injurious effects upon the tenant, to those vexatious services he was bound to render to the landlord and his factors. After landlords became at last satisfied that these services were even more prejudicial to their true interest, than to that
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of their tenants, they have been mostly abolished, or commuted for a fixed rent. These services consisted in thirlage to the landlord's mill and blacksmith's shop, and often to those of other landlords; carriages, tonnage, payment of kain fowls, yarn, &c. &c. Beside these services to the landlord, the factor or steward, obliged the tenants to cut, dry, and carry home his peats, to carry and spread his manure, weed his flax, and to do what work he pleased upon the lands in his natural possession. As some of these services may not be understood by persons at a distance, and even by the next generation their existence may be called in question, a short description of them may be necessary in a work of this kind.

And with regard to thirlage to mills, it may be observed, that the only way of grinding corn which was known to the ancient Romans, and which is still practised in many parts of the Highlands and Isles of Scotland, was by small flat round stones, called by the Highlanders *Querns*, moved by the hand. When water-mill for grinding were first introduced into this country, (and to the shame of history, which dwells so much on the exploits of the destroyers of mankind, the author of this useful invention remains wholly unknown,) proprietors who had the conveniency of a water-fall, on erecting a mill, bound their tenants to grind all their corns at this mill, and to pay a certain proportion of the meal, in name of multure. Nay, as an inducement to erect the mill, contiguous proprietors often bound their tenants to grind at the same mill. The lands thus bound were said to be astricted, and the proportion of multure varied from the tenth to the twentieth peck of meal. In rude times when all the produce was consumed among the people themselves, no evils were felt to arise from this practice as it was much better than grinding, as formerly, b
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hand-mills. But after corn became a subject of commerce, the case was materially altered. Expensive litigations ensued; and it was found that he who sold corn from an astricted farm, was bound to pay the multure, whether ground at the mill or not. Nay, what may appear almost incredible, after fallows, green crops, and sown grasses were introduced, in many cases it was decided, that the lands thus occupied should pay the same proportion of multure as if they had been sown with corn. This was literally chaining mill-stones to the limbs of agriculture, and saying, "Thou shalt not advance an inch beyond thy first and rudest efforts." Beside the payment of multures, the astricted tenants were bound to repair the mill leads and dams; to convey new mill-stones from the quarry, often at the distance of many miles, and which, before the improvement of roads and wheel carriages, when they were trundled upon their edges, cost the labour of many men and cattle during successive weeks, sometimes attended with the loss of lives; and, in fact, they were bound to do every thing which the tacksman of the mill might deem necessary for keeping the mill going. Yet the astricted tenants always complained, and with too much justice, that their corn was ground in the most careless and slovenly manner; that while they paid higher, they were much worse served than they could have been at free mills, or even free tenants at the same mill. While the servitude of thirlage raged through Scotland, and was even exasperated and extended far beyond the original intentions of its inventors, by very absurd decisions of our Supreme Court, I knew several farmers towards the south, who sent even what they grinded for their own use, and that of their families, to a very distant free mill; while they paid the neighbouring miller, to whom they

they were astricted, his legal dues. This is not meant as a sweeping reflection against these thirlage millers; for I have known many of them who treated all their customers with equal kindness and attention, and who were as anxious to serve and take care of the property of those who were astricted, as of those who were free. All that is meant is to point out the inveterate and incorrigible evils of the system, and its hostility to the present, and what may be expected, the still more improved state, of human society. It is gratifying to know that the proprietors of this county, who possessed thirlage mills, with minds enlightened to their own interest and that of their country, have long ago relieved their own tenants from this servitude; and have also compounded with other servient proprietors, so as to relieve their tenants also. Unless this servitude may still lurk in some obscure corner, I do not know of any but free mills in the county, where people may go where they are best served, and on the cheapest terms. The only exception is a few very old leases, the occupants of which, I understand, had refused to compound. Nor has the abolition of thirlage tended to diminish the rent of proprietors in mills. On the contrary, it has increased it considerably; and when leases expire, the increase is progressive. Our Highland Society procured a legislative enactment for the abolition of thirlage; but, as far as this county is concerned, they came in the *tail* of the day. Their enactment will not effect its abolition, except where it is abolishing itself; and their interference, like all their other measures, is merely calculated to annex to themselves the merit of doing what would have been done without them.

The thirlage to smiths, like that to mills, arose in the infancy of the arts. It probably began when every proprietor

priest was the chief of an armed association, engaged much more frequently in internal than in foreign war. The original business of this smith was to make, and repair, the arms and military weapons of the community which employed him; and he received an annual allowance, in kind, from each member of the community, by way of retaining fee, whether he was employed or not. From the poems of Ossian, and many others of much later date, we see the high veneration entertained for the smith, during ages of barbarous warfare. Like Vulcan among the Greeks and Romans, he was supposed to possess abilities super-human, and truly divine. But when the operations of this great personage came to be directed towards such low and vulgar objects, as the making and repairing of plough-irons, and other implements of husbandry, in which iron or other metals are used, his glory suffered a rapid eclipse.—Still, however, to get the necessary work done for themselves and tenants, landlords were induced to tempt an artist to settle among them, by furnishing a shop and tools, and binding themselves to pay him a certain annual allowance. Contiguous proprietors were often induced to bind themselves and their tenants, in the same obligation. Thus the thirl-smithy, like the thirl-mill, became a property, and was let at a rent, with right to levy all the legal dues, whether the work for which these dues were exacted, was well or ill performed, or performed at all. After artists began to multiply, as it was much easier to erect a smith's shop, than to construct a mill, to which the landlord was bound not to grant permission on his stream, in opposition to the mill which paid him rent, the thirl-smith died a natural death, being supplanted by those who worked on chance, having nothing to recommend them

them but the superior quality of their work, and punctuality in executing their orders.

The carriages consisted in the tenants being bound to bring home the landlord's fuel, to convey his victuals, or any thing he had to dispose of, to a market; to run his errands, and to perform various other services too tedious to be enumerated. The *banage*, or *bondage*, consisted in the tenant's being obliged, when called, to plough and harrow the farm which the proprietor kept in his own hands, and which was distinguished by the name of the *mains*; to cut and dry his hay; to cut and dry his peats, his corn, &c., while their own was neglected. At the same time that the tenants were under this bondage to the proprietors, the cottars, as an equivalent for the houses and small patches which they possessed, were under a similar obligation to work upon the *ir* farms.—The *kain* was exacted for the accommodation of the landlord's family, and it consisted in the payment of a certain number of fowls, of sheep and lambs, sometimes of cheese, butter, yarn, and a variety of other articles.

These last services are a remnant of the ancient state of the cultivators of the soil, when they were merely *ascripti glebæ* slaves; and when land was not valued from the quality of the soil, its local position, or state of cultivation, but from the number of people upon it. While such services subsisted, it is evident that the farmer had not an hour, nor any article of property, he could call his own; and that it was utterly impossible he could follow out any regular or efficient system of cultivation.—All these services are now happily abolished, to the mutual benefit both of proprietors and their tenants. At the same time, a few proprietors in the interior parts of the county, find it impracticable to reside upon their estates, without

without occasional assistance from their tenants. They therefore take them bound to carry their coals from the coast, and peats and other fuel, for which they pay them a reasonable stipulated allowance for each day's work, of themselves and horses. Other proprietors, who have entirely relieved their tenants from all services whatever, find them always ready to lend their assistance when their coals are to be brought from the coast, or when any thing is to be done which the proprietor's own horses and servants are not able to accomplish. These services were not confined to the proprietor, but extended also to the factor or steward. In some parts of the Highlands, where the proprietor does not reside, the factor keeps the people under him almost constantly working for his advantage, while their own farms are neglected. The only services to which the farmers of this county are still bound, is the carriage of materials for building and repairing churches and manses.

The valued rent, by which the right of freehold, and other public matters is regulated, is, in Sterling money, L.14,803. This valuation was probably made in the reign of Mary, Queen of Scots, or in that of her father. In the year 1796, the learned Dr Playfair estimated the rent of the county at L. 90,000; but he did not estimate farms possessed by proprietors, quarries, fisheries, &c. From the best information we have been able to obtain, it appears, that in the year 1808, the gross rent of lands, woods, quarries, fishings, &c. in the county, and including farms in the natural occupancy of proprietors, at a reasonable valuation, amounted to L. 208,924 15 3

Estimated value of house-rents in the towns and county, for same year

1808,	-	-	95,872	0	6
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Total rent from fixed property,	L. 304,796	15	9
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It may be observed, that the whole of this rent does not go into the pockets of the proprietors, because out of it must be deducted taxes and all public burdens; and it is only the nett surplus which they can apply to their own use. It may also be observed, that such of the rents as are paid in victual, are estimated by the fiars price.

SECT. IV.

TYTHES, OR TEINDS, AND STIPENDS.

IN Scotland, the word *teind* was originally of the same meaning and import with *tythe* or *tithe*, in England. Both mean a tenth part of the produce of land levied in kind. But as such produce has not been levied, nor could be legally levied in Scotland, during nearly two centuries, the word *teind* in the latter country, has come to have a very different meaning annexed to it, from the word *tithe* in the former. In Scotland, this word now means a fifth part of the rent of land.

At what time a tenth part of the produce of land was first set apart in this country for the support of religion, and of its ministers, history is silent. It is very probable, that after the first teachers of Christianity in this country had succeeded in abolishing the Druidical worship, they contrived to annex to themselves, if not the whole, at least a great part of the emoluments and privileges which had belonged to that hierarchy; and from the great power and splendor they had attained, there is reason to think, that these, according to the then state of
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the country, were very ample. The indefatigable Mr Chalmers in his *Caledonia*, vol. i. p. 432, shews, that tithes, when first mentioned in the most ancient charters of our kings, that are extant, are recognised as immemorially established, and no hint is given of their being a novelty, or of late origin. He elsewhere shews, that tithes were gradually extended to fishes caught in the sea, and in rivers, as well as to the produce of land.

It is true, tithing was a Jewish institution, and from that circumstance, the clergy would not fail to hold it out as of divine right, and binding upon all those who professed the Christian religion. The Presbyterians, however, although they maintain that the workman is worthy of his hire, and that the ministers of religion are entitled to a decent and comfortable maintenance, do not hold tithes to be of divine right, any more than other municipal regulations which were prescribed for the government of that people. Their ministers receive no tithes in kind; and they do not claim their stipends *jure divino*, but from the civil constitution of their country, which protects their property, as well as that of all other classes in the community.

Soon after the reformation of religion in Scotland, the tithes were engrossed by laymen, who procured grants of them from the Crown; or, rather having divided them among themselves, the Crown was induced to sanction what it could not withhold. These *lay impropiators*, as they would be called in England, were distinguished by the name of *titulars of teinds*, and they were burdened with the payment of stipends to the parochial clergy, according as they should be modified by the Court of Session, which, for this purpose, was erected into a court, under the name of the Commissioners of Teinds. At the same time, any proprietor, upon tendering nine year's

purchase to the titular, acquired a right to his own teinds, or became titular of the teinds arising from his estate. It soon appeared, however, that these laymen exacted the teinds with more rigour and severity, than even the Popish clergy in the plenitude of their power, while the pittance they were bound to pay to the parochial clergy was very ill paid, if paid at all. This naturally excited great murmurings among the people; who, whatever they might think of their spiritual, did not find their temporal interests improved by the exchange of lay for ecclesiastical exactors. At last the whole case, by the mutual consent of all the parties, was submitted to the sole decision of King Charles I., who pronounced a decret-arbitral, which is the foundation of the laws respecting teinds, as they still exist in Scotland. He decided, that where the tenth of the produce could not be ascertained, the fifth part of the rent should be held as equivalent to this tenth; a decision which has proved very favourable to landlords, as, in the progress of agriculture, a fifth of the rent has frequently been found to be less than a half, or even a third, of the tenth of the produce of the land. He further decided, that every proprietor should have a right to value, and to record the valuation of his teinds, so that any new increment added to the produce of his lands should not, in future, be liable to the claims of the clergy for augmentation of stipend. This also has proved very advantageous to proprietors, as many of them chose to value their teinds towards the expiry of old leases, when the fifth of their rent was a mere trifle, and they soon after got three, four, or five times the former rent, on which the clergy have no claim. Another circumstance has proved very favourable to the landlords, and very much against the clergy, namely, that these valuations of teinds were generally made in money, according

ording to its current value at the time the transactions took place; so that articles of produce which would now fetch from L. 50 to L. 60, are paid, agreeable to old valuations, by L. 4 or L. 5. This award of Charles I. was afterwards ratified in the Scottish Parliament, as the law of the land; and it has been recognised in the articles of Union between the two kingdoms.

By the law of Scotland, then, the fifth of the rent is the tithe or teind; which every proprietor, if it has not been done already, has a power to fix, by a process of valuation, so that the tithe can never afterwards be increased, whatever may be the increase of the actual rent. Upon this fifth part of the rent, the clergy have an action before the Commissioners of Teinds, for an augmentation of stipend; and they can claim no more than this Court is pleased to award them. This Court is guided entirely by its own discretion, having no rules laid down to regulate its decisions. For a very long time it has been a received maxim in Scotland, that a *poor Church* is a *pure Church*; and this maxim long influenced the decisions of the Court of Teinds. They were long very averse to grant augmentations to the stipends of the clergy, even where ample funds of unappropriated teinds remained in the hands of proprietors, or of the titulars. But when these Commissioners began to see they were carrying their maxim too far, and that the clergy were sinking below that level which the utility of their office required they should occupy in human society, and became more liberal in granting augmentations, the landlords cried out murder! and insisted, that what they had received originally in trust, but which they had enjoyed for more than two centuries, was their undoubted property; and they made the most strenuous efforts to keep what they had acquired. Hence expensive litigations, and frequent
appeals

appeals to the House of Peers, who have uniformly confirmed the decisions of the Court of Teinds.—That the fifth of the rent is the tithe or teind of Scotland; and that this Court may either grant the whole, or what part they see expedient, for the maintenance of the parochial clergy. A minister's stipend in Scotland, then, or living as it is called in England, is that portion of the fifth part of the rent of his parish, which the Court of Teinds have chosen to award for his maintenance.

One good effect attending this mode of paying stipends in Scotland, is, that it prevents all animosities and disputes between ministers and their parishioners. The minister can exact nothing but what the law of the land awards to him as his right; and as the stipend is a part of the rent, the tenants know they must pay it; and it is of no consequence to them whether they pay it to their landlord, or to their minister. In England, the levying of tithes in kind, occasions perpetual disputes between the clergy and their parishioners; and the clergy, let their vigilance be what it may, are always defrauded of part of their legal dues, and obliged to compound with the farmers on their own terms. When a man from this part of the island goes up to England, primed and loaded with all that has been written against tithes in kind, as hurtful to agriculture, he is naturally led to suppose that all the farmers there will be unanimous in exclaiming against this system, as hostile to their individual interests, and to all improvements in their profession. But what will be his astonishment on discovering, that the great body of English farmers are decided friends of tithes in kind, and do not wish any alteration of the system? The obvious reason is, That tithes in kind are used as a raw-head and marrow-bones to beat down the
landlord's

landlord's rent; while they take the parson in their own hands, and defraud him as much as they can.

It is therefore evident, that tithes in kind are very hostile to the interest of the landlord, in preventing that rise of rent, which ought to ensue from the gradual progress of society, and the natural rise of the value of land, in every society whose prosperity is progressive. They have another bad effect, that they render it the interest of every occupier of land, to continue it in the state in which his predecessors had left it; but not to advance any expence, nor exert any labour, by which it may be rendered more productive.

It seems to follow, that it would promote the true interest of the clergy of England, were they to concur in a measure by which their tithes in kind might be commuted for a certain proportion of the rent of land, as in Scotland. It would also be proper, that those commutations which were made in money, in Scotland, should be converted into land produce, according to the price for which the money was given as an equivalent: That the tithes of both countries should thus be converted into land produce, of which the proprietors should only be bound to pay the ascertained money price for the current year. Let distant periods be fixed for the clergy claiming additions, after landlords have acquired, and enjoyed, great rises of rent. But if society should retrograde, instead of advancing in prosperity, the clergy to receive no more than the legal proportion of rent, which the landlord actually receives. Thus would tithes in England, like teinds in Scotland, operate as no bar to the prosperity of the country, or the improvement of agriculture; and the clergy of both portions of the island would rise or fall with their country.

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In this country there are several parishes, where the officiating minister receives little or no stipend from his parishioners, but from parishes very remote; and in some cases, from other counties. As far as this admits of being accounted for, it would seem, that the whole, or greatest part of these parishes, originally belonged to ecclesiastical corporations, for example to the Monastery of Arboath. As cultivation first began near the sea-coast, and gradually extended along the banks of rivers, it is probable, that their back settlements were only used as grazings, to which the people resorted, with their cattle, during summer, as is still practised in some parts of the Highlands. After a permanent population came to be settled in these back settlements, this monastery, and others in similar circumstances, found it expedient to establish, what was at first a chapel, but afterwards grew into a parochial church. But as there was not then a sufficient quantity of land produce, in the parishes annexed to these churches, to afford a maintenance to the officiating clergymen, they assigned them meal and other produce from their cultivated lands near the coast. However this may be, it is certain that when these ecclesiastical bodies found their power tottering, they assigned many extensive estates to potent chieftans, from whom they expected protection. From this cause, there are several valuable properties in this county, which pay no stipend to ministers, being held, in terms of the original conveyance from ecclesiastical bodies, *cum decimis inclusis*. This is a great grievance to ministers, that they are obliged to make long journies in groping after small fragments of stipend, and often expend more than they get, in searching after their right.

An act of Parliament was lately passed, prohibiting the Court of Teinds from granting any augmentations
of

of stipends, except at intervals of twenty years. They are also required to convert the former money-stipend into grain, at the average fiars' price of seven years; to grant all future augmentations in grain; only the ministers are not to receive the grain, but the fiars' price of this grain each year. This is with a view to prevent, in future, that injury which many of the clergy have sustained by old conversions, as, in many cases, what was formerly a boll of oatmeal, or of barley, is now paid by a merk, or a pound Scots.

But as there are many parishes where the teinds were valued in money, when the value of money was much greater than it is now; and there are others, where extensive estates are held *cum decimis inclusis*, and are not liable to pay any stipend, Government have humanely provided a fund, from which the stipends of the ministers of such parishes may be augmented to L. 150. But as they have fixed upon the average fiars' price of seven years of scarcity, when grain was uncommonly high, as the criterion for estimating the value of victual-stipends, it so happens, that there are a considerable number of stipends in this county which, in ordinary years, do not much exceed L. 100, and yet can receive no increase from this fund.

With respect to stipends, it only remains further to be observed, that they are not injurious to any class of the community. To landlords they are not injurious, as they are only a part of what was the immemorial right of the clergy from the first commencement of individual property. When an estate is sold, the stipend and all public burdens are estimated, and only the free rent is purchased. To the cultivators of the soil they are not injurious; because, being a part of their rent, they would be obliged to pay them at all events. From the annex-

These were first established by an act of Charles II. Par. 1. Sess. 2. Chap. 4., which ordained, that there should be a *school and schoolmaster* in every parish, his salary to be not less than 100 merks, nor more than 200; to be paid by the heritors and liferenters, but having relief for the half off their tenants. This act was afterwards confirmed by an act of William III. Par. 1. Sess. 5. Cap. 2. Another act was passed in 1803, by which the salaries of country schoolmasters are raised, the *minimum* to 300 and the *maximum* to 400 merks. This act likewise empowers the heritors to fix the fees which scholars are to pay to their master, from time to time, but at intervals of not less than twenty-five years. The schoolmasters have also a garden, extending to one-fourth of a Scotch acre, or a small allowance in place of it. The fees are extremely moderate, seldom exceeding 1s. 6d. for reading; 2s. or 2s. 6d. for writing and arithmetic, and 4s. 5s. for Latin or Greek; while other branches are taught on the same low terms.

We have not been able to learn what additions have been made to the salaries of schoolmasters, in the several parishes of this county, in consequence of the late act; whether the *maximum* or *minimum*, or any intermediate point, have been generally adopted; but we believe that few or none of the country schoolmasters have had their fees they get from their scholars increased. This was formerly suggested as a measure of justice to this laborious and useful body of men, owing to money having become very much depreciated since their fees were first established. Nor will this tend to raise the price of instruction above the reach of the lower orders, because labourers of every description now obtain much higher wages in numerical value at least, than they did formerly.

In addition to their official emoluments, schoolmasters generally exercise the offices of precentor and session-clerk; from which, small salaries, and a few perquisites accrue to them, such as proclamations for marriages, registration of baptisms, granting certificates, &c. Some of them also act as clerks to the trustees on the parish roads, collect the road-money, &c. from which small emoluments accrue. The annexed Table *, exhibits the emoluments of schoolmasters, as far as they could be collected from the Statistical Account of Scotland, in which their lately increased salaries are not included. We have already stated, that the utility of this institution, and its beneficial consequences to landlords, and their tenants, far surpasses the actual amount of its burden on the land. Schoolmasters' salaries, like ministers' stipends, are always deducted from the value of estates, when they are sold.

The Presbytery of the district are the legal judges of the qualifications of schoolmasters; but they are chosen and installed into the office by the heritors of the parish to which they belong. The law requires that Presbyteries should visit the several parishes, and the schools within their district, once in the year at least. These visitations tend much to excite emulation, both among the teachers and the scholars; and in some cases prizes are distributed among those scholars who acquit themselves best. This has a happy effect upon the scholars, and it would be desirable that the practice were more general.

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SECT.

* See Table.

SECT. VI.

POORS RATE AND POOR.

HAPPILY no poors rate, or legal assessment for their maintenance, have yet found their way into this county. The poor have been hitherto supported by the compassion of their friends and neighbours; the collections at the church-doors; and the private charities of the humane and merciful.

The justice and expediency of poors rates, have been much the subjects of controversy among political economists. On the one hand, it is alleged, that as it is by the labour of the poor that land is rendered productive, they have a natural right to a share of its produce, when disabled by sickness, or by old age. They insist, too, on the injustice of throwing the whole burden of maintaining the poor upon the charitable and humane; and as the niggardly and avaricious have perhaps profited more from their labour, than the other description of persons, it is but just to compel them to bear a share of the burden, in proportion to their property, by a legal assessment.

On the other hand, it is alleged, that a poors rate uniformly operates as a bribe to idleness, and thus tends to create that poverty it was meant to relieve: That much of what is raised by legal assessment, is consumed in the expence of levying and distribution; and thus although the people should be oppressed by heavy exactions, the poor, in fact, are not relieved: That these have been the direful effects of poors rates in England, and must uniformly

formly follow their progress in every country where they have been established.

In Scotland there were ancient laws enacted for imposing something like a poors rate; but it is the opinion of many that these laws are obsolete, and that they could not be enforced upon those who should choose to resist their operation. It is certain that no such laws have ever been enforced in this county.

Though the ministers and elders (churchwardens) are not legally bound to bestow any more attention upon the poor, than any other individuals; yet, in practice, the care and management of the poor are devolved upon them. They distribute among the poor, according to their necessities, the weekly collections which are made at church, perquisites arising from the use of the mortcloth or pall, fines exacted from delinquents, or violators of decorum, and some occasional items arising from marriages and baptisms. Beside these, which may be considered as the permanent fund for the maintenance of the poor, in many cases they have a few pews in the church, which are let by the kirk-session, and the rents applied to their maintenance. By law, if the kirk-session should plant trees around the church-yard, they may cut them down, and apply their produce to the maintenance of the poor; but if they be planted by the heritors, they become their property, though they commonly give them to the poor. To all these, there are frequently added, the interest of money bequeathed to the poor by charitable individuals; or rents of lands and houses that had been left to them; together with the interest of stock arising from former accumulations. The latter are more frequent in towns than in country parishes; and in the distribution the poor are divided into different classes, each receiving an allowance, according to their supposed
q 2 need.

need. The sums allowed, even to the most destitute, are extremely small, seldom exceeding 1s. 6d. or 2s. a week, and much oftener below than above these sums; the object being, not to encourage idleness, but to enable those barely to live, who cannot live without an addition to what they can gain by their labour. The kirk-sessions also distribute a great variety of occasional charities, to persons in temporary distress, beside what is given to those who are regularly upon their list. They also grant certificates to those they are unable to relieve, that they may solicit alms within the bounds of the parish. These charitable donations are never claimed as a right, but are thankfully accepted as a favour; and such is the pride of independence which pervades the lower orders, that children will labour hard to support their aged parents, rather than they should be a burden to others. Coming on the poor's box, if it can by any exertions be avoided, is always regarded as a mark of profligacy, and of being lost to all sense of shame.

In those parishes where the gentry and their families usually attend the established church, or where, though absent, they send their usual contributions to the fund, the poor are generally sufficiently provided, and have often a stock laid out at interest. Where this is otherwise, the poor are left to maintain the poor, and a state of things takes place, which seems to render a legal assessment unavoidable. Dissenting chapels are also very hostile to the interest of the poor; because what is collected there is generally laid out in defraying the expense of building and repairing their church, or in maintaining their minister. This must be understood with several exceptions; because there are dissenting congregations which maintain their own poor, or contribute handsomely to the general fund. But it commonly happens,

pens, that what is collected there is so much withdrawn from the fund allotted to the poor. This it behoves proprietors to reclaim; because, if the poor's funds should prove deficient, they are bound to make up the deficiency. Ministers and elders often complain of persons frequenting these places of worship, while they are able to contribute any thing, and then demanding charity from the parochial fund when they fall into poverty or distress. They think it injurious to those who contributed, to give any thing from a fund to those who contributed nothing.

When these funds prove deficient, or when any emergency happens, such as a scarcity, or a stagnation of trade, the course which the law points out, is, for the minister to call the heritors of the parish; lay before them the state of the poor, and the addition to the ordinary fund which may be necessary for their support. The heritors then assess themselves according to their valuation, of which the proprietors pay one half, and their tenants the other. If any of them prove refractory, the minister may enforce payment by an action before the Judge Ordinary, or Sheriff of the bounds.—In this consists the radical difference between the poor's laws of Scotland and of England, that in the latter country the persons who fix and levy the assessment are a separate corporation, whose influence lies in the amount they can contrive to levy; whereas in Scotland it is those who pay who fix and levy the assessment, and it is distributed free of all expence. No doubt the heritors may appoint persons to levy and distribute the assessment, and pay them for their trouble; but they seldom take this business out of the hands of the ministers and elders, who do it for nothing. But in this county, when emergencies of that kind occur, that the poor may not be led to rely
upon

upon a legal assessment, it is more common to have recourse to a voluntary subscription, which is never exacted except in proportion as it is found to be absolutely needful. A meeting of the parishioners is called for that purpose, and they are careful to keep the amount subscribed from the knowledge of the poor, that none may be induced to apply except those in real want.

By the law of the land, the care and maintenance of the poor devolves upon the heritors, and the kirk-sessions are only their factors, so far as that business is concerned. They can be called to account by the heritors when they please, or the heritors may take the management of the poors' funds upon themselves, or appoint other persons to do the business. This experiment has been tried in some parts of Scotland, where heritors happened to get into squabbles with their minister. But the people called them *beatben elders*, and contributed nothing; and the effect was, that the heritors involved themselves in a legal assessment. It is believed, that no fund was ever managed with more prudence and frugality, or was productive of such beneficial consequences, as that which arises from the voluntary contributions for the maintenance of the poor in this country. In the annexed Table*, there is exhibited a state of the funds belonging to the parochial poor, so far as they can be collected from the Statistical Account of Scotland; and their condition has not varied much since the publication of that useful work.

But it has often been observed, that the best kind of charity is that which arises from the industry of those who are its objects. Of this kind are charitable or *Benefit societies*, as they are here commonly called, which are frequent in all the towns in this county. Sometimes a
society

* See Table.

society of this sort is confined to a particular trade, weavers, for example, and sometimes they are of a general nature, and comprehend day-labourers, and all who choose to apply. Several of the farming societies in the county have also established funds for charitable purposes; and the several mason lodges, and the guilds in towns, have similar funds. In these societies, the general practice is, for each member to pay a small sum at entry; and a small annual rate is paid by instalments every month or quarter. An annual meeting is held, to examine the state of the funds, and to choose persons to manage them for the ensuing year. The money thus contributed is lodged at interest, under the responsibility of the managers; and each member who may be disabled from working by sickness, accident, or old age, receives a weekly allowance, proportioned to the amount of the contribution. To prevent improper applications, a certificate of the disability of the applicant must be produced from a medical man, and also from the minister of the parish where the applicant resides. These societies are attended with the most beneficial consequences, and it were desirable they were extended so as to include all classes of persons. This would effectually supersede the necessity of imposing a poors' rate, which is allowed at all hands to be the most disastrous mode that ever was adopted for maintaining the poor.

There is another kind of charity which does not admit of abuse, because none apply except those who are its proper objects. We mean that which consists in curing the wounded and diseased, and thus restoring useful labourers to society. For these purposes, there is an infirmary at Dundee, and another on a smaller scale, at Montrose, as formerly observed; which are productive of the most salutary consequences.

In general, the country parishes maintain their own poor; but they are much annoyed by strolling beggars from the towns, and often from distant counties, who are not over scrupulous in helping themselves to what they can carry off. As a very great proportion of these persons are able to support themselves were they inclined to work, it would be a great improvement on the police of the county, were there a Bridewell constructed, where such persons should be compelled to labour at such employments as can be carried on within doors.

SECT. VII.

LEASES.

IN some of the Grampian districts, and properties contiguous to them, there are no leases, or only leases of short endurance, such as five, seven, or nine years. Where this takes place, there is no improvement, and cultivation is in the same awkward state in which it was some hundred years ago. Indeed, where the arable land is runrig, or occupied by a number of small tenants, in patches which are intermixed, leases are of small consequence, because there can be no inclosing, draining, or any deviation from the ancient system. These observations do not apply to a tract of hill pasture, being occupied by a joint flock of sheep, under the care of a common shepherd. This practice has been introduced into Lochaber and other parts of the Highlands, with great success; where the low arable lands are divided into separate

parate farms, while the mountains are put under flocks of sheep, in which each farmer has a share. Withholding leases, or granting only such as are of too short duration, is more prejudicial to the landlord than to the tenant; in so far as, instead of meliorating the condition of the soil, and increasing its value, it makes the tenant's interest to consist in deteriorating the soil, by severe cropping.

The proper duration of a lease, which would prove most advantageous both to landlord and tenant, depends upon a great variety of circumstances; and on this point rural economists are not yet agreed. Where a farm is already in a high state of cultivation, and needs only to be continued in the same state, it is evident that no such length of lease is necessary, as when a great outlay must be made in order to render it productive. Or where a landlord chooses to improve a farm, by draining, inclosing, applying calcareous manures, and otherwise bringing it into a productive state; it is evident that no such length of lease is necessary, as when these operations are left to be performed by the tenant. No tenant would be induced to make any extraordinary exertions, or expenditure, unless his lease was of such endurance as to secure a suitable reward for his labour, and a sufficient profit on his capital. Even on farms which are already in a high state of cultivation, the tenant is entitled to reap the full benefit of the rotations to which they are subjected, of the manures he applies, and a suitable profit on the capital he employs. This, in all the best cultivated parts of Scotland, is now thought to be accomplished by leases of nineteen or twenty-one years endurance. These are also the ordinary terms of leases through a great part of this county; and they are supposed to afford the tenant sufficient time to be indemnified for his labour, and the capital

pital expended at the commencement of his lease. These terms are also supposed to afford the landlord opportunities of sufficient frequency, of profiting by the progressive rise in the value of land, and of coming in for his share of the improvements which had been made during the currency of former leases.

The late Earl of Panmure, and other proprietors, his cotemporaries, were strenuous advocates for long leases; and they always wished to add the life of the occupant after the lease expired. They acted on the presumption that a man would always indulge the hope of living a year longer, and hence would not be disposed to injure the land towards the close of the lease. This may be true in general, but instances might be adduced of occupants on their lives, after the lease expired, entertaining an apprehension, during many years, that they were soon to die; and of course, they endeavoured to take out of the land what they had put in, as they expressed it; instead of increasing, or even keeping up its former fertility. Upon the whole, it seems to be most advantageous, both to landlord and tenant, that leases should have a precise period, at which they expire. While several proprietors formerly were advocates for long leases, and a life at the conclusion, a great proportion of the farmers were averse to them, as they thought such leases bound them down to the land, and brought them under obligations which they, or their children, might not be able to fulfil. Like the farmers in many parts of England, they were averse to leases, or wished only such as they might hope to see the termination. But the case is very much changed now. Proprietors generally wish to shorten leases, that they may have their land more frequently in their power; while tenants complain they cannot obtain them of sufficient duration, to warrant them in making
substantial

substantial improvements. Where very expensive improvements are expected on the part of the tenant, the best mode seems to be a long lease, as already hinted, with a progressive rise of rent.

The usual terms of entry to farms, are, to the grass and houses at Whitsunday, or 26th May, and to the arable lands, at the separation of the ensuing crop from the ground. This practice seems to have been introduced when peats were the sole fuel of the farmer, when the cutting, drying, and securing of which, occupied a great part of his time and labour during summer. In such a situation it was necessary that the farmer should enter his premises, at the period most favourable for providing fuel for the ensuing winter. But since roads were improved, coal has become the principal fuel in all the lower and best cultivated districts, which can be got at any time from the towns on the coast; and it therefore seems expedient and just to allow the outgoing tenant time to dispose of his crop; and that the incoming tenant should enter to the arable lands at Martinmas, or at the separation of the crop from the ground, and to the grass and houses at the term of Whitsunday next ensuing.

Rural economists are not agreed concerning the expediency of inserting conditions in a lease, and of binding the tenant to any particular mode of cropping or management. On the one hand, it is asserted, that where a bad system of agriculture prevails, it is highly expedient to bind tenants to follow a better system, for their own advantage. On the other hand, it is asserted, that these conditions generally betray the ignorance of those who impose them; that they are often impossible in the execution; that though a tenant should shew a seeming compliance with them, he will never execute with such vigour as when he is satisfied that what is enjoined is really
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for his advantage ; that such conditions reduce a tenant to the state of a mere machine, who has no judgment nor will of his own ; and that they subject him to a most abject state of dependence on the caprices of his landlord, or his factors. It is certain that the conditions inserted in many of the leases of this county, are most palpably absurd, and had they been rigidly enforced, agriculture would not have advanced beyond the state in which it was forty or fifty years ago, when there were no fallows nor green crops, and when sown grasses were only beginning to be introduced. Many enlightened proprietors are so sensible of this, that they daily wink at the violation of their own conditions ; but it would be much better to remove them entirely, and not keep the penalties for their violation always hanging like a lash over the heads of their tenants, who have adopted an incomparably better system of management than was prescribed by these absurd conditions.

A few of these may be specified by way of illustration. Some tenants are bound to take four or five corn crops in succession ; then a crop of sown grass ; after which they are required to keep the land six or seven years in pasture. Now, were this enforced, the land would throw up whins, broom, and other brushwood, and would revert to a state of nature. Some are bound to sow turnips where they do not thrive ; and others are prohibited from sowing wheat on soils well adapted for that grain. Some tenants are bound " to obey and abide by all acts of the baron court, made and to be made." This may serve to intimidate a troublesome tenant, and render him more obsequious to his landlord. But perhaps an unmerciful steward may take advantage of this clause, to harass a tenant, against whom he may have conceived an ill-grounded prejudice. In some cases a tenant

nant is prohibited from using calcareous manure, without the consent of the proprietor in writing; after which he is not to take above four crops, and then lay down the field with grass and clover. Other tenants are tied down to a particular rotation of cropping, which the season often renders utterly impracticable. The tenant is certainly the best judge of the species of crops which are best adapted to the soil, and the condition of the land. During the currency of a lease, it may often happen, that new modes of cropping, and of management, may be discovered, which are much more advantageous than those prescribed; and it seems high presumption to fetter a tenant so that he cannot take advantage of these beneficial discoveries. The old feudal notion of the *delectus persone* still prevails too much, and assignees and subtenants are generally, though not always, excluded. The effect of this is to injure the credit of a tenant, so that he cannot borrow money upon the security of his lease. It operates like a prohibition on the part of landlords, against vesting capital upon their land, by which its value would be much increased when it came again into their power. If a man has laid out a considerable sum in improving a farm, and dies before he has recovered suitable returns, leaving a wife and young children, it is manifest injustice to debar them from subsetting their interest in the land, to a farmer who can manage it properly. If they be obliged to manage the farm themselves, of which they may be utterly incapable, not only their interest but that of the landlord are likely to suffer. This exclusion of assignees and subtenants prevents men of capital and credit from embarking in farming as a mercantile speculation, where, after having rendered a tract of land highly productive, they can sell the lease, or subset it to a tenant,

and

and then bring their capital to operate upon another tract which is in a state of nature.

Where the modes of agriculture have attained a considerable degree of perfection, the only restrictions upon a tenant that seem to be expedient, are that he shall consume the fodder on the ground, and not sell off the manure that may be collected. In the neighbourhood of towns these restrictions are unnecessary, because the farmer can dispose of his straw to good advantage, and receive manures in return. Perhaps the farmer's own interest is the best of all restrictions. But some restrictions seem absolutely necessary during the four or five last years of the lease. For when a farmer knows he must quit possession, he is under a very strong temptation to injure the land by overcropping towards the close of his lease. He should therefore be bound to leave a certain proportion in fallow, green crop, or sown grass for which the incoming tenant should pay him by appretiation; and a certain proportion in pasture of so many years standing. In some leases the outgoing tenant is obliged to leave all the dung upon the premises to his successor. But this seems impolitic; because a man will not be very active in collecting what he is to derive no benefit from. It seems more expedient to allow paymen for his dung by appretiation; and that threshing-mills and other machinery, should either be paid for in the same way, or the tenant be allowed to remove them. By a late decision of our Supreme Court, it appears, that threshing-mills are declared to be fixtures, which the tenant has no power to remove. This should put farmers on their guard against constructing such machines, unless it be stipulated that they shall be paid their estimated value, or be allowed to remove them at the expiry of their lease.

It was formerly the practice in this county, which is still, to a certain extent, most absurdly continued, to insert a variety of what are called *irritant clauses* into leases, by which tenants who did not perform what was perhaps nearly, or even physically impossible, were subjected to heavy penalties, and even to ejection, without previous warning. The only effect of such clauses was to create a power in the hands of the landlord, or of his agents, to domineer over and oppress a tenant, against whom they might have conceived an antipathy. For while the performance of these conditions was seldom rigidly exacted, and the tenant might flatter himself with the imaginary security of a lease, a writ of ejection, or in order to pay a heavy penalty, might come forth against him, like an explosion of thunder. Happily these irritant clauses have been declared illegal and inoperative, by repeated decisions of our Supreme Court. Yet, in spite of law, of reason, and of common sense, they are still continued in some leases, and often excite jealousy and ill-humour between landlords and their tenants. The latter, having little access to know the law, are often kept in bodily fear by these bug-bears.

It is thought, that in no art or profession is the competition greater, and the reward of skill and labour less, than in agriculture. But of the expence and profit of farms, no satisfactory account can be given. They depend upon such a variety of circumstances, that a detailed account of one or two farms, would afford no criterion by which to judge of others. Those who occupy upon old leases, and who manage their affairs with judgment, have ample returns. Many who occupy on recent leases, with advanced rents, have still contrived to live comfortably, by the profits of grazing. But in general it may be stated,

ted, that servants' wages, agricultural implements, all the expences attending cultivation, are very high and though the profits may be more regular and steady they are not so high in this, for the same proportion of skill and capital, as in other employments.

BOOK VI.

IMPLEMENTS AND MACHINERY.

THESE are every way similar to those which are used in all the most improved districts of Scotland, and have been so minutely described in the Surveys of the several Counties, that no more is necessary than to present a short enumeration of them, and to hint at such implements as may be peculiar to this county.

Ploughs.

In the northern district, the old Scotch plough is still occasionally used, and it is an instrument well adapted for breaking up waste land, that is encumbered with the roots of shrubs, or with stones. At no remote period, it was usual to yoke four, or six horses abreast in this plough. The driver walked backwards before the horses, and struck them in the face to make them come forward. Now, this plough is commonly drawn by four, sometimes by six horses, which are yoked in pairs, and the driver

A

walks

walks beside them. But, excepting for the purposes already specified, the plough which was first invented by the late Mr Small near Dalkeith, and from him named *Small's plough*, is universally used. It has a cast iron mold-board, which is sometimes made in parts, so that the portion which is most exposed to friction may be replaced, without needing to replace the whole. There are several variations in the form of the mold-board, some preferring those which are concave, and some those which are convex, or different intermediate forms between these extremes. This plough is constructed by skilful tradesmen in all parts of the county, and costs L. 2, or L. 2, 2s. It is drawn by two horses, which are generally so well trained that they obey the ploughman's voice, and need neither reins nor driver. Oxen were formerly very much used in the plough; but they have been almost entirely given up on corn farms, as horses are more expeditious, and fit for many purposes for which oxen are ill adapted. Even the tax upon plough horses has not operated in favour of oxen, as horses are more general now, than they were before that tax was imposed. The ploughmen here are very skilful, and many of them have been carried to Ireland, and other districts, in order to improve their modes of ploughing.

Harrows.

These are of three sorts, in this county: 1. The *break barrow*, is a strong and weighty instrument, and to give it greater efficacy, is sometimes loaded. It consists of four heavy and strong bills, connected by cross spars. The teeth extend from six to eight inches below the bills; are bent a little way forward; are of an angular shape, so as to resemble small coulters; and are so strongly wedged in the bills that they cannot turn. This instrument

instrument is drawn at one corner by two, three, or sometimes four horses yoked abreast, according to the soil on which it operates. Its teeth, as indeed of all the other harrows used, are so placed as to cut the land at equal distances. Its use is to break and reduce adhesive soils while under fallow, and to tear up root-weeds. When the teeth are choked by these weeds, the driver has a rope fastened to the rear of the harrow, with a cross stick, by which he can lift it up, and cause it to discharge its contents on the surface. In some cases, the break-harrow is in the form of a triangle, with a pair of stilts behind, by which the driver can press it deep into the ground, or can raise it so as to make it discharge the weeds it had collected. This latter construction seems to be a great improvement; but the break-harrow is not yet so universally used in this county as its merits seem to require.

2. The common harrow is the one used for covering in the seed, and for destroying annual weeds in fallows. They are drawn in pairs with one horse to each. A pair costs from L. 1, 10 s., to L. 2, 2 s.

3. The grass-seed harrow, has teeth much shorter, and the instrument is not so strong as the common harrow. It is used for covering grass and clover-seeds; but sometimes the common harrow is used for this purpose; and sometimes a mass of thorn bushes, loaded by a weight.

Rollers.

These are universally used, and they are sometimes constructed of a log of hard wood; but more generally of a sandstone fashioned into the form of a cylinder. In a few cases they are composed of old cart wheels, the rims of which are covered with spars of wood, and an

iron axle passing through the centre, serves to connect the roller with the frame by which it is dragged along. This kind has commonly a hopper above, by which it can be loaded at pleasure, or by which stones can be conveyed from the land. Other rollers consist of broad cylinders of cast iron, which seem to be the most effectual of any. The prices of these instruments vary with the materials, and the mode of their construction.

Drill Barrows.

These are used for sowing turnip, and other small seeds, in rows, or drills. For this purpose, some of the small farmers use a small triangular box of tin-plate, the form of a hopper, into which the seed is put, and closed with a lid. This is fastened to the lower end of a stick, which is shaken with the hand along a small furrow previously formed in the top of the drill, while the seed drops through a small aperture in the bottom of the tin box.

The single drill-barrow is pushed along the drill with the hand, the drills being previously smoothed by the common roller. It forms a small rut for the reception of the seed; while a rake and small roller follow to cover it in. Other machines of this sort, sow two, three, and sometimes four drills at a time; have a roller in front to smooth the drills, and another behind to cover the seed; are drawn by a single horse, who walks in the hollow between two drills, and are guided by the ploughman, who walks behind. These machines cost various prices, from about one to six guineas.

Hoeing

Hoeing Machines.

These are, 1. The *scarificator*, which is a sort of Dutch hoe mounted upon a small plough, and drawn by a single horse. It cuts the annual weeds about two inches below the surface, and causes them to wither by the heat of the sun. Sometimes this instrument is composed of three angular hoes placed in the angles of a triangle, which form is preferred, as the two rear hoes can be varied in distance according to the breadth of the drills. These machines are regulated by wheels.

2. The double mold-board plough, is a small plough, drawn by a single horse, whose mold-boards are moveable upon a hinge, so that they can be extended at pleasure, by bars of iron crossing the rear of the plough. It is used for paring away the earth from the rows of drilled crops, and throwing it into the hollows between the drills. After the weeds are destroyed, the mold-boards being extended, it is used for throwing back the earth to the roots of the plants. The common hoe, and the hand, are used for eradicating such weeds as cannot be reached by these machines.

Carts.

In proportion as the roads have been improved, single horse carts have become much more frequent than formerly. The double horse cart has one advantage in miry roads, that when the shaft horse and the cart are sticking in a puddle, the trace horse has generally cleared it, and can exert himself to drag the rear horse, together with the cart, out of the mire. But on firm roads, it is clearly ascertained that two horses, in separate carts, which one man can easily manage, can draw a third more weight,

weight, with less injury to themselves or to the road, than two horses in one cart. The carriers betwixt Glasgow and Edinburgh commonly convey from a ton to thirty hundred weight, upon a single horse cart; and they perform the journey of forty-two miles in about twenty-four hours. In this county, a single horse cart, or coup, as it is commonly called, is about five feet five inches in length, three feet five inches in breadth, and the sides seventeen or eighteen inches in height. The price of a cart, for a single horse, or for a pair, varies from about L. 10 to L. 16, including the wheels, iron axle, and other appendages. The harness for a pair of horses, may cost about L. 5 more. The boards of the cart are now generally fastened to the shafts and spars by screwed bolts, which keep them much firmer than can be done with nails; and one set of these bolts will outlast several carts. For carrying corn in the straw, or hay, each cart is provided with a frame of wood, which is laid over its mouth, and enlarges the base on which the load is built. The large waggons which prevail in England, are not adapted for this hilly country; and it is demonstrable, that even on level roads, if they be firm below, single horse carts are the most economical way of applying animal force in the conveyance of goods.

Threshing Mills.

These are now very general in this county, on all corn-farms which exceed a hundred acres in extent. When the flail is used for separating the corn from the straw, the barnman gets one boll in twenty-one without, or one boll in twenty-five with, one meal a-day. But the threshing mill excels in expedition, and its superiority in point of clean threshing is such, that the barnman's allowance

allowance is supposed to be more than saved by employing it. Many attempts were made to construct threshing mills, on various principles; but the one which has succeeded best, and which, with only one exception, is universally used here, is that which was invented by Mr Meikle, when he was employed in constructing machinery by the late Mr James Stein, distiller at Kilbagie, near Clackmanan. This machine is so very common, that all description of it seems unnecessary. In this county threshing mills are commonly moved by horses; but where opportunity occurs, water is always preferred. A few of them are moved by wind, and there may be one or two near the coast moved by steam. The latter are used for grinding, as well as threshing corn.

Many attempts have been made to construct threshing mills with a one-horse power, so as to accommodate small farms. But these machines have not hitherto proved efficient with less than a four-horse power; and the generality of them in this county, are moved by six horses; or by a power equal to their strength. Such machines cost from about L. 140 to L. 180.

An artist at Arbroath has lately introduced into that neighbourhood, a threshing machine which is moved by two horses, and seems to do the work very well; only it does not thresh so much as a four, or six-horse, machine, in a given time. In his machine, the length of the drum, or trundle, to which the beaters are fixed, is diminished, so that they cannot take in more corn at a time, than is proportioned to the power of two horses. The wheels and moving powers are all of cast iron, and it is merely Meikle's machine reduced in its dimensions. This machine costs from L. 50 to L. 60. It seems probable, that by a still farther contraction of the drum, or trundle, these machines may be made to do sufficient

work with one horse, or even with any inferior power; but it must be understood, that the quantity threshed in a given time, must always be proportioned to the original power applied. Thus Mr Meikle's mill may be accommodated to small farms.

The ingenious Mr Stirling at Howmuir, near Forfar, has adopted a threshing mill, which bids fair to succeed on small farms. It was first invented in the neighbourhood of Dunblane, and the mode by which it is put in motion is exactly the same with that by which small corn mills are moved in the district of Uig, Island of Lewis, and in some other Hebridian Isles. It consists of a perpendicular shaft or axle, moveable on a pivot below, and having another pivot inserted into a box in the upper part of the building. This upright shaft may be about twenty-five or thirty feet long, according to the height of the water-fall which puts the machine in motion. On the lower part of this shaft there is fastened a trundle of cast iron, about three feet, or two and a half feet diameter, which has thin and broad leaves extending from its centre to the rim which incloses their extremities. These leaves are bent, so as to make an angle of 45° with the horizon, this being the angle by which the water is projected against them; and thus the water falls perpendicular to their surface. The water is conducted down a wooden spout, nearly perpendicular, from an elevation of eighteen or twenty feet; and by striking against the leaves of the trundle, puts it, and the upright shaft fixed in its centre, into very rapid motion. Upon the floor through which the upright shaft rises, there is placed a circular wooden trough, about three or four feet high, and from eight to ten feet in diameter. Within this, four cross bars or levers, strongly fastened to the upright shaft, at right angles to each other, are swung round
by

by the motion of the shaft round its axis. These are every way similar to the scutchers by which lint is dressed. A square aperture through the top of this trough, lined with sheet iron, admits the sheaves to be thrust down by the hand, and the corn is quickly knocked off by the scutchers, which are swung rapidly round. The straw drops down upon a wooden hack, or brander, in the bottom of the trough, where it is tossed round by a wooden lever, provided with a few iron spikes, until it drops the corn; and then it is thrown out at an oblique opening in the side of the trough. What passes through the brander, descends by an inclined plane, upon a riddling machine, which throws aside chips of straw, and coarse chaff. It then passes through the fanners, which are moved by the machinery; and being riddled and passed through the fanners a second time, the grain is ready for the market.

One disadvantage of this machine is, that the sheaf is not struck with the same force at all points, as happens with Mr Meikle's horizontal knockers. For the velocity at different points of the scutchers, being as the squares of their distances from the centre of motion, it is evident that the outside of the sheaf will be more forcibly struck, than the parts nearer the centre. Another disadvantage is, that they have not yet contrived to make the machine feed itself; and feeding with the hand is subject to inequalities, sometimes the machine having too much, and sometimes too little. It seems, however, to answer well for threshing oats and barley; but is not so well adapted for wheat. Perhaps this might be remedied, were a method found of making the machine feed itself. The whole expence of the machinery in this instrument does not exceed L. 20; but there must be a house built for it,
at

BOOK VII.

INCLOSURES.

ABOUT eighty years ago, few fields in this county were inclosed, excepting some in the vicinity of gentlemen's seats. In the year 1730, some proprietors in the eastern parts of the county, first began inclosing with ditch and hedge, to which they superadded hedge-row trees. As might have been expected, these never became sufficient fences; and earthen mounds, on the tops of which were sown the seeds of whins or furze, were next adopted. When furze attains a certain age, it becomes open, or is smothered by deep snows, and ceases to be a fence. I have known some persons clip a hedge of this sort with hedge-sheers, which causes it to grow very close, and to exhibit flattering prospects of its becoming a lasting fence. The clippings are an ample compensation for the labour; for being bruised, they are excellent food for horses and cows, during winter. Whether or not this experi-
ment

ment has been tried in this county, is more than I know ; but I have hardly seen any of these fences that are sufficient. The next sort of fences that was had recourse to, was stone-walls, which are now the most prevalent in all parts of the county.

Thorn hedges afford both ornament and shelter, and they have seldom failed in this county, except where they were not properly weeded and defended while young, or where they were smothered by hedge-row trees. The ash is the species of tree which has been most generally planted in hedge-rows, under whose shade no other plant is known to thrive. Even when planted along the sides of stone fences, which it frequently is, in double rows, the swelling of its roots, which pass below the fences, operates like so many wedges, in pushing the dike from its base ; so that a bend in the wall can be seen opposite to each tree, and the dike at last falls down. The roots of this tree ramify to a great extent in arable land ; often interrupt the plough ; and do more injury to the crops than the value of the trees will ever repay. Hedge-row trees were first adopted here, in imitation of those in England ; but I never saw a good fence in that country, where such trees were planted. Trees should always be planted in large masses, on spots which are inconvenient for aration, where they may break the force of the most pernicious winds, and where they may prove most ornamental to the country.

Thorn hedges are generally planted on the side of a mound of earth, which is thrown from a ditch three feet wide at top, and three feet deep. On the top of the mound, a paling is stuck, to defend the hedge while young. Sometimes the mound of earth is faced with a stone-wall, and the hedge planted on the top. At Glamis ; and some other places, there are fences of this sort,
where

where the thorns are stuck into square holes in the face of the stone-wall by which the mound is defended. These need no weeding, but the thorns are apt to be open below, and the fence depends more upon the sufficiency of the facing of stone, than of the plants. At Glamis, too, and some other places, thorn fences are managed with great skill during the rearing. In particular, they are always clipped and pruned so as to make them taper towards the top, or rise in the form of a wedge, with its edge uppermost. This is agreeable to the order of nature, as all trees affect a conical shape; and if a hedge be made broad at top, or the upper branches allowed to extend too far, it always becomes open below, and soon ceases to be a fence. The expence of these fences is every way the same with that of similar fences in other counties, and need not be repeated here.

As this county abounds with sandstone, which is well adapted for various sorts of building, so by far the greatest proportion of fences are stone-dikes. Of these the species of dike that most commonly prevails, is about two feet two inches broad at bottom, and one foot ten inches at top. The wall being raised to the height of four feet, is covered and made level with flat stones, projecting two or three inches on each side. On the top of this, flag-stones are placed on edge, to the height of about a foot, making the whole height of the dike five feet. The flag-stone coping is placed so close, that it resembles an arch, and the projecting angles of the stones scare any beast that attempts to leap over it. The expence of this fence varies according to the ease or difficulty of quarrying the stones; the distance and quality of the road by which they are to be conveyed, and other circumstances. As such fences are generally executed by contract, the high or low demand for this and similar kinds of labour,
also

also affects the price at which they will be undertaken. The expence of ditches depends much on the hardness or softness of the ground.

The gates in most frequent use for inclosures in this county, consist of three or four spars of wood, inserted in upright posts of sandstone. In one of these posts, or pillars, there are holes, into which the ends of the bars are inserted; and in the other, there are horizontal grooves, along which the other ends of the bars are pushed, until they drop into perpendicular notches, corresponding to the holes in the opposite pillar. To prevent cattle from rubbing out these bars, there are commonly boles bored in the stone, above the perpendicular notches, into which wooden pins being inserted, prevent the bars from being moved from their place. The gates conducting to gentlemens houses are of various kinds; but they generally move on two centres, and open alike both ways. Some of these are of painted cast iron, moving by rollers on semicircular bars of iron; and it sometimes happens, that the gates and porter's lodges, are more superb than the house to which they conduct.

The size of inclosures varies with the extent of the farm. Though in dividing fields, they are generally attentive to have water for cattle in each inclosure, yet in running the lines of hedge and ditch, care is not always taken to place them so as to answer the purpose of drains for swampy land, or to turn aside water which descends from higher grounds. Nor is sufficient attention paid to the quality of the soil; wet and dry clay and chingly soils being often included in one field. In many cases, at the bottom of hills, the fence is made to take a sweep, so as to join in the same field a part of the hill soil, with level ground, of a very different quality, extending from the bottom of the hill.

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In many cases, where long leases were granted, inclosures have been made at the expence of the tenant; this being one of the conditions of the lease. In other cases they are executed by the landlord, and the tenant pays interest for the money advanced upon them. In many other cases, the tenant is at all the expence of inclosures, and he receives their value, according to the appretiation of persons mutually chosen, at the end of his lease. I conceive this to be the worst way of any, as it absorbs and renders inactive, the capital of the tenant, which should operate solely on the melioration of the soil, while it also diverts his attention from his proper business. In many cases, the cleaning and defending your hedges is left entirely to the tenants, by whom they are too frequently neglected. In other cases, they are taken care of by a person appointed for the purpose, at the mutual expence of landlord and tenant.

BOOK VIII.

SECT. I.**TILLAGE.**

In remote times, the lower parts of the county, were, to a considerable extent, marshy, or covered with impenetrable forests. The higher grounds, chiefly, were susceptible of cultivation. On the declivities of the Grampians, to a considerable height, there are still marks of ridges, now covered with heath, or a thin stratum of moss, on a subsoil of clay or gravel. But these have been long neglected; and the lower districts, composed of a better soil, have been subjected to tillage. The Strathmore and the maritime districts, are almost entirely under cultivation; the Grampian and Seedlay districts are but partially cultivated; and indeed there are extensive tracts in these districts which are so elevated, so rocky, or so much encumbered with stones, as not to admit of tillage.

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About

About fifty or sixty years ago, the arable lands were divided into *infield* and *outfield*. On a farm of a hundred acres, or more, the usual proportion of infield was from twenty to twenty-five acres; which received all the manure that was gathered upon the farm, and was constantly under corn. In the year of dunging it was sown with bear, and afterwards carried oats, during two, or sometimes three successive years. The outfield, after being pastured five or six years, was made to carry oats three years, and was then left to recover grass of itself. The produce was reckoned a good crop, if it amounted to three returns of the seed. Now there is no distinction between infield and outfield, a whole farm being treated in the same manner, and subjected to a rotation in which are included turnips, or potatoes, and sown grass. Since this improved system became general, the produce of arable land in the county has been greatly increased.

We have already observed, that the ploughmen here are very expert; and that the species of plough which is almost universally used, is drawn by two horses, and managed by one man, without a driver. Excepting a few small farms, which are possessed runrig, or intermixed, the ridges are all straight, and from about eighteen to twenty feet in breadth. In dry soils, the ridges are alternately split from crown to furrow, so that what was the middle of the ridge one year, becomes the water course the year following. In damp or adhesive soils the ridges are raised higher in the middle by repeated gatherings, and are afterwards kept in that form by a mode of tillage which is here called *casting*. In performing this, the ridges are ploughed in pairs; beginning the tilling in the division-furrow between the two ridges, one season, which is called *casting inward*.

but still keeping this division-furrow open. In the following year the operation is reversed, by beginning the tilling on the outsides of the pair of ridges, which is called *casting outwards*. Great attention is paid to lay the ridges so as to discharge the water which falls upon them; and if there be hollows where water would stagnate, it is drawn off by a lateral furrow, or by a drain made with the spade.

It is thought that ridges of from eighteen to twenty feet in breadth, are best adapted for turning the horses in ploughing; that they are most proper for two casts of the sower; for three harrows in seed-time, and four reapers in harvest. Turnips, potatoes, coleworts, cabbages, and all cleaning crops, are planted in drills, which are formed by the plough throwing up a furrow on one side of a stripe which remains unstirred, and then closing it with a furrow thrown up on the opposite side. These drills are always perfectly straight; and vary in breadth, from about eighteen inches, to two, and sometimes three feet, according to the nature of the crop and fertility of the soil. Persons from this country are astonished, when, in some districts of England, they see three, four, and sometimes six, powerful horses, with two men, employed in tilling land, which might be more neatly executed by one man and two horses; and they cannot conceive what inducements there can be for sowing turnips broadcast, after being accustomed to see much heavier crops, and the land better cleaned, by sowing them in drills. A ploughman and pair of horses will till about an English acre a-day, at two yokings, of four hours each. On friable soils, and in the after operations upon fallows, they will do more, and turn over sometimes more than a Scotch acre in a day.

A practice prevails very generally here, of ribbing land which is intended for barley, drilled crops, and sometimes for naked fallow next season, before the winter sets in. This is done by throwing every alternate fur-slice upon another, which remains unstirred. The direction of these ribs is generally across the ridges; and after they are executed, the water furrows are cleaned out, so as to prevent any water from stagnating. It is thought that this practice prevents the land from being soaked with water during winter; that it admits the frost to the bottom of the soil, so as to effect its pulverisation; and that it kills the weeds by exposing their roots to be nipped by the frost. Some, however, are of opinion that it rather tends to multiply than to destroy root weeds; and that it should not be attempted on land infected with these weeds. We do not pretend to decide this point; but are inclined to think that a practice so general must be attended with beneficial consequences, or it would not be persevered in.

SECT. II.

FALLOWING.

MUCH controversy has taken place among rural economists, concerning the expediency of naked fallows, or of fallows without a crop. One party strenuously asserts, that such fallows are unnecessary on any kinds of soil, or in any circumstances whatever; while they are attended with great expence, and the loss of a crop. The other

other party appeals to experience as decisive of the question, and asserts, that on all farms where fallows are most frequent, and most completely executed, by far the greatest quantity, and the best quality of produce, are obtained during the course of a rotation, or during the same period of years.—We admit, that in porous friable soils, in whose composition sand predominates, it is not necessary to repeat naked fallow so often as in tenacious soils, where clay predominates. In general, such soils can be kept sufficiently clean by turnips and other drilled crops, provided sufficient care be taken to extract the creeping roots of grasses, and other weeds, by break harrows, before the turnips be sown. But even for such soils, a naked fallow seems absolutely necessary at first, to put them into a cultivable state, and thoroughly to clear out all the root-weeds with which they are infested. It does not seem necessary to repeat this species of fallow so often as on soils of an opposite description; yet it should be repeated as often as a drilled green crop fallow appears insufficient to accomplish the object of making the land perfectly clean. It is very true, that pulverising the soil, and the other objects of fallow, about to be stated, are not necessary on soils of this description; as such soils are generally improved by being consolidated by poaching during winter.

The ends of fallow, are, 1. To destroy root-weeds. This object is accomplished in two ways. Either the first ploughing is made very deep, so as to raise the furrows on edge, but not turn them over; or the second, or cross ploughing, is made broad, so as to throw the soil into large masses, exposed to the heat and drought. In either case, the land being left in this state a considerable time in spring, and beginning of summer, the roots of weeds are parched, and their vegetation destroyed. In

the Lothians, the second, or cross ploughing, is chiefly depended on, for the destruction of root-weeds; and they are careful to have it performed so as to leave the land in as irregular a state as possible, so that the large clods into which it is formed, may have their moisture completely exhaled by the sun and air. In this county, the same effect is produced by the cross ribbing of the land intended for naked fallow, before winter. In spring, the land being ploughed in the direction of the ridges, and across the ribs, throws the soil into large irregular lumps, which can draw little moisture from the earth below, and are exposed, so as to be completely dried by the heat and drought of the atmosphere.

The second design of fallow is to pulverize the soil, and render it penetrable by the roots of plants, in quest of their food. With regard to the soils already discussed, we have already stated that they need compression, and consolidation, rather than pulverizing. But with regard to stiff, tenacious, clay soils, there can be no doubt but exposing them to the air and weather, has a much greater effect in reducing their tenacity, and rendering them permeable by moisture, and by the roots of plants than all the mechanical means for pulverizing such soils that can be employed. This is clearly ascertained by experience; and here I may venture to introduce a maxim of my late worthy cousin, farmer at Corstonphine, near Edinburgh,—That in the management of fallows, on strong clay soils, whatever pulverization the soil might have endured, in the previous processes, he always contrived that the last ploughing on which wheat was sown, should leave the land in broken lumps, about the size of hens eggs, or exceeding those of geese.—Tenacious soils, in this state, allowed more freedom for the roots of plants to push in quest of nourishment, than
wh

when the soil was reduced to powder. In the latter state, it always became a hard pavement, with numerous cracks, after the drought of spring had advanced; in which the roots could not push, and the stems of the plants could not expand, being inclosed as if in solid rock. On sandy, friable soils, this design of fallow is inapplicable, as they are already in a sufficient state of pulverization.

A third design of fallow is to destroy what are commonly called *annual weeds*, or those which grow from seeds abounding in the soil. This object is generally accomplished after the root-weeds are destroyed, in the manner described. To accomplish this, the soil must be reduced to a highly pulverized state. As the object is to bring as many as possible of the seeds existing in the soil, within the sphere of vegetation, harrowing and ploughing down the weeds which have actually sprung, brings a new quantity of their seeds to that depth, or position in the soil, which is most favourable to their germination. Thus this object of fallow consists in causing, if possible, all the seeds contained in the soil, to germinate, and sprout; while the plants that spring from them are ploughed down, and destroyed, before they have formed new seeds, to continue, or to multiply their race.

A fourth design of fallow, and perhaps the most important of any, is to renew the putrefactive fermentation of animal and vegetable substances in the soil, by exposing them to the influences of the sun and air. It is well known that peat moss, wood, charcoal, and other carbonaceous matters, if they be sunk deep in the earth, or if they be covered with water which remains upon, and pervades them, unchanged, remain for ages without any sensible decomposition. But if such substances be frequently

quently stirred, and exposed to the air and weather, they are soon resolved into carbonic acid, hydro-carbonate, and other aërial fluids, which Chemists seem now agree on, that, next to water, constitute the chief food of plants. Thus, by fallow, the quiescent energies of the soil are roused into action; and while weeds are destroyed, an additional supply of food is provided, in the soil itself, for the plants which are substituted in their place. I am aware, that some may cry out,—*Theory!*—*speculation!*—But I shall only appeal again to my worthy cousin, already referred to, who was a man of no theory, but was a man of great experience, acquired by accurate observation. He often assured me, that he had frequently known land which had been so far exhausted by severe cropping, as hardly to repay the seed and labour; and yet, by a fallow, had its fertility much more restored, than could have been accomplished by manure of any kind, at the rate of from L. 4 to L. 5 per acre. In these cases, fallow was the only manure applied; and the fact can only be accounted for, by its bringing into action the remains of animal and vegetable matters, previously existing in the soil, on which the putrefactive process had ceased to operate. To accomplish this design of fallow, the more surface there is exposed to the air the better. For this purpose, I have known drilled fallows attended with good effects. In this county, after the other objects of fallow are accomplished, it is not an unfrequent practice to throw the land into drills, in which state it is allowed to remain until it is ridged, to receive the seed. This not only exposes more surface to the air; but it keeps the land dry, and it meliorates the subsoil, by exposing it to the action of the atmosphere.

A fifth design, or rather an effect of fallow, is to convert the weeds which previously infested the soil, into manure

manure for future crops. The simple destruction of these weeds increases the fertility, as it removes rivals which would otherwise absorb the nourishment which should be reserved for the crops. But if the weeds be killed, they soon rot in the soil, and furnish, from their substance, materials for the nourishment of crops. This is in conformity to the general law of nature, that living plants are nourished from the decomposition of dead animal and vegetable substances. It is well known, that if pease, beans, clover, buckwheat, and other plants, be sown on sterile soils, and the plants be ploughed down at a certain stage of their growth, they increase the fertility of the land. The same effect must arise from the ploughing down of seed-weeds, and from killing those which grow from roots, and thus causing them to rot in the soil. Here it may appear, that part of the fertility produced by fallow, may be owing to this cause, as well as to the exciting a new fermentation in the inert animal and vegetable matter, which previously existed in the soil.

In this county naked fallowing is practised on all lands where wheat is cultivated, and it is always adopted as a preparation for the wheat crop. In many cases this fallow is employed while they are draining, levelling, and clearing the land of stones; or with a view to reduce waste land to a high state of tilth, where no wheat is sown. In ordinary cases the land to be fallowed is either ribbed, or receives a close ploughing, about the end of October, or beginning of November. As early in spring as it can be overtaken, it is cross-ploughed, and thrown into large irregular lumps, and in this state it is allowed to remain until the drought has withered and killed the roots of grass and other weeds. These clods are then reduced by break-harrows, and the roots of weeds, being gathered

gathered into heaps, are sometimes burnt upon the surface; though the most advisable method seems to be, to mix them with dung, and thus rot them into manure. The land now begins to throw up the weeds which spring from seeds, which are alternately ploughed and harrowed down, until no more of them make their appearance. Thus these fallows generally undergo five, and sometimes more ploughings, with intermediate harrowings, before they receive the seed in the month of September. Among the Grampians, and other districts where wheat is not generally cultivated, the only cleaning the land receives is from a crop of potatoes or turnips, which are always sown in drills. Sometimes also, pease are sown as a meliorating crop, which though their grain should not arrive at maturity, are always valued for their straw.

SECT. III.

ROTATION OF CROPS.

A proper rotation of crops has been found by experience to be necessary, not only to keep up, but to increase the fertility of the earth, and to cause it to yield the greatest possible value of produce during a period of years. With this view farmers distinguish crops into the *meliorating*, and the *exhausting*, or *sourging* crops. Among the first are included the leguminous, and large rooted crops, together with clover and grass, and are commonly known by the name of green crops. The last include flax, hemp, and every species of grain that is raised

raised for food, and they are commonly distinguished by the name of white crops. It has been found by experience, that the most perfect rotation is that where two white crops never come in succession; but where a green crop, or naked fallow, are interposed between every two crops of corn.

The causes of this order of nature have not yet been fully investigated; yet we may be allowed to state a few of the observations which have been made by chemists, botanists, and by physiologists, concerning it. There seems to be no ground for the old conjecture, that each species of plant has a peculiar nourishment, already prepared and concocted in the soil, which it absorbs, while it rejects the food which is peculiar to other species of plants. That the food of plants is prepared and concocted in the soil, in a way similar to the digestion of food in the stomach, previous to its being absorbed into the animal system, seems certain. But it seems equally certain, that the food of plants, as it exists in the soil, is the same to all; and that plants derive their peculiar properties from the elaboration which this food undergoes in their respective organs. It has been observed, that some plants extend their roots, and collect their food near the surface, while others penetrate to a great depth. Thus, by varying the species of plants, all the vegetable nourishment contained in different parts of the soil, may be absorbed in succession; while by repeating the same species, only the part to which its roots extend, can be extracted. It has also been observed, that the deep-rooted plants split and agitate the soil, and thus render it more permeable by moisture, and by the more delicate roots of corn plants, in quest of their food. This is singularly the case with a crop of beans, upon a tenacious clay soil. The succulent broad leaved-plants, such as clover,

clover, &c. are thought to derive the greatest part of their nourishment from the air; and have even been found to discharge a mucilaginous sort of juice, from their roots, into the soil, which is thought to be a good food for corn plants. Green crops, being always planted in drills, and well cleaned, must add to the fertility of the soil, in the same way as was stated respecting clovers. Further, these crops being consumed by cattle on occasion a much greater accumulation of putrescent matter, than could be obtained by supporting the grass for cattle on dry provender. We have ranked the green crops among the green, or enriching crops; and when laid down and thrown down into pasture, it is perpetually enriched by the droppings of the cattle which graze upon it; by being covered with a close matting of herbage, which prevents the exhalation of its vegetable food; and by the increase it receives from the rotting of the decayed leaves of plants upon its surface. The two last effects are accelerated by light stocking, so as to keep the herbage rough, and in good bite; which is also most beneficial to the animals that are pastured. On some species of soil the part of the effect of pasture, in increasing fertility, may be ascribed to the consolidation which a soil too porous undergoes, when treated in this manner. Except in some, however, soils of a very peculiar quality, there are limits beyond which pasture will not increase, but will rather diminish, the fertility of land. Damp soils, with a retentive bottom, soon begin to throw up sphagnum moss, lungwort, and other moss plants. Those which have not a sufficient proportion of calcareous matter in their composition, are apt to revert to their original wild state, and to throw up heath (*erica vulgaris*.) There are a great variety of soils in this county, which, if continued long in pasture, throw up broom, furze, and other shrubs.

All these plants rob, instead of increasing, the fertility of the soil ; and such soils ought to be subjected to the plough, before the evil has become inveterate ; or they will become as sterile in pasture, as they were before they were reduced from a state of nature.

We have already stated the sort of rotation which has been found, upon the whole, to be most beneficial. But it is evident that this must be varied according to the quality of the soil ; as a rotation which may be very beneficial on one kind of soil, may be wholly inapplicable to one of an opposite quality. The rotation must also be varied according to the elevation above the level of the sea ; according to the exposure ; and according to the object which the farmer has chiefly in view. It is evident that a farmer, whose principal object is the rearing of sheep and cattle, must adopt a different rotation on his arable lands, from him whose principal object is the production of corn. Rotations must also vary according to the quantity of fossil and putrescent manures which can be obtained ; and according to the distance or vicinity to a town. They must also vary according to the seasons ; some rotations being easily practicable in one season, which are physically impossible in another.

All the circumstances we have enumerated are exceedingly diversified in this county ; and from these we may see the consummate folly of those landlords, who tied down their tenants to a particular rotation, which they are not allowed to depart from, on any account whatever. We have already stated our strong disapprobation of all restrictions upon tenants, as far as respects their mode of cropping, except such as are meant to operate towards the conclusion of the lease. Many of the leases in this county are upwards of fifty years standing. The rotations then prescribed may have been the best that were known

at

at the time; but in every case where they have been enforced, the farmers continue to struggle with poverty and the style of cultivation has not much advanced beyond what it was at the first commencement of improvements in this country. Such restrictions debar a man from profiting by his own experience; and from adopting the beneficial improvements, whose good effects have been verified by his neighbours around him. As formerly hinted, a man will always be disposed to execute in a very careless, and slovenly manner, a prescribed task which he is convinced will prove less beneficial to him than the task which is of his own choice. His bodily service may be granted; but there is wanting that soul that animated energy, which stimulate the exertions necessary to surmount every obstacle that may stand in the way of success. A great proportion of the landlords in this county, are so much convinced of this, that they think the rotations which themselves or predecessors prescribed, from an erroneous opinion that agriculture has then obtained its acmè of perfection, *more honoured in breach than in the observance*. A good many years ago gentlemen were appointed annually to perambulate an extensive estate in this county, where the tenants were strictly tied down to one rotation, without any regard to the circumstances which should induce a variation. The object of this perambulation, was, that new rotations, or variations should be prescribed, which, in the opinion of the gentlemen, might be more beneficial, than those prescribed in the leases. But the tenants would not swallow the prescriptions of these land doctors; and the result was, that they were left to the freedom of their own wills. Accordingly, they soon adopted rotations, much more advantageous to themselves, and incomparably more beneficial

times five years. In some cases three successive crops of oats are taken, after the first breaking from ley.

On stronger soils, there are,

1. Oats, at breaking up.
2. Naked fallow.
3. Wheat, with compost of marl, dung, and earth.
4. Barley, or oats.
5. A green crop, with dung.
6. Barley, with grass seeds.
7. Hay.

After which the land is pastured two, three, and sometimes four years.

In other cases, there is,

1. Wheat, at breaking from ley, or after hay.
2. A green crop, with manure.
3. Barley, or oats.
4. Naked fallow.
5. Wheat, with grass-seeds, manured.
6. Hay. The hay-stubble ploughed down for wheat, or the land pastured two, three, or four years.

In other cases, there is,

1. Oats.
2. A green crop, with manure.
3. Barley, or oats.
4. Lint.
5. Wheat, with manure, and grass-seeds.
6. Hay. After which pasture for one or more years.

Another rotation is,

1. Lint, at breaking from old ley.
2. Wheat, with or without manure.
3. Green crop.
4. Oats, or barley.
5. Naked fallow.
6. Wheat, with manure, and grass-seeds.
7. Hay.

Then pasture for one or more years.

Another rotation is,

1. Oats.
2. Naked fallow.
3. Wheat, with manure.
4. Pease, with a mixture of beans.
5. Barley, or oats.
6. A green crop, with manure.
7. Barley, or oats, with grass-seeds.
8. Hay. Afterwards pasture for one or more

Another rotation is,

1. Oats.
2. Oats.
3. A green crop, with manure.
4. Barley.
5. Naked fallow.
6. Wheat, with manure, and grass-seeds.
7. Hay. Afterwards pasture, as before.

In many cases, a part of the field which is under fallow, is planted with potatoes, which are well

hood, and wheat is sown after the potatoes are removed. In this climate, however, it seldom happens that potatoes can be removed in sufficient time for sowing wheat.

On a farm of 400 Scotch acres, in the Seedlay District, where no putrescent manure can be got, except what is collected on the premises, and where imported lime must be carted upwards of six miles, the following rotation is generally observed. Part of the soil is dry turnip land, and part has a wet retentive subsoil.

On the dry land,

1. Oats, at breaking up.
2. Part naked fallow, part turnips.
3. Wheat on the fallow, and oats, on the turnip division, with grass-seeds.
4. Hay.
- 5, 6, 7. Pasture.

On the wet-bottomed land,

1. Oats, from ley.
2. Fallow.
3. Wheat, where the surface is clay; where mossy, oats, with grass-seeds.
4. Hay.
- 5, 6. Pasture.

In the maritime district the soils are more various than in the interior; and on the clay soils the farmers generally introduce a crop of drilled beans, horse-hoe, as a part of their rotation. This is particularly the case on all the soils which we have distinguished by the name of *Carse Clay*. It may also be observed, that since barley became

became unsaleable, in consequence of the prohibition of distillation from grain, the farmers have generally aimed at taking wheat in that part of the rotation where they were wont to take barley. This is especially the case with farmers near the coast towns, who having a much greater command of manure than falls to the lot of their brethren in the interior, are enabled to introduce a greater proportion of exhausting crops into their rotations.

In the vicinity of Dundee, the following rotation chiefly prevail. At breaking up,

1. Oats.
2. Fallow.
3. Wheat, with manure.
4. Turnip and potatoes; or, where the soil is clay drilled beans.
5. Barley, with grass-seeds.
6. Grass, cut green for cattle, or made into hay.
7. Pasture.

It may be observed, that since barley became less valuable, it has become common to repeat wheat, after the potatoes, and drilled beans as the fifth crop in the rotation, with or without additional manure, according to circumstances.

Another rotation is,

1. Wheat, after grass.
2. Potatoes, turnips, or drilled beans; or vetches, peas and beans broad-cast; or cabbages, and coleworts.
3. Oats, or barley.
4. Fallow.
5. Whea

5. **W**heat, with grass-seeds.
6. **G**rass, cut green, or hay.

Another rotation is,

1. **F**allow.
2. **W**heat, with all the manure.
3. **P**otatoes and turnip, horse-hoed.
4. **B**arley.
5. **O**ats, with grass seeds.
6. **G**rass, cut and sold green.
7. **G**rass made into hay.

On the carse clay soils near the Bason of Montrose, and other tenacious soils in that neighbourhood, the following rotations are adopted :

1. **F**allow.
2. **W**heat, the field being limed at the rate of 50 bolls of shells to the acre, and well dunged.
3. **D**rilled beans; or pease and beans broadcast, and often a part vetches: sometimes part cabbages and coleworts, horse-hoed.
4. **B**arley.
5. **O**ats; when they return again to fallow.

In other cases there is,

1. **C**lover, cut green, or made into hay.
2. **W**heat.
3. **D**rilled beans, with part cabbages and coleworts; or part vetches, or broadcast pease and beans.
4. **B**arley, or oats.
5. **F**allow.
6. **W**heat well manured, with grass and clover seeds.

The treatment of the more sandy and friable soils, in the maritime district, varies, at least in respect to the time they are allowed to remain in pasture, according to their distance from towns, where more manure can be obtained than is raised upon the farm. But it may be observed, that near towns turnips and potatoes are valuable crops; and that wheat is generally sown after potatoes, at low elevations above the level of the sea. In other respects, the treatment of such soils does not differ much from those of a similar quality in the interior.

On light sandy soils near towns, the following rotation has begun to prevail :

1. Oats.
2. Part fallow, part potatoes, part turnips.
3. On the fallow and potatoes, wheat; on the turnips, barley; both with grass-seeds.
4. Grass cut green, or hay.
5. Sometimes pasture; but generally return again to oats.

We have thus stated, the information we have been able to obtain, concerning the prevailing rotations in the county, (and we are conscious of its deficiency), without meaning to express approbation, or disapprobation, concerning them. We have only hinted an opinion, which we believe to be founded on sufficient evidence, that those rotations are the most perfect, which have a naked fallow, or green crop, interposed between every two white crops. But it may be seen, that the farmers here vary their rotations according to the quality of the soil, and its local position. They are sometimes compelled to vary them according to the season. Thus, the spring may be unfavourable, and the farmer may not be able

able to get all his seed into the ground in sufficient time. He is therefore forced to reserve a field, out of its regular course, either for a green crop, or naked fallow. Sometimes turnips do not spring, or do not thrive, and are ploughed down as a preparation for wheat. In very wet autumns wheat cannot be sown, and the land is reserved for a spring crop. Sometimes the farmer's manure proves insufficient to go over the whole of the ground prepared for turnips, or fallowed for wheat, and he is obliged to reserve a part for some other crop.— These hints, and many others that might be adduced, may serve to illustrate the absurdity of tying down the farmers to one uniform system, even granting that to be the best possible, which seldom or never is the case. Accordingly, a worthy friend of mine, who is at the head of agricultural science in this country, was lately employed to inspect a considerable property in this county, where the tenants were under prosecution for penalties, because they had deviated from the rotations laid down in their leases. He found that the rotations they had adopted, were much better for the property, than those which were prescribed to them. It will be seen that the farmers here, when unshackled by restrictions, aim at what is called convertible husbandry, or alternate white crops, green crops, and pasture, according to their position in respect of manure. This system, according to the perfection with which it is carried into effect, seems calculated to produce the greatest amount of food, both for man, and for brute animals.

SECT. IV.

CROPS COMMONLY CULTIVATED.

Wheat.

WHEN Mr Pennant made his tour through Scotland in 1775, after passing Dundee, he observed, "that the fields of wheat grow scarcer." (Part II. p. 128.) Were he to repeat his tour now, he might perhaps be disposed to join with some old farmers, in thinking that this grain is too frequently repeated on some soils, which are not well adapted for it.

Wheat has been cultivated in this county from time immemorial. It appears that considerable quantities of it were paid to the ancient monastery of Arbroath, in name of rent. The species anciently cultivated, was the awned, or bearded wheat; but this has been long exploded, and the white and red species have been substituted in its place. These are usually known by the names of Essex or English wheats. The white species is universally preferred, as being less liable to rust, and fetching a better price; but the red species, when it escapes disease, usually yields a heavier crop. The spring wheat of which the illustrious Sir Joseph Banks published a description, has been tried by George Dempster, of Durnichen, Esq; and by many other farmers; but, whether owing to the coldness of the climate, or to what other cause, it has not succeeded. This is a bearded wheat, of two rows, very much resembling the two-rowed barley.

A great proportion of the ears were blasted; and what was made into flour, did not rise in fermenting, so as to make agreeable bread. If it had succeeded, it had one recommendation, that it might be sown upon turnip and potato land, in spring, at the usual time of sowing barley, and be ripe as soon as wheat sown before winter; and thus might be substituted in place of barley, in the rotation of crops.

During a very long period, the cultivation of wheat was confined chiefly to the maritime district, and low situations near the sea-coast; and it was thought to be too delicate a plant to thrive in high elevations, and on the soils in the interior parts of the county. But this opinion is now generally exploded; and it is cultivated at all elevations, not exceeding 800 feet from the level of the sea, and on almost every species of soil. In the year 1809, I observed a small field of wheat upon the glebe of the Reverend Mr Inglis, minister of Lochlee, about 1000 feet above the level of the sea; and understood it to be the first wheat that ever had been tried within the Grampians. Although it had been sown after potatoes, which were late in removing from the ground, and this was a very bad season for wheat, it did not appear worse than some other fields at much lower elevations.

Wheat is usually sown, 1st, after summer fallow, the land being well dunged and limed, or manured with compost. About three-fourths of all the wheat in the county are sown in this manner. 2dly, After clover or pasture ley, with one furrow, and dunged, if the land requires it, or this manure can be procured. This practice is more frequent now than it was formerly. 3dly, After drilled beans, a small proportion on clay soils. 4th, After lint, a still smaller proportion, with manure, if it can be procured. 5th, After turnips, a very small proportion,

proportion, sown in February or March. 6th, After potatoes a greater proportion. Some apply fresh dung with the wheat; and some give all the dung to the potatoes, and apply lime or marl with the wheat.

A great proportion of the seed-wheat sown in this county, is brought from the Carse of Gowrie, and a considerable quantity is annually imported from England. In this way, it is thought, that they most effectually cross the soil, climate, and elevation, which is found to be beneficial for all kinds of grain, and for none so much as for wheat. Some kinds of grain seem rather to improve by being transferred from a colder to a warmer climate; but, from any experiments that have been made this does not seem to be the case with wheat, which thrives when transferred from a warmer to a colder, but not from a colder to a warmer climate. The seed universally degenerates in this county, if the same be used successively more than two, or at most three years upon the same farm. If the same seed be too long sown, in spite of all the efforts that can be used, a great proportion of the crop is infected with smut, and is of little value.

Pickling, or steeping of the seed is universally practised, with a view to obviate the disease of smut. This is done by throwing the seed into salt water, and carefully skimming off every thing that floats; or it is sprinkled with urine, and afterwards powdered with quicklime. These operations have the effect of keeping the seed tolerably pure for two, but seldom for three years, without a change from the Carse of Gowrie or from London; of which the latter is far preferable.

An experiment was tried upon some English white seed, sown in autumn 1808, upon the glebe of Dunichen. Since

Since the disease of smut appears to be propagated from the seed in so far as it is found in the ears before they have burst from the *hose* or seed-leaves, and expanded into the open air, it was thought, that could all the smutty grains and particles of smutty dust be extracted from the seed, the crop would be pure. For this purpose, the seed was thrown into a vessel filled with water, well stirred, and what floated skimmed off. Then more water was added and stirred, until it began to come off clear. Perhaps many of the smutty particles might have escaped; and after skimming off the smutty grains, it would have been better to have washed the smutty powder through wire sieves. However this may be, the crop which was reaped 1809 was remarkably pure, and even more so than portions of the same seed which had been pickled and steeped in the ways above described. Only a few smutty ears could be observed in places which had been much trodden by horses and carts in laying on the manure, most of which were selected and carried off by the hand. The crop was chiefly sold for seed, and its produce much approved of by those who bought it.

Mr John Henderson, gardener to the Honourable William Maule at Brechin Castle, has invented a method of cleaning wheat seed of smut, which promises to be very successful. His method is to wash the seed with a ley of soft soap, according to the following recipe:

“Take of soft green soap from fresh oil 1 lb.; warm water 16 pints, (Scotch, we presume, equal to about 32 English quarts). Dissolve the soap in a glazed bason with a small portion of the water; continue stirring it, and add more water as it dissolves, till the whole is a perfect ley; use it about the heat of new milk. Put the wheat into a tub with a drain bottom, like a brewing vat,

vat, and pour over it such a quantity of the liquor as, standing some inches above the grain, will allow the operation of skimming it freely. Stir it every ten minutes, and take off the scum. Keep the tub covered with a blanket. After an hour's steeping, let the ley run off; or if a common tub has been employed, drain by means of sieves. In this manner, forty pints of ley will clear half a boll of wheat."

The author adds, that if the seed appear to be very foul, the same steep should not be used oftener than once; and even when the seed is apparently clean, the same steep should not be used oftener than three, or at most four times.

It may be observed, that the cure of smut in wheat has hitherto been attempted on two principles. Either a caustic substance has been applied, such as the volatile alkali and other salts in urine, and in sea-water; or it has been attempted to wash off all the smutty grains and particles from the seed. Could the latter be completely accomplished, it seems to be both the safest, and most efficacious method, as caustics, if it cannot be sown in sufficient time, are apt to injure the seed, and prevent its growth. As soft soap has a considerable degree of causticity, as well as being a powerful detergent, it may probably combine both of these methods in one. It is possible, that a weaker ley may answer the purpose provided, after it is withdrawn, the seed be well washed with pure water, in sieves; similar to the rinsing of cloth after it has undergone the soap ley.

In Clackmananshire, a method has been adopted of preventing the smut in wheat, by *kiln-drying*. But some who have tried it, think it merely prevents the further increase of smut, without extinguishing what previously existed in the seed. Some experienced farmers think
the

the only effectual remedy is in bringing fresh seed from England each year ; of which, however, the steeping or washing ought not to be neglected. They observe, that English seed is not more expensive than Scotch ; for, though three bushels of English seed, including freight and insurance, should cost as much as four bushels of Scotch, yet three bushels of the former will sow as much land as four of the latter.

The quantity sown is from three firlots to a boll on the Scotch acre. Rich summer fallows, which are early sown, do not require so much seed as clover leys, potato or drilled bean grounds, whose time of sowing is late. Drilled, and dibbled wheat have been tried on a small scale, but have not been persevered in. All wheat, with these trifling exceptions, is sown broadcast.

The fallows, if the weather permit, are generally sown in the month of September, or beginning of October. Clover leys in October, or beginning of November. Drilled bean, and potato lands, as soon as the crop can be removed, and the land prepared. Sometimes the latter are not sown until the middle of November. Wheat is sown on turnip lands, which is a rare case, from November to March.

Wheat receives hardly any culture after it is sown. If thistles, or other large weeds, should spring up, they are pulled out with the hand. If grass seeds be sown among it in spring, they are first harrowed, and afterwards rolled, or sometimes only rolled. I have sometimes known good effects result from harrowing and rolling wheat on strong tenacious clay soils, which had bound and hardened in spring with the drought. But such soils are not very frequent in this county.

The

The time of reaping wheat is from about the middle of August to the end of September. Some of the sown wheats are often not ripe until after the middle of October. The produce from eight to ten bolls the year. Sometimes upwards of fifteen are reaped; but in the best cases not much above four bolls.

The use of wheaten bread is becoming every day more general in this county. Although the lower orders consist chiefly on oat and barley meal, made into pot-cakes, yet even the lowest of them occasionally consume more or less of wheaten bread. In the towns, pot-cakes are seldom seen among persons above the rank of labourers; and they seldom appear at the tables of the gentry. Yet the county produces much more wheat than is consumed within it, and considerable quantities are annually exported to Glasgow and London; and large portions of American, Dantzic, and other foreign wheats are imported, to mix with that which is of native growth. This is more especially the case when the season happens to be unpropitious to wheat, as then the native flour does not swell and ferment properly, without a mixture of that which is of foreign growth. The farmers commonly grind the light grains which are blown from the chaff by the fanners, in the common mills, and make the meal into scones for family use, or dispose of it by sale.

Bear, or Bigg, and Barley.

Bear, or bigg, is here commonly distinguished by the name of *Ghester*, and is the most ancient species which was cultivated in this county. The barley is of late introduction; but has already supplanted the *Chester*

all the maritime district, and in a great proportion of lands which are below a certain elevation.

The Chester has six rows of grains in the ear. I have seen some varieties which had only four, and the ears resembled quadrangular prisms. Its beards, or *awns*, are longer, and adhere more firmly to the grains than those of barley. Its husk also is generally thicker. This grain still occupies the Grampian districts, and places adjacent, and continues to be sown on the higher and more exposed parts of the Seedlay Hills. It ripens earlier, and thrives on soils that are neither so well wrought nor manured, as those occupied by barley.

The barley has only two rows of grains in the ear, and it generally fetches two, three, and sometimes four or five shillings a boll more than the bear. This is a strong inducement to prefer this sort, on all soils that are in good condition. It is commonly sown about a fortnight earlier than the bear. Some have sown parcels of it in autumn, at the time wheat was sown, with apparent success. Others always make it the first of their spring crops which are inserted into the ground. The bear seed is sometimes not finished until the end of May.

The seed of these grains is subjected to no preparation, by steeping, or otherwise, as no disease is known to affect them, except what may arise from the inclemency of the atmosphere. Some import regular changes of barley seed from England. Others content themselves with repeating the seed of both sorts, which has grown on their farms since their first introduction. Although the seeds of both these sorts are not subject to such rapid degeneration, as those of other grains, yet those who annually procure from a third to a fifth of fresh English seed, find the expence compensated by the superior weight and
value

value of their produce. About twelve or fourteen pecks of both sorts are sown upon the Scotch acre.

The preparation for barley and bear, if after another white crop, consists in ribbing the land before winter, to expose the soil, and the root-weeds, to the frost. In spring these ribs are torn in pieces by break-harrows, and the land receives one, sometimes two ploughings, before the seed is sown. In the districts where wheat is unfrequent, and bear is the principal crop, it is often sown after fallow, with all the manure of the farm, except what is appropriated to potatoes and turnips. If sown after the latter crops, which is a very frequent practice, the land is simply ridged. Some farmers have assured me, that they always got a much better crop of barley when they threw the land into ridges occasionally, in proportion as the turnips were removed, than when they allowed the whole turnip field to remain untouched until the time of sowing in spring. With this view, they always remove as many rows of turnips at a time as form a ridge, and then proceed to throw it up. This may be owing to the land being put into a shape to discharge superfluous moisture during winter; and for this purpose, some draw furrows through it with the plough, marking the breadth of the intended ridges.

This crop receives no culture while growing, unless thistles or other large weeds should spring up, which are removed with the hand.

Barley sown before winter, or in the month of March, comes to maturity before, or as soon as wheat, generally from the middle to the end of August. The later sown barley and Chester, is commonly reaped in the month of September. The threshing mills do not humble, or separate the awns from this grain so effectually as the flail,
and

and they are sometimes obliged to beat it with flails, after it has passed the mill.

The produce is various, according to the condition of the soil, the season, and other circumstances. On some low rich grounds, from ten to twelve bolls are frequently returned from the Scotch acre. But on high moorish soils, from four to five bolls are reckoned a good crop. From six to eight bolls per acre, may be reckoned the general average of the county.

Much bear, and some barley, is ground into meal, in the common oat-mills, for the use of the inhabitants. The meal is either made into pottage, or into thin cakes called *scons*. It is reckoned an aperient and wholesome food; but not so strengthening as oat-meal. A boll of bear, which weighs from sixteen to twenty stones, will yield from twenty to thirty pecks of meal, the peck being the sixteenth part of a boll, of eight stones Amsterdam. In many cases, the husk is scraped off the grain, by passing it through the stones once or twice before it is ground into meal, or flour. It is then formed into thin cakes, or scones, which are whiter, and by many are preferred to wheaten bread; and its price is not inferior, owing to the quantity scraped off before it is ground into flour.

Hulled, or pot barley, is very much used by all ranks in the county, for the purpose of making broth, commonly with, but sometimes without vegetables. The ancient way of separating the husk from barley was by beating it, while moistened with water, in a stone trough, with a wooden mallet. Now there are machines for hulling barley in almost every corn-mill. These consist of circular stones, which are rapidly turned on an axle, in a vertical position, within a frame lined with strong
sheet

sheet iron, which is indented by a chissel, with numerous holes, forming asperities on the inside. The frame is moved slowly in the opposite direction of the stone; and the barley being whirled round with great violence, has its husk rubbed off by the asperities of the stone, and of the sheet iron. Considerable quantities of this hulled barley are exported to London, to Leith, and Glasgow.— Barley-broth, with vegetables, is esteemed the most economical, as well as the most wholesome method of using animal food. It is singular, that no such use of barley was known in England, until it was brought there by the Scotch; with whom it has been in immemorial use. I have met with persons in the south, who imagined that hulled barley was a distinct species of grain, peculiar to Scotland.

Considerable quantities of barley are consumed in the breweries of beer and porter, within the county; or are purchased by the brewers at Leith and Edinburgh. Some of it, but chiefly bear, is consumed by whisky stills among the Grampians. It is a pity but some mode could be devised for rendering this trade legal, and productive of revenue to government. Such high duties as are paid in the south, cannot be expected from those who have no other fuel but peats, and who cannot make distillation a regular and constant business. But the greatest proportion of the disposeable barley produce of this county, was purchased by the distillers in the neighbourhood of Edinburgh, and places adjacent. Since these were obliged to operate on sugar, the demand for barley has very much diminished, and the farmers have been induced to reduce the quantity raised. In most cases they have substituted wheat or oats in place of barley; and agriculture is likely to suffer from too frequent a repetition of the same crop. As these distillers use a great proportion

proportion of unmalted grain, they were accustomed to take off the farmer's hands, at a reduced price, barley which had been damaged by a bad harvest. Now, this is wholly unsaleable, as it will not make meal, and is of no use to the brewers.

A new species called *naked barley*, was lately introduced by George Dempster, Esq; and tried upon his own and other farms. It has no husk, which occasions its name, and has two rows in the ear. It does not require above half the time of common barley to ripen. But it was found so difficult to separate from the straw, that it is now given up.

Oats.

This was the first grain that ever was cultivated in Scotland; and in vulgar language, while other grains are distinguished by their specific names, this is still known by the generic name of *corn*. This grain is probably indigenous, as wild oats abound in various parts of this county. It still forms the most prevailing crop, as oatmeal and potatoes constitute the principal vegetable food of the people.

Oats are most commonly sown after grass, or old pasture; and in the latter case, where no regular rotation is observed, they are sometimes repeated two, three, or four times in succession. They are also sown after barley and other crops. Being a very hardy grain, the soil requires less preparation for oats, than for any other crop. But they are very apt to degenerate, unless the seed be frequently changed. Hence the farmers here always endeavour to have a certain proportion of seed-oats annually, from a soil of a different quality, elevation, and exposure than their own. If there be soil of different

qualities on the same farm, the seed raised on one kind of soil is sown on that which is of an opposite quality.

The kinds of oats usually cultivated, are, 1st, The *common oat*. This was formerly cultivated in most parts of the kingdom, and was distinguished in the south country by the name of *Angus oat*, as great quantities of it were sent thither from this county, and even to England, for seed: 2. *Blainsley oat*, is a small grain that yields abundant crops on high and poor ground. This species derived its name from the farm of Blainsley, in the upper part of Tweeddale, where it was first selected from other oats, and brought into cultivation: 3. *Barley oat*, requires a good soil, and ripens early; but is liable to be shaken: 4. *Dutch oat*, is large bodied, with a thick shell; but is easily shaken: 5. *The bearded grey striped oat*, commonly called *black oat*, formerly prevailed over all the county, and is still partially used in some of the Grampian districts. This species requires one half more than any other, to produce the same quantity of meal, of an inferior quality. In many places it grows spontaneously among other corn. When found among other oats, it is distinguished by the name of *sbags*, which the farmers are at pains to blow away with the fanners, that it may not adulterate their grain, and mar its sale: 6. *The potato oat*, in all the more fertile districts, has nearly supplanted every other species of oats. Though it is not many years since these were introduced, they have already begun to degenerate. They are much later in ripening than at first; the grain has become less plump and the husk thicker. They formerly yielded from nine teen to twenty pecks of meal to the boll; but now seldom above seventeen pecks, each peck being the sixteenth part of eight stones.

On richer grounds, about one boll is commonly sown upon a Scotch acre. But poorer soils, which are in bad tilth, generally get two or three pecks more. It is generally thought, that thick sowing is favourable to an abundant crop, and early harvest; because when too much vacancy is left between the seeds, the roots stock or tiller, which retards their progress towards maturity.

The time of sowing is from the first of March to the middle of April; but in unfavourable seasons the seed is sometimes not all inserted until the end of April, or beginning of May.

The usual time of reaping oats is from the end of September to the middle of October. But as this grain is raised on all kinds of soils, from the low fertile vallies, to the high exposed muirlands, on some of the higher grounds oats sometimes remain unreaped in the middle of November.

From the diversities of soils and elevations where this grain is sown, it may be anticipated, that its produce must be exceedingly various. In many cases it does not exceed three bolls the Scotch acre, while in others it exceeds sixteen bolls. The average produce of the county may be from five to six bolls the acre.

Much of the oaten crop is consumed by horses, and considerable quantities are exported from the county. What is made into meal is first kiln-dried, then sheelled, to take off the husks, which are blown away by the fanners. The sheellings, or kernels, are again passed through the millstones, which are now placed so close as to grind them into meal, of the fineness wanted. The meal is passed through fine sieves, to take out the seeds; and is made into pottage, or porridge, which is eaten with milk or beer. This forms the breakfast, and very often the supper, of most of the labouring class. Or the meal

is made into cakes, which being well toasted, are used as bread; forming an invigorating and wholesome food. The seeds which are sifted from the meal, as they have a considerable proportion of meal mixed with them, are put into a bucket with water, where part of the meal soon becomes acid, and dissolves in the water; while the farina, or starch, is disengaged. The sour water is poured off from time to time, and fresh water added. When all the starch is separated, the coarsest of the seeds are squeezed and removed with the hand. The remaining mass is washed through a fine wire sieve, or thin linen cloth, to separate all the seeds that remain. Thus is obtained a white semi-liquid substance, called *raw sowens*. This being put into a pot, and well boiled, the starch dissolves in the hot water, and the whole mass coagulates when it cools, forming an elastic, yellowish-white substance, of the consistence of jelly, called *sowens*. This possesses an agreeable degree of acidity; and being eaten with sweet milk, it forms a very palatable and nourishing food, being both aperient and diuretic. It is most frequently used for supper, even by persons of high rank, especially by invalids.

Rye.

This is a very unfrequent crop in this county, being confined to the sandy downs near Montrose, and in the lower parts of the parishes of Panbride, Barry, and Monifieth. It is generally sown before winter, at the same time with wheat. But as it only occurs in a few detached patches, and is chiefly consumed among those by whom it is cultivated, it makes no figure in the general system of the county as a corn crop.

PULSE CROPS.

Pease.

At one period these were almost the only meliorating crop known in the county. But since the introduction of sown grasses, and drilled green crops, their cultivation has very much diminished. A few patches of them are still sown in the interior and higher districts, chiefly for their straw. In the maritime district, they are often mixed with beans, and sown broad-cast, or a small proportion of them is mixed with the beans which are planted in drills. In the former districts they are a very precarious, and often a scanty crop. As the straw is the principal object, the Hastings pea is preferred, whose straw is more valuable than that of the common late pea.

The time of sowing is from the beginning to the middle of April, when four firlots, wheat measure, are commonly sown upon an acre. About seven bolls are reckoned a very good return; but in unfavourable seasons there is little other return except the straw, which is a nourishing fodder for horses.

Drilled Beans.

These have been tried on some of the friable soils in the interior of the county. But they grew into long straw, and did not form pods of much value. They are chiefly confined to the tenacious clay soils in the maritime district, and to those which we described as carse soils, or similar in quality to these soils. To bring them to perfection, it is necessary the soil should have a considerable proportion of calcareous matter in its composition.

They are commonly sown after oats, or barley, as a preparation for wheat; or after wheat to correct the exhausting effects of this crop. The land is ploughed before winter, and thrown into drills in January or February, or as soon as the season will permit. The drills are made from thirty to thirty-six inches broad from furrow to furrow, that there may be room to horse-hoe the land between them.

As soon as an opportunity occurs, from the end of January to about the middle of March, the beans are sown in the furrows between the drills, and are covered by splitting the ridges. From three to four firlots are sufficient for a Scotch acre. Some prefer a small mixture of pease among the beans, chiefly that they may form bands for tying the crop into sheaves. Others prefer pure beans, and tie them with withes, or with straw ropes.

The sort cultivated is intermediate in size between the hotspur garden bean, and the small horse bean; and is whitish in the colour. The pease can be separated from the beans by passing them through a sieve.

When the beans appear above the surface, they are carefully hand-hoed in the rows. After which the horse-hoe is admitted, and throws the earth from the plants forming a small ridge in the centre, between the rows of plants. When weeds arise in this space, they are cut below by the scarificator, formerly described; and, finally the earth, being cleaned of weeds, is thrown up to the roots of the plants. These operations are repeated until the plants grow so tall, that the horse-hoe cannot work among them; before which they receive the last operation, called *earthing up*.

They are reaped at the same time with other corn, from after the middle of August to the beginning of October. Beans have one advantage, that they can be cut while

while wet, and thus the reapers may have constant employment. They are laid across the drills for six or eight days; which position admits a free circulation of air to dry them. They are then gathered, bound into sheaves, and stooked, after which they never suffer from the heaviest rains. When fully dry, they are carried home, and put into the stack.

The produce varies according to the condition of the soil, and quality of the season. Sometimes not more than five or six bolls are returned from a Scotch acre; in other cases 16 bolls or upwards. But in general, the produce may be stated as varying from about 10 to 15 bolls.

The places where drilled beans are chiefly cultivated, are in the neighbourhood of Dundee, and northward, where there are clay soils, towards Arbroath. Also in the parishes of Fernall, Maryton, Craig, and at Heatherwick, near Montrose. In these districts, a mixture of pease and beans, called *masblem*, is often sown broadcast, though the drilling system is now much more general than formerly.

Part of the beans is retained for seed, and part is used as food for horses, and for fattening swine within the county. The overplus is exported to Leith, or England. The straw, especially when softened by passing through the thrashing-mill, makes excellent food for horses during winter. The pease, being separated from the beans by passing through a sieve, are ground into meal, which makes wholesome bread for the poor, and a species of puddings, which are used by seamen with their salt provisions.

We have just been informed, that a person in Angusshire has invented a method of separating the fibres from bean-stalks, and converting them into a material which answers all the purposes of hemp; and that an acre of
beans

beans yields about 200 stones of this hemp. In the present state of this country, should this project succeed, it must be of incalculable importance.

Tares, or Vetches.

These are chiefly cultivated in the maritime district, especially in the neighbourhood of the sea-port towns. Some feeble attempts have been made to introduce them into the interior parts of the county, which have not been followed by success. A small part of the crop is reserved for seed. The remainder is cut green, and sold for feeding horses and cows in the towns, or used by the farmer's stock. This is a very useful crop for the farmer, as it comes between the first and second cuttings of clover, which seldom can be made to meet. As no more of the seed is allowed to ripen, than is necessary to continue the breed, it ought, perhaps, to have been classed with the green, or meliorating crops. It forms an excellent preparation for wheat, and is generally removed from the ground in sufficient time to allow this crop to be sown.

The seed is brought from England; and it has been remarked, that the quantity of its produce continues to increase during eight or ten years, after which it begins to decline, and new seed becomes necessary. It is sown as early in the spring as the weather will admit; and there is generally a small quantity of rye, or of oats or beans, mixed with the seed, on the stalks of which it may raise itself from the ground. The quantity sown is about a boll to the acre.

I have not heard, whether the winter species of vetch has ever been tried in this county. Perhaps our long and severe winters may prove unfavourable to this crop. It is sown in autumn, and is ready for use between the
failure

failure of turnips and the first cutting of clover. It is generally removed in sufficient time to admit of inserting a crop of turnips, or of following the land for wheat; so that this crop interferes with no other.

There are several species of wild vetches, which grow spontaneously in different parts of the county, some of which are greedily devoured by cattle. It appears worth while to stock a field with some of the most luxuriant and palatable of these, with a view to ascertain their value as green food, or made into hay. As these are perennial plants, the field might either be thrown into permanent pasture; or, receiving an occasional top-dressing, might be cut for hay or for soiling cattle.

HARVESTING.

The greatest part of all the crop here is cut down with the sickle. A few attempts have been made to introduce the English mode of cutting with the scythe. But unless all stones could be removed, and the land freed from all inequalities of surface, this mode is not likely to succeed. Besides, even in the smoothest lands of England, there is more waste of the crop when cut by the scythe, than would compensate the superior expence of the sickle. In some places they let in flocks of geese to eat up this waste, which cannot be procured here. When cut, the corn is set up in stooks, consisting of ten sheaves standing in pairs, and two called hoods, which form a roof, to throw the water off the standing sheaves. But, from the superior length of the straw, wheat generally requires twelve standing sheaves, with two hood sheaves.

The small farmers generally cut down their whole crop, by the assistance of their wives and families. The larger

larger farmers are obliged to hire reapers, who, when gaged for the season, received from L. 3 to L. 3, 1 since men became scarce; and the women from L. 15s. to L. 2, with their victuals. When engaged by day, the men received 2s. and the women 1s. 6d. with victuals.

But the mode which is now most generally adopted and which seems peculiar to this part of the kingdom (at least I never observed it any where else), is that which is known by the name of *threaving*. This is an excellent mode, and is likely to become universal over the kingdom. The farmer pays the reapers what sum they can agree upon for cutting down each threave, consisting of twenty-four sheaves, or twenty-eight sheaves, necessary, for wheat. The price of this varies from 2d. to 6d. and sometimes more each threave, according to the quality of the grain, and according to the number of competitors who offer their services. If the farmer furnish a man to bind and stook the sheaves (and one man is necessary for every six shearers), the price is lower than when this work is performed by reapers themselves. This is sometimes done; but generally, different parts of a field are undertaken by families, or by persons nearly connected, who bind and stook and gather all the ears that may have dropped, on turning to the side where they began to cut down. Hence it is the interest of the reapers to cut as close as possible because they know, that the lower ends of the stalks cut the sheaf better than the upper parts; and also as close as possible, because thereby they make the more sheaves. All that the farmer has to do, is to count the number of the threaves; and he is furnished with an iron fork fastened on the end of a pole, about ten inches wide, which the sheaves must fill at the bands, or they are rejected.

jected as deficient in size. The reapers subsist themselves; and young and old, even mothers who are encumbered with infant children, devote as much of their time to threaving as their strength, or other avocations will admit. Since this mode was adopted, it has been ascertained, that women are, in general, more expert at this kind of work than the men. Many of the former have been known to earn 20s. a-week by threaving, while the men seldom earn above 18s.

As soon as the corn is sufficiently dried, it is conveyed to the stack yard; no more of it being put into the barn than what it may be necessary to thrash for immediate use. All the principal farmers have stone pillars on which their stacks are built. These are placed in the circumference of a circle, from five to eight in number, upon stone pedestals, and have a broad projection at the top, on which to rest a frame of wood. These pillars are from eighteen inches to two feet in height. The frame of wood, which rests upon them, is composed of strong spars, and is of from five to eight sides, according to the intended dimensions of the stack. As an additional security against dampness, there is generally an upright conical and triangular funnel, placed in the centre of this frame, composed of three sticks, bound together by horizontal rungs, or bars. The stacks are built upon this pedestal with great neatness, and are afterwards very neatly thatched with straw or rushes, and the thatch fastened by small straw ropes. The funnel in the centre occasions a draught of air up through the stack, should it begin to heat; but is not always effectual. Often in damp harvests, the farmers are obliged to throw down their stacks, and expose them again to the air.

A man in Renfrewshire prevented the heating of his stacks by means of a pair of bellows, into the nozzle of
which

which was soldered an old gun barrel, with its breach cut off. On observing the commencement of heat, by thrusting in a stick, he introduced the pipe of his bellows into different parts of the stack, and blew air through it until it became perfectly cool and dry. This appears to be a preferable expedient to the damage and loss which are always sustained, by removing heated corn to the field.

The pillars on which these stacks are built, with their broad projections above, effectually exclude all vermin from the stacks; provided no straws, or other means of communication, be left by which they may ascend. Those who are not provided with pillars and frames, have generally circular areas, somewhat elevated above the surface, and paved with flags, or rounded stones gathered from the land, on which to build their stacks. In these cases, the air is admitted into the central funnel, by an opening in the side of the stack. Sometimes this funnel is produced by drawing a sack, filled with straw, up through the center of the stack, while it is building.

In general, it may be observed, that in the Grampian district, and on the higher cultivated districts of the Seedlay Hills, as the operations in spring are often retarded by long continued frost and snow, so the ripening is obstructed by incessant fogs, and harvest never commences so early as in the lower districts. In 1802, harvest did not begin in many parts of the Grampian district until the 3d of October, and was not concluded until the 20th of November. In 1811, owing to long continued and excessive rains, after the equinox, much corn was made to grow in the stook in the lower districts, while what was ripe could not be cut, until it was shaken by an impetuous wind; and harvest was not completed in the higher districts until after the middle of November.

ROOTS AND GREEN CROPS.

Potatoes.

THESE are said to have been first brought from South America, to Cork, in Ireland, by the celebrated Sir Walter Raleigh, about the year 1565. M. Humboldt, in his Travels through Spanish America, found that they were cultivated in Mexico, and other Spanish provinces, on the high Cordilleras, or terraces of the Andes, under the torrid zone, at elevations of from one to three miles above the level of the sea; and that the people there are possessed of several varieties of this root, some of extraordinary size, which have not yet reached Europe. This gentleman accounts for the introduction of wheat, and other European plants, into Mexico, or New Spain; but he declares he never could find potatoes, or any of the plants there cultivated for food, growing in a wild state. It seems probable that potatoes had been introduced into Mexico from countries situated to the north of the torrid zone; but where the frost is not so intense as to destroy them in winter. Some American gentlemen have assured me, they have seen dwarfish potatoes growing in the savannahs of Virginia and Georgia. These grounds are composed of alluvial mud, and are overflowed with water during the rainy season, which is the winter of these countries.

Whether this be well or ill founded, I shall not pretend to decide; but it would seem that the potato, in its original state, is a sort of aquatic plant, which delights in a loose soil, with abundance of moisture.

On

On the Cordilleras of the Andes, they are chiefly planted among soft black mud, which is overflowed during the rainy season, but is dry during summer.

The climate of Ireland is very wet, with much loose friable soil; and this may account for the great progress the cultivation of this root has made in that country. In Ayrshire, which is a very wet country, potatoes attain great perfection on cultivated mosses.

No plant yet discovered, (unless, perhaps, we except the banana, and bread fruit tree of the southern hemisphere,) yields so great a proportion of human sustenance, from the same extent of ground, as the potato. This may account for the rapid increase of population in Ireland, since the potato came to be generally cultivated. In less than a century their population has been more than quadrupled; the principal food of the people being potatoes and milk.

In Scotland, potatoes were first brought into field culture by a farmer near Kilsyth, Stirlingshire. This man made several journies to Ireland to learn the mode practised there, which seems to have been the lazy-bed method; at least this was the mode he adopted upon his farm, and which was afterwards followed by all his imitators. From the appearance of the leaves, learned doctors pronounced his potatoes to be a species of the *deadly nightshade*, and nobody would eat them after they were raised. The man was scouted and laughed at; and died, at an advanced age, in great poverty.

In this county potatoes first began to be tried, as a great curiosity, in gardens, about the year 1745; but a good many years elapsed before it occurred that they might grow in the open field. They are now raised on every farm; and there is hardly a cottager who has got

a small *kail-yard*, but has a part of it planted with potatoes.

Potatoes do not thrive on strong tenacious clay soil, nor on soils, whatever be their quality, which have a retentive bottom. On such soils they are apt to get curly; and even those plants which escape the disease, produce roots which are ill tasted and watery, and do not possess that proportion of farina or starch, the abundance of which constitutes the chief excellence of this root. But this observation must be taken with many exceptions; for I have known the most tenacious clay soils yield abundant crops of excellent potatoes, by the application of lime. In particular, a field of most tenacious clay, near Hamilton, which had been cropped until it hardly returned the seed, was first ploughed in autumn, and limed at the rate of 500 bolls per acre; then cross-ploughed, and before the frost set in, thrown into drills. In spring potatoes were planted without any other manure, and covered by splitting the drills. About 100 bolls per acre were returned, of excellent quality. Wheat followed, and returned from 16 to 17 bolls per acre. It is well known that if lime be placed in immediate contact with the sets of potatoes, the crop is scabbed and of bad quality. But if it be gradually worked into the soil, before it comes to operate on this plant, it proves highly beneficial, especially on such soils as we have been describing. Hence in Renfrewshire, and in many parts of Ayr and Lanarkshires, tradesmen who take plots of potato ground from the farmers, generally spread more than half an inch thickness of powdered lime upon the tops of the drills, after the potatoes are planted; the lime being wrought into, and correcting the acidity of the soil, during the operations for cleaning the crop. In several districts of Fifeshire, this practice

is followed by many farmers, who raise potatoes for sale, on a large scale.

In this county the preparation for potatoes consists in ribbing, or close ploughing the land before winter. In spring it is ploughed once, or twice, as circumstances may permit, or require; with intervening harrowings, and thrown into drills. Towards the end of April, dung is equally spread in the hollows between the drills; the sets, or cuttings, are dropped at the distance of from eight to ten inches from each other, and covered by splitting the drills. Horse-dung answers best, or old compost, especially that which is made from moss, well rotted. The drills are from twenty-five inches to three feet broad; rich ground requiring the broadest drills, that the plants may not be suffocated from want of air. In other cases the dung is equally spread over the surface, and ploughed in; the sets being planted in every third furrow. In some cases, potatoes are planted on land that had been well dunged the year before, which yields the best quality, though not the most abundant crop. They are commonly planted after oats, which succeeded ley. In the lower districts they are usually succeeded by wheat; but at considerable elevations they can seldom be removed from the ground in time to make way for that crop. It has not been found that too early planting is any advantage, but the contrary; and that those potatoes are best in quality, and most abundant, which had been planted after the season had become somewhat genial.

There are several varieties of early potatoes, which are planted in gardens for private use, but are not planted in the field for sale, except in small patches near towns. The sort most generally cultivated in the field, is nearly of a globular shape, with deep eyes, of a dark purple colour, variegated with white spots. It throws

up tall stems, of a reddish purple colour; its leaves of a deep green; its flowers pale purple, inclining to blue.

This species was brought to Ayrshire about twenty years ago, by a vessel from America, which had put into the bay of Fairley, in distress. It was soon adopted by Mr Smith of Swinridgemoore, and planted on his improved mosses. It has since nearly supplanted every other species in the western counties, and has spread, more or less, through almost every district of Scotland. It is most agreeable after being kept until spring; and in Ayrshire, by turning it on a barn floor, and taking off the shoots as they sprout, they contrive to make the old crop meet the new.

Next to the foregoing, the leather-coat is chiefly cultivated. It is of an oval form; has a rough skin, of a yellowish white colour; its stems not so tall as those of the former; its leaves a pale green; its flowers white. It answers best when fresh from the ground; and soon becomes waxy and unfit for use after the heat of summer commences. In very many cases both these sorts are planted promiscuously; which, from the intermixture of their flowers, in progress of time, produces a mongrel breed, not so good as either when kept uncontaminated.

A new sort has lately been brought to the neighbourhood of Forfar, which is fast gaining ground. It is called the *sky-red*. It is a long and large kind, of a smooth white skin, variegated with spots of a faint red colour. Its stems, leaves, and flowers, similar to those of the leather-coat. It is very farinaceous, and agreeable to the taste. I have tried experiments on several other kinds, specimens of which had been brought into the county; but however they may be regarded as curiosities, they did not seem adapted for general culture. Beside those mentioned, several other varieties are cultivated,

vated, as the Kidney, the London Don, the Ox-eye, &c.; but not so extensively as the former; and it is doubtful whether some which pass under other names, may not be the same with the leather-coat.

The quantity planted is about 12 cwt. the Scotch acre; the potatoes having been previously cut with a knife, and at least one eye left in each set. The practice of scooping out the eyes was tried, but did not succeed; as it lacerated the embryo plant, and did not leave sufficient substance to nourish it during infancy. In some cases, the largest potatoes are selected, and are planted whole at the distance of four feet from each other every way, so that the earth can be ploughed, and thrown up to the roots, in both directions. If proper care be taken in earthing them up, this seems to yield potatoes of larger size, and a more bulky crop, on the same extent of ground, than the method of cutting; but they do not so soon arrive at maturity.

The usual time of planting is from the 20th of April, to the beginning of May.

When the plants come above ground, which is commonly in the first week in June, the land is well harrowed. After this they are hand and horse-hoed alternately, until no more weeds appear. Before the rows begin to close, which is commonly in the first week of August, they receive the last operation in being well earthed up; after which they are left to themselves.

After the corn harvest is finished, they are taken up by a three-pronged fork, or by the plough. The land is then well harrowed, to uncover such as may have escaped the first gathering. They are sometimes secured in the corner of the barn, where they are surrounded and covered with straw. Other farmers have a hut, called the potato house, where the crop is laid up. But they

they are usually secured on the driest part of the field where they were grown. A platform is raised, by heaving the earth a few inches above the surface. On this a conical heap of potatoes is placed, containing from three to six bolls; and they are covered with a thick coating of earth, drawn to an apex at the top, and smoothed with the spade. Where there are banks of dry sand, they are sometimes thrown into holes dug in the sand, and covered with turf. Among the Grampians, they have round holes dug into the sides of gravelly banks, which are faced with stone, and the potatoes are thrown down through an aperture at the top.

As this root will not bear the expence of distant carriage, it is most extensively cultivated in the neighbourhood of towns and villages. In places remote from these, no more are raised than what serve the cultivators and their families; the overplus being given to their cattle and pigs.

The quantity produced upon an acre, depends so much upon the quality of the soil, the quantity and quality of the manure, and the care bestowed in cleaning and pulverizing the earth about the roots, as well as upon the season, that it is next to impossible to present any thing like a general average. Potatoes are also here rated by weight, of eight stones to the boll; the stone in some districts, being 16 lb. avoirdupois, in others 20 lb., and in others 24 lb. The nearest approximation that can be made to the truth, is to state the produce to be from seven to ten tons the Scotch acre. In many cases it is much more, in others much less than this amount.

After supplying the inhabitants, considerable quantities of potatoes are occasionally exported, from the maritime district, to London and Leith. A peck of potatoes

tatoes yields about three lb. of starch, of which hardly any is made in this country. Potato starch, mixed with a small proportion of wheaten flour, makes a very white, light, and nourishing bread. It would be a great desideratum to find some method for preserving potatoes so that they might be kept like flour, and sent upon distant voyages. Evaporating their moisture, so as to render them sufficiently dry, would effect this purpose. But if this be attempted by a naked fire, they are liable to be scorified, and their substance changed, or sent off in vapour. I once attempted this by the heat of steam which was blown into a tinned vessel, such as are used in drying cotton yarn and cloth in bleaching. The potatoes were boiled, skinned, and bruised as small as possible. They were then placed on a broad tinned plate, heated by steam below, and frequently stirred and turned. They coalesced into small hard cakes which were not altered by exposure to the severest frost, nor by keeping several years in my possession. Part was reduced to powder in a mortar, and made very palatable puddings and cakes. They might easily be ground in a mill.

The disease called curl is very rare in this country and I never observed it except in a very few cases. It seemed to be owing to a stiff clay, or wet bottom soil.

Yams

or Surinam potatoes, are not so generally cultivated here, as in the Lothians. Some farmers have small patches of them; and they are an excellent resource for their horses and milch cows. They are chiefly given to the latter in spring, after the turnips are exhausted.

and they cause them to yield rich and well-flavoured milk. A few of them are useful in making the horses eat their dry food, and in keeping up their spirits at that laborious season. They are commonly washed clean, and given raw; and should always be given in limited quantity, as horses and cows have been known to eat them until they died. In the Lothians they are commonly boiled in a large iron boiler, built in a furnace, or by means of steam; and are then mixed with chaff upon a clean stone floor, where they are allowed to cool before they are presented to the animals. This converts the chaff to use, and the chaff prevents them from greasing the horses feet.

Two kinds are used here, the white and the red, the white being most prevalent. They are chiefly cultivated in the neighbourhood of towns, and sold to cow-feeders. They yield a much greater bulk per acre than the common potatoes, and thrive on poorer soils.

The late Doctor Walker, Professor of Natural History in the University of Edinburgh, was in the habit, especially during years of scarcity, of using yams in place of bread, in his own family. He cut them into thin slices, and either broiled them on the fire, or dressed them in the frying pan, with as much butter as prevented the pan from burning. When dressed in this way, their taste was very pleasant; and they were used in all cases where bread is commonly used.

Turnips.

These were first introduced into the county about sixty years ago; but they were not cultivated in the fields until more than thirty years afterwards. They are now

so general, that they make a link in the rotation even of the smallest farmers. They thrive well on all soils except tenacious clays, and such as have a retentive bottom.

The land is always ribbed, or close ploughed before winter, that it may be pulverized by the frost. It receives three other ploughings in spring and summer, before the seed is sown; and is well harrowed to extract the root weeds. Sometimes the dung is spread upon the surface, and covered in with the last ploughing, and sometimes it is applied the year before. But the most usual practice is, after the soil is well pulverized and cleaned, the drills are marked out with the double moldboard plough, and dung is thrown into the ruts thus formed from carts which move along. The common plough goes round these ruts, and throws the earth above the dung, forming the land into single bout ridges: or the land is first thrown into drills; the dung spread in the hollows betwixt them, and covered by splitting the drills; this is the most general practice. A long roller succeeds, which compresses and smooths the tops of the drills. After which the seed is sown on the top of the drills, by drill-barrows, some of which sow one, some two, and some four drills at a time; while they form small ruts before the seed, rake it among the earth, and gently compress it by small rollers, on the rear of the machine. At other times the seed is sown from tinned boxes, fastened to the end of sticks, which are managed with the hand, as described under the head of Implements. Excepting small patches in gardens, broadcast turnips never were known in this county; and any person who should attempt them, would excite doubts of his sanity. Even in gardens, they are most frequently sown in drills.

Abou

About 2 lb. of seed is commonly given to a Scotch acre. The kinds cultivated here are the white top, the red top, the green top, and the globe. The first, though it grows to a large size, does not stand the winter well, and should be first consumed. But all of these sorts are often intermixed in the same field; and this will always take place, until the farmers can be induced to raise seed for themselves. The yellow turnip is now coming into use, and many farmers have a part of their field under this species. It is not so large as the others, but stands the winter better, and is highly relished by cattle after the other is exhausted.

The usual time of sowing is from about the tenth to the end of June. When sown too early they are apt to shoot, and when too late they do not arrive at maturity.

When the plants have put on the rough leaf, which is commonly about a fortnight after they are sown, the earth is pared from the rows and thrown into the hollow between the drills, by the small drill plough. The rows are then hand-weeded, and the plants thinned, so as to stand from twelve to fourteen inches asunder in the rows. This process is often too long neglected. After this, the space between the rows is subjected to repeated horse hoeings, with machines formerly described, while the rows themselves are hand-weeded as often as may seem necessary, until the leaves begin to close. They now receive the last operation of earthing up, or rather cleaning out the hollows between the drills by the double moldboard plough. In performing this operation, care is taken not to throw the earth far up on the stems, as is done with potatoes, as this obstructs the swelling of the bulbs.

The

The produce varies according to the circumstances formerly enumerated, but may average from twenty-five to thirty tons upon a Scotch acre. In many cases it is much less, and in others considerably more. They are used chiefly for feeding, and partly for rearing cattle in straw-yards; and in this way may be worth to the farmer from L. 6 to L. 7 per acre, in value added to the stock, beside the dung they accumulate. Part is also given to the milch cows. When sold on the ground, in the neighbourhood of towns, they often bring from L. 15 to L. 20 per acre, and sometimes more. The feeding of sheep upon turnips, by means of nets or hurdles, has not yet been introduced into this county. A few gentlemen feed sheep, kept for their own use, upon turnips scattered on the grass.

Ruta-Baga, or Swedish Turnip.

These are beginning to be more extensively cultivated than formerly; but cultivators have been so often annoyed with bad seed, that it has helped to retard their progress. This plant being nearly allied to coleworts and cabbages, if its seed be raised in nurseries contiguous to the others, their pollen or seminal matter, impregnates the flowers of the ruta-baga, and the plant forms a stem, but no bulb. To obviate this, I selected two of the largest and best bulbs I could find, and raised seed from them in a situation remote from the flowers of any other congenial plant. But the seed not being yet sown, the result cannot be known.

The ruta-baga stands the winter much better than any other turnip, and even after it shoots, the ensuing summer, its bulb still continues to be palatable and nutritious. It is particularly adapted for milch cows, to whose milk

milk it does not communicate the bad flavour, called the *turnip taste*. Horses also are fond of it, when it is sliced so that it can be eaten by them.

It should be sown about the middle of May, or transplanted from a seed-bed, at the time the other turnips are sown. In the Lothians, the farmers have generally a part of the turnip land under this root, and have a seed-bed from whence they supply vacancies where their other turnips fail. It does not rot, like the other turnips, if bitten by mice, hares, or other animals. It keeps well if stored before a storm; and can even be kept on the ground for house feeding, until the first cutting of clover. These circumstances, joined to its nutritious quality, and its being an agreeable esculent for the table, both in its root and leaves, would doubtless recommend it more to the attention of farmers in this county, could some method be adopted by which they might always be certain of getting good seed.

Carrots.

These thrive well in gardens, and have been successfully tried in the field by several farmers. But they were so much exposed to depredation, that their cultivation in the field is now abandoned. This was the case with potatoes and turnips, before their cultivation became general; but now nobody thinks of stealing them. Carrots delight in a loose friable soil, which abounds in this county. Near Leuchars, Fifeshire, I have seen considerable fields of them, upon sand which had been blown from the sea. Such sand abounds in the maritime district near the sea-coast.

Parsnips

Parsnips

are only cultivated in gardens; but would thrive upon all soils which are adapted for carrots. Live stock always thrive best when treated with various sorts of food; and the two preceding roots are known to excel for feeding milch cows, and all sorts of animals. They have an additional advantage, that no manure is necessary to be applied along with them. Hence the farmer may obtain a crop of them, when his limited command of dung precludes him from obtaining a sufficient stock of turnips. But for these roots the ground should be previously trench-ploughed. They have another advantage, that being sown early in spring, they occasion a more equable division of the labours of drill husbandry, than when all its operations are confined to one plant.

Cabbages and Coleworts.

Almost every farmer has a few rows of his turnip field, stocked with one or other of these plants. Sometimes both are planted in contiguous rows. The reason is, that cattle delight in change of food; and if the turnips should be locked up in frost, when a sufficient quantity is not stored to last until thaw comes on, these plants can be got at in the interim. Near the towns they are cultivated on a larger scale, and sold for the use of milch cows.

The cabbage here cultivated is commonly called the Kirriemuir cabbage, because its plants are chiefly raised in the neighbourhood of that town, and of Forfar. Its leaves are of a pale green colour, its heart white. It is supposed not to stand the winter so well as the Aberdeen cabbage, whose leaves are of a dark green, its heart purple, approaching to redness.

The coleworts are universally known under the name of *curly kail*, and are of two sorts; one of a deep, the other

other of a yellowish green colour. These plants are much used in the making of broth, and other culinary operations, as well as in the feeding of cattle ; and it has been remarked, that those raised in the field are much more tender, and better flavoured, than those raised in the garden. The reason may be, that in the latter they are too often repeated on the same land.

I tried the thousand-leafed cabbage, and distributed its seeds and plants to a variety of farmers. It yields a regular succession of leaves during summer, which are highly relished by cattle ; and it seems best adapted as house feeding for milch cows, to whose milk it conveys an agreeable flavour.

Lucern.

We have not heard that this plant has yet been introduced into the county. It sends its roots to a great depth, and hence requires a very deep soil, which is well stored with calcareous matter. It thrives upon blown sand at Portobello, near Edinburgh, and is likely to succeed on the sandy downs near the coast, especially where they are impregnated with fragments of sea shells. It may be cut three or four times in a season, and yields excellent food for cattle, whether eaten green, or made into hay.

Flax, or Lint.

This was cultivated to a much greater extent in former times, than it is now. Some old farmers think that it does not thrive so well as it did before the practice of liming and marling the land became general. Some proprietors discourage it as much as possible, on the ground that it takes every thing from the land, and returns nothing to it. But this objection might be easily

ly obviated, by bringing back the *shows* and waste from the mill, and using them for littering cattle, a method which I have often known to be carried into effect. Its cultivation is still kept up by the thrifty housewives, who insist on having a few pecks, or even lippies, sown in the corner of a field, to make cloth for family use. Since our intercourse with the Baltic, and with Holland, was interrupted by Bonaparté's outrageous decrees, its cultivation has begun to extend, and farmers have begun to sow fields of from three to six acres, in several districts of the county.

It is sometimes sown after old ley (that had been ploughed before winter, or early in spring,) the land being well harrowed before the seed is inserted. But most frequently it follows oats which had succeeded ley, and is itself followed by wheat, with manure. In a few cases it is sown after turnips, or after pease.

The seed used is of three kinds: The *Dutch*, which is reckoned the best; *Riga* little inferior to the former, but is mixed with the seed of a weed which resembles flax, but yields no lint. *American* is only used when neither of the others can be got.

In some cases the people ripple off, and sow their own seed. But from the dampness of this climate, the home seed is apt to get mouldy, so that little of it springs, and what does get above ground, sends forth a sickly stalk. The ingenious Mr Tenant, who has laboured with so much success in improving the linen manufactures of Ireland, has invented a method by which linseed is kept perfectly fresh in that climate, which is still more damp than ours. The part of the flax that is reserved for seed, is allowed to grow perfectly ripe, which renders the lint more coarse and brittle than that which is pulled while part of the stalk still retains its flowers. From this ripe

flax

flax the bolls, or seed capsules, are rippled in the usual way. At first he had them laid up in barns, of several stories, one above the other, whose floors consisted of wicker work wattled with twigs. This allowed a free circulation of air to pass up through the floors on which the bolls were spread; and there were openings in the roof which excluded rain, but allowed the air to pass. He afterwards found that this expence was unnecessary. Upon a dry piece of ground he first lays a stratum of whins or broom, then a layer of the bolls, and so on until the mass be built up into the form of a stack. This is thatched with broom, or rushes, so as to keep out rain. In spring the bushes are shaken, to separate the bolls, which are laid upon a barn floor and beaten with sticks. This separates the dry capsules from the seed, which is cleaned by winnowing, and passing it through fine sieves. In this way the Irish now not only supply themselves with good seed, but might even spare quantities for exportation. The same plan would probably succeed in this county, where whins and broom are to be had in abundance, and might render it independent of the continent for a supply of linseed. But the growing of flax never can be carried to any great extent in this country, unless there be, as in Ireland, an intermediate class of persons between the farmers and the spinners, who conduct all the operations of weeding, pulling, sorting, watering and preparing the flax for the spindle; leaving the farmers no more to do but to furnish and prepare the ground.

About nine or ten pecks of seed are sown upon the Scotch acre. The time of sowing from the middle of April, to the first of May.

The small patches are hand-weeded during summer, by the women, who consider these as their *peculium*. But when large quantities are sown by farmers as a crop,
it

it is generally upon land which throws up few or no annual weeds, and hardly needs any weeding.

It is pulled from the beginning to the middle of August, and immediately put into a pond to steep. In warm weather it is sooner ready than in cold, which is known by the boon becoming brittle, and parting easily with the bark or lint. It is then spread out upon grass to dry; then collected into sheaves, and sent to the lint mill.

The produce is so exceedingly various, that it is hardly possible to fix upon an average. Sometimes there will not be six stones, avoirdupois, upon a Scotch acre; and sometimes thirty-six stones or more. It commonly sells for about twenty shillings or a guinea a stone unheckled.

The quality is generally very fine, and it is commonly spun in families, and weaved into fine linen for private use, or to be sold in the country. Very little of the cloth from home flax is exported. Thrifty housewives begin to prefer spinning their flax at the mills, instead of employing their servant maids to do it in the house. The tow makes coarser fabrics, such as harns, checkers, and kitchen towels.

Much of the seed that was raised at home, used to be sent to the mills, and bruised to yield linseed oil. But these mills are now mostly converted to other purposes, and the business is much fallen off.

Hemp.

This plant was formerly cultivated in small patches; but now hardly any of it is to be seen growing in the county. The late Dr Walker, already referred to, was of opinion, that marshy or swampy grounds, were the best completely drained, and then pared and burnt, would

answer

er well for the production of hemp. He was also
 in opinion, that no other manure would be necessary for
 on grounds of this description, but a repetition of
 ring and burning; to which might be added the
 procured from burning the woody fibres of the

As there are numerous tracts of such ground in
 county, at present of very little value, it would cer-
 be proper to try if they could be made to produce
 icle of such essential importance to the national
 in the supply of the navy. Public bodies, and
 who direct the helm of affairs, should stimulate
 experiments by liberal encouragements. After
 and was reduced into cultivation, the hemp might
 be used as a crop in rotation.

SECT. I.

GRASS.

Natural Meadow, and Pasture.

UNDER the latter may be comprehended a great por-
 tion of the Grampians and Seedlay hills, which ex-
 ceed a certain elevation above the level of the sea, or
 are so much encumbered with rocks and stones
 as to render their subjection to the plough impracticable.
 These extensive districts, which occupy so much of the
 face of the county, must remain for ever in natural
 herbage; and though we may have occasion to suggest
 some means by which their natural herbage may be improved,

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where

where there is any thing but bare rock to work upon these pastures never can be rendered so productive as those which are improved by the plough, with application of manures.

What are called natural meadows in this country, are very different from those known by that name in England. There the most nutritive grass, if it be the spontaneous product of the soil, however much it may have been improved by draining, and by top-dressings of manure, is held to be natural meadow. In this country the term *natural meadow*, indicates low swampy hollows, which are perpetually soaked, and often overflowed with water; which throw up rushes and sprits, and other aquatic grasses, that, when given to animals, can only be considered as a reprieve from starvation.

At one period no other hay was known in this country, but what was made from the herbage that grew upon these swampy meadows. Along all the glens of the Grampians such meadows still prevail, near the sides of rivers, or in hollows near the bottom of hills. In Clova they abound most, where they are not only soaked by springs which break out from below, but are occasionally inundated by the regurgitation of the North Esk. Such meadows also occur in hollows between the Seedlay hills, where some of them were formerly lakes, which have only been partially drained. They also occur in some parts of Strathmore, and in other parts of the county. Like all other soils, their characters are various; and so also is the quality of the herbage they throw up. In general they are composed of alluvial mud, which would form a very rich soil were it rendered dry. In others moss occurs, and in others a stratum of moss that has been covered with alluvial earth. In some cases these meadows are a sort of floating islands, which bend and

shake beneath the feet of the traveller; and were he to get through the matted roots of aquatic plants, which support his steps, he would vanish out of sight.

During winter, and the early part of summer, these meadows are depastured by cattle and sheep. After the herbage begins to improve on the higher grounds, the stock is removed. Late in the season they are cut for hay. The grass is spread as equably over the surface as possible, and is stirred and tossed up to the air until it can be put into cocks. It is afterwards carried home or stacked in the field; and the hay is employed to keep young cattle alive during winter.

Watered Meadows.

Were such meadows as we have described, completely drained, and ruts cut to discharge water from hollows on the surface, in many cases they might be converted into watered meadows. Where this is not practicable, they might have their herbage improved by top-dressings in the English mode; or they might be converted into corn land, as has been lately done with an extensive meadow of this sort, to the north of Forfar.

Watered meadows, for the purpose of improving the herbage, have not been carried to great extent in this county. Yet bringing water over land, as a mean of fertilizing it, is of very old standing. Mr Scrymgeour of Tealing, at the southern declivity of the Seedlay Hills, practised it upwards of sixty years ago. His first object was to fertilize the land for the production of corn, and with this view, water was made to trickle over its surface while it was in pasture. He found that it had little efficacy when the land was first laid down in grass; and that it operated most powerfully the year before it was

broken up. The reason seems obvious, that while the land was soft and porous by tillage, the water sank to the subsoil; but after it was more consolidated by pasture, it moved along the surface, where alone it could produce beneficial effects. By watering, one inclosure of his was brought from an exhausted state, into good heart, and preserved an uncommon fertility during a succession of crops, one of which was wheat, without following, lime or marl; and with a very moderate assistance of dung. The watering system is still continued on this gentleman's property; but since the profits of grazing came to surpass those of corn, it is now directed more towards the former than towards the latter object.

Mr Scrymgeour found that a dry, black, or loamy soil, received most benefit from watering; but that sand is not thereby meliorated, as it cannot retain moisture for any time. The same thing occurred on the blowing sands between Portobello and Leith. When the dirty water, which flows from the city of Edinburgh, was first conducted over these sands, it sank through the surface, and produced no good effect. But after the water had operated a sufficient time, the pores of the sand were silted up with mud, and the water extended itself gradually upon the surface, producing the best effects. Mr Scrymgeour also found that clay was rather chilled by water, and too much hardened by it, especially if the following season proved remarkably dry. This might be the case if the water was only occasionally applied and with a view to corn crops. But it is well known that if water be long applied with a view to the production of grass, it gradually changes the quality of the soil so as to adapt it for that object. Accordingly, below Edinburgh, strong clay land, which was wont to carry
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wheat and drilled beans, is now converted into watered meadow; watered grass being more valuable there than any crop that can be raised.

He found no sensible difference between the effects of running water of any kind, and that which comes immediately from springs. It is very natural to suppose that the water under his command, was all of the same quality. But it is well known that such dirty water as flows down from Edinburgh, answers this purpose much better than that which is pure; though even the purest water may produce good effects.

His water was conducted by a main drain, along the highest side of the field, for which portions of it might be let out at convenient places, and distributed by furrows, over every part of it. He found the autumn and spring the best seasons for applying water, and that it should be taken off during frost. In spring it should be applied before the grass has made any considerable progress; otherwise the crop may be injured. Mole tracts must be pressed down by the foot, as far as they can be discerned; otherwise they are apt to draw the water in an improper direction.

Colonel Kinloch has long practised watering on his estate of Logie, in the lower part of Kirriemuir parish; his sole object being grass, which is every year improving. He uses the water of a rivulet, which rises in the earl loch of Kinnordy, and receives much filth from the town of Kirriemuir, and from splash mills in its progress. His land is laid up into broad and high ridges; the water is conducted by a main drain along the highest side of the field, and divided into ruts, one of which passes along the summit of each ridge, from which it is made to trickle down the sides into the furrows, by which it is

discharged. He lets on the water in November, and continues the operation until the middle of April. The Colonel has now three inclosures under the watering system, containing about thirty-five to forty acres. They are let to graziers for pasture during summer. The field which was first subjected to water, about the year 1770, now lets for L. 8 per acre. The other fields let from L. 5 to L. 7 per acre, according to the time the water has operated in improving their herbage.

I have been trying experiments upon some stinking water which flows down upon the glebe of Dunichen, from the village above. Except during heavy rains, this water is in small quantity, and in dry weather it disappears. On its first application to arable land, when thrown into grass, it sank through the sandy soil and disappeared. Now that the field has remained two years in grass, the soil is more consolidated, and the water has begun to spread more extensively on the surface. This water was also conducted to a meadow, whose surface is very unequal from the foundations of old buildings, and was covered with lichens, sphagnum palustre, and other moss plants. Where the water trickled, or spread and moved slowly over the surface, it has extinguished these plants, and caused a very luxuriant growth of excellent grass. But where it remained stagnant in hollows, it acquired a white scum on the surface, which remained on the grass after the water retired, and nothing grew but unpalatable grasses, and aquatic plants.

There are many situations in this county, where watering might be practised with every prospect of success. These are chiefly haugh grounds, near the sides of rivulets, and such swampy meadows as we have been describing. Were these first sufficiently drained, and then the water of the rivulets made to move over them, before
winter,

winter, and early in spring, there can be no doubt but they would throw up luxuriant crops of grass, fit either for hay or pasture. This system appears particularly adviseable for the Grampian District, where pasture is the principal object; and where there is hardly as much land capable of aration as is sufficient to support the inhabitants. There I observed, that where springs break out from the sides of the mountains, they have extinguished heath, and raised green grass, on all the lower grounds over which they spread. It would be easy to conduct these springs, or the burns which descend from the mountains, by horizontal ruts along the sides of the hills, and to cause the water to trickle down, at every convenient point, upon the lower grounds. This would soon extinguish heath, and cause nourishing grass to grow in its place. There are also numerous tracts of swampy, or useless ground, on the sides of rivers, which being drained and watered during spring and part of summer, would yield abundant crops of excellent hay; while the aftermath would be valuable pasture in the beginning of winter. Some years ago, the sheep-farmers on the Duke of Buccleuch's estates in the south country, during hard winters, were obliged either to remove their numerous flocks down to the low country, or to bring hay for their subsistence, from the distance of thirty and even forty miles. But since his Grace introduced and encouraged the watering system among them, they have always abundance of hay and pasture for their sheep upon their farms.

SECT. II.

ARTIFICIAL GRASSES.

RED clover was first introduced into this country, about sixty or seventy years ago, by a farmer in the parish of Logie-Pert. Having sown a ridge with this plant, he caused proclamation to be made, requiring people to keep sheep and cattle from it. This induced persons from remote places to visit his clover, as an uncommon curiosity. Artificial grasses, among which clover is always mixed, are now cultivated on every farm in the lower districts, and have even made considerable progress among the Grampians.

Rye-grass is the species universally sown; and even where red clover is the principal crop, a portion of rye-grass seed is always sown along with it. The proportions of the different sorts of seeds, and the quantity sown upon an acre, are always varied according to the judgment of the farmer, and the object he has in view. In the neighbourhood of towns, where there is great command of manure, and where a crop of green grass or hay, is only taken as a link in the rotation, the annual species of rye-grass seed is now begun to be sown. Along with this, the seeds of goose-grass, and of red clover, are mixed in various proportions. In the districts more remote from towns, where the scarcity of manure obliges the farmer to keep the land sometime in pasture, after it is sown down with grass, the perennial rye-grass seed only is used. To ensure this, the seed is always taken from hay of the second year's growth. When the land is intended to remain in pasture, a smaller proportion of red clover is sown, and a greater proportion of white

white clover; together sometimes with yellow clover, rib-grass, and other seeds.

Where one crop of grass only is intended, from twelve to fifteen pounds of red clover seed is mixed with a bushel of rye grass seed, or which contains a small proportion of goose-grass seed, and sown upon a Scotch acre. When the field is intended to remain some years in pasture, from seven to ten pounds of red, and from four to six pounds of white clover seed, are mixed with two bushels of rye-grass-seed, and sown upon the acre. Along with these, it is very frequent to sow from three to four pounds of rib-grass seed, and sometimes the same proportion of yellow clover. Rye-grass is seldom sown alone.

Formerly grass seeds were sown along with bear, or barley, which succeeded turnips, or fallow. But since barley became less cultivated, they are more frequently sown along with wheat, which succeeds fallow. As they require the land to be highly pulverized, they succeed well with these crops, especially with wheat. Sometimes they are sown with oats; but they are apt either to extinguish the oats, or the oats to extinguish the grass. With wheat, they are sown in spring, before the plants have become too rank, and are covered with a short toothed harrow, followed by a roller. If the plants be too rank, the roller alone is used. With barley, or oats, they are sown after the crop; the ground having been previously well harrowed and pulverized. They are covered either with a short toothed harrow, or with a heap of thorn bushes dragged over the ground, followed by a roller.

The ensuing spring, the stones are gathered from the surface, and the young grass is rolled. This is generally done in the month of April, while the land is neither too wet nor too dry.

A part of the sown grass is cut green, for feeding the farmer's stock in the house. Near towns and villages, fields of it are sold in small lots, for green feeding, and usually fetch from L. 10 to L. 12 per acre. In some extraordinary cases L. 25 and upwards have been got for an acre of sown grass, which afforded three, and part of it four cuttings during the season.

When the grass is made into hay, it is commonly mowed in the month of July; that which is reserved for seed being allowed to remain a week or fortnight longer. The mowers get from 3s. to 5s. per Scotch acre, according to the weight and state of the crop. Sometimes they work by day's wages, and receive 2s., with victuals and beer. The grass is first turned in the swathe, and if the weather be dry, a day or two after it is put into small round cocks. In adverse weather, hay-making is a very tedious and expensive process, and it is sometimes half rotten, and its value much diminished, before it can be saved. But in favourable weather, it is generally secured in the tramp-rick, of from 40 to 50 stones, within four or five days after it is cut. After all the hay is thus secured, it is carried to the stack-yard, and put up in long stacks called Sows, which are neatly thatched, and the thatch fastened with straw ropes.

The produce is exceedingly various, from 100 to 350, or 400 stones the Scotch acre. The average may be from 150 to 190 stones of 16 lb. Avoirdupois, and 22 oz. to the pound.

A considerable part of the produce is consumed by the farmers horses, milch cows, and feeding nolt. The remainder is disposed of to innkeepers in the towns, and on the public roads; and to feed horses employed in manufactures, or for the saddle. The price of a stone of hay varies according to the quantity disposable compared with the
the

the demand. When sold in large quantities, it is often so low as 6d. and sometimes exceeds 1s.

The second crop of clover is generally depastured by the farmer's cattle. Sometimes it is sold to be cut green, for milch cows in the house. It is very seldom, or never, made into hay, as the lateness of the season will not admit of its being properly dried. I have known it made into hay; and though not sufficiently dried to keep by itself, when put in a stack with old barley, wheaten or oat straw, arranged in alternate layers, it kept remarkably well, and proved an excellent resource to the farmer's stock. The stack being cut with the hay knife, the dry straw was found to have imbibed the juices and flavour of the clover, and was greedily devoured by cattle that would hardly taste it if presented by itself. In other cases, the second crop of clover, before it has become too rank, is ploughed down for wheat.

White clover, being an indigenous plant in all parts of Scotland, which grows spontaneously on all soils that are favourable for it, the seed has been raised by several farmers in this county. Home seed was found to succeed better than what is imported; but as the farmers lost their crop of hay, or pasture, by saving the seed, the raising of it has not been prosecuted to any great extent.

SECT. III.

CULTIVATED PASTURES.

WE have adopted this title, to distinguish such pastures from the natural herbage which grows upon the mountains

mountains and waste lands, which have never been subjected to the plough, nor to any sort of improvement. Every farmer has a certain proportion of his farm in pasture, for his milch cows, together with his breeding and working stock. The proportion of this varies according to the access which the farmer has to manures, and other circumstances. The land is thrown into pasture after the first, and in some cases, after the second year cutting of sown or artificial grasses; and the time it is allowed to remain in pasture, varies according to the circumstances already enumerated, or according to the covenants contained in leases. But the farmers only pasture their cultivated land as a link in their rotation of cropping; the pasture, in its course, being again subjected to the plough, and made to carry corn and green crops. In this county no such practice was ever known, as prevails in many districts of England, where the farmer is obliged to keep a certain proportion of his farm in perpetual pasture, while the rest is constantly subjected to tillage.

The only examples of perpetual pasture that can be quoted, are the parks of a few noblemen and gentlemen here distinguished by the name of *Policies*. Some of these have been laid down in pasture, from forty to fifty years ago, in the most correct style, and are still continued in that state; these pastures being occasionally topped with lime, or marl, or compost. We formerly alluded to the extraordinary luxuriance, closeness, and variety of the grasses on part of the Deer Park of Panmure, and on the parks of Dun, about mid-way between Brechin and Montrose. A few more examples of such pastures, which have been long permanent, might be quoted, where it seems extremely doubtful, whether the proprietors could turn them to better advantage than by continuing

continuing such lands always in pasture. But other examples might be adduced, where, owing to an unfavourable sub-soil, the grass of such old pastures is nearly extinguished by sphagnum palustre, lichens, and other moss plants. A few other proprietors, who did not possess much agricultural skill, when their parks were first thrown into pasture, and these having no attention paid to them since, they have run totally wild, and are so thickly covered with tall broom and other shrubs, that cattle can hardly find their way through them; or they are clothed with heath, and the plants which occupied the ground before it was reduced to cultivation. Mr Don of Forfar, to whom this work is under such high obligations, has been employed by several gentlemen, not only of this but of neighbouring counties, in stocking parks which are intended for permanent pasture, with the most valuable of those grasses which are natives of the county; and also in extirpating such plants as are hurtful to cattle. Such parks or pleasure-grounds, are either let to graziers from year to year, at a rent which varies according to the degree of competition, and the demand for fat cattle; or they are stocked with cattle and sheep purchased by the proprietors themselves. In the latter case, a great proportion of the sheep, and a few of the cattle, are reserved for family use. The remainder, when fat, are sold to the butchers. The rent of such pastures varies exceedingly, according to local position, and their intrinsic quality. In some cases it does not exceed a guinea per Scotch acre; in others it is L. 7 or L. 8, or even more.

The resident proprietors have smoothed lawns, of more or less extent, around their mansion-houses, which are allowed to remain in permanent pasture. But such of them as have farms in their natural possession, which

which are usually distinguished by the name of *mains*, commonly subject their parks, or pleasure grounds to the same rotation of cropping with the rest of the farm. It is true, indeed, that they usually keep the enclosures nearest their houses, longer in pasture than the farms who pay rent, or than they allot for those of their own farms which are more remote; but whenever they see it expedient to recover the grass, or to promote the general interest of their farms, they do not scruple to subject such pastures to the plough, and to a rotation of crops, to be laid down again in a common style.

Such proprietors, and the farmers who have a portion of their land in pasture, usually rear a certain number of cattle annually. To consume the remainder of the grass, they purchase cattle at the fairs. Such as grow upon the pastures are sold to butchers; and the remainder are finished off upon turnips during winter. A great number of fat cattle are consumed in the county. The remainder are purchased by dealers, chiefly at Glasgow, and the manufacturing towns in the west of Scotland; though, from the late stagnation of trade, the demand from these quarters is now much diminished.

The cultivated land under permanent pasture, at least, what has not been ploughed during thirty or forty years, being wholly confined to the parks of a few noblemen and gentlemen, bears a very small proportion to the cultivated land that is under convertible or alternate culture; meaning thereby, a regular change from pasture to a rotation of crops. But for reasons repeatedly stated, the proportion of this pasture land varies exceedingly in different districts, so that it is very difficult to state a general average. What seems to approach nearest to truth, is to state the quantity of land under alternate

are, at two-fifths of all the cultivated land in the county. If to this we add the extent annually sown down with grass, with what is under fallow, or drilled and meliorating crops, the extent under corn will hardly exceed a half, and in some districts, a third of the cultivated land of the county.

If these statements make but an humble approach to the truth, it will appear that, in general, the cultivated lands are in a progressive state of melioration.

It must also appear, that the proportion of surface occupied by corn, is much smaller now than it was in former times. Though this be the case, the quantity of corn produced is much greater, upon the whole, than what took place before the alternate husbandry was introduced. The reason of this is, that although much less corn be sown, the produce from the same extent of surface is much greater, and of better quality, than when the whole cultivated land was occupied by corn.

In proof of this it may be observed, that the population of this county has gradually increased, from 68,297, its amount in A. D. 1755, to 91,001, in A. D. 1790—1798; to 99,127 in A. D. 1804, and to 107,578 its amount in A. D. 1811;—being an increase of 39,281, from A. D. 1755, to A. D. 1811.—Yet the county, excepting in some very adverse seasons, has not only supplied itself with provisions, but has exported corn to a considerable amount. When we come to state the amount exported, it will appear that it has rather increased than diminished, in consequence of the extension of the alternate system of husbandry. But the county has not only exported corn, notwithstanding the increase of its population, and the superior waste occasioned by the numbers of horses employed in manufactures; it has also supplied itself with butcher meat, and exported fat
cattle

cattle to a great amount. Formerly lean cattle only were sent from the county. Now there are hardly any exported but what are well fed, and ready for the butcher; excepting what may be called the flying stock, great part of which is sent, half fed, to the English markets. This may be considered as an increment to the produce of the county, in addition to the superior quantity and value of the corn raised, and all owing to the mixture of green and corn crops; together with the alteration from crops to pasture.

SECT. IV.

BREEDS OF PLANTS.

It may seem surprising, that amidst the great exertions that have been made to improve the breeds of animals, and after the late Mr Bakewell and others had reduced this branch of rural economy to scientific principles, little or no attention has been paid to the breeds of plants. It seems, however, to be well ascertained, that among plants of the same species, which are even growing in the same field, there are as great, if not greater varieties of quality, and of adaptation to the purpose intended, than takes place among animals of the same species which are allowed to breed promiscuously. Plants are even much more exposed to degeneracy from promiscuous intercourse than animals themselves, in so far as they have no power of resisting the contamination of degenerate plants which grow beside them. But in a wild herd of cattle, of horses, or of sheep, the strongest bull, or stallion, or ram, will first subdue and beat off his antagonists,

nists, and then propagate his own breed. As the breeds of animals have been much improved by selecting those individuals of each species which seemed best adapted for the purpose, in order to continue the breed; so it is extremely probable that the breeds of plants might be improved in the same manner.

It is certain that all the plants now cultivated, originally existed in a wild and dwarfish state, before they were expanded and improved by cultivation. Wheat is said to be a native of Sicily, and to have been first reduced to cultivation by Ceres, who was afterwards worshipped as the goddess of corn. But the accounts concerning her goddessship, as happens in such cases, are so vague and uncertain, that we can place no reliance on them. Barley and bear are natives of many countries; and in this country we have a diminutive variety of this grain, known by the name of *hordeum triviale*, or *murinum*. It abounds on sandy grounds near Edinburgh, and near the sides of roads almost every where. Several species of oats are natives of this country; and at the commencement of agriculture, seem to have been the first plants selected for cultivation. Our countryman Bruce also found a species of oats, growing in great luxuriance, near the source of the Nile. It is certain, that the several varieties of oats which were originally cultivated in this country, and which are still cultivated in many parts of the Highlands and Isles, exist in a wild state in various places. But these wild grains are as much inferior to those of the same species, which have been duly cultivated, as a crab apple is to that of a tree ingrafted on its stock, and which has been subjected to skilful garden culture.

I do not pretend to be sufficiently acquainted with botany, to be able to condescend upon the countries where

the plants now cultivated are indigenous ; but it seems probable that those who first selected them for culture, were at pains to pick out, from all the varieties of the same species which occurred to them, those individuals which appeared likely to yield the greatest proportion of food, from the ground they occupied. Had their first endeavours been followed out by a constant attention, to select, each successive year, the best plants to be found in a field, in order to raise seed, it is not easy to estimate the degree of perfection to which the cultivated plants might have arrived. Any one who casts his eye over a cultivated field, as well as over a drove of cattle, or of sheep, may observe many individuals of much better quality than others, and from which it would be desirable to continue the breed.

When plants of the same class, but varying in their individual qualities, are allowed to grow promiscuously in the same field, the pollen, or fecundating powder of one set of plants, is blown about by the winds, and is brought in contact with the female organs of another set of plants, by which mulish breeds are produced ; and the uniform consequence of such intermixtures is a degeneracy, or diminution of the value, of the breeds of the plants. In many cases, the fecundating pollen is carried from the flowers of one plant to those of another, by insects, and particularly by bees, who apply this pollen for feeding their young, and seem to convert it into wax for the construction of their cells.

We already remarked the extreme aptitude of rutabaga, or Swedish turnip, to degenerate, and not form a bulb, when its seeds are raised contiguous to those of coleworts, or cabbages, or even of turnips of a different species. Common turnips are also liable to degenerate, when their seeds are raised contiguous to those of the
forementioned

forementioned plants, or even when the seeds of various sorts of turnips are raised contiguous to each other. I have often remarked, that cabbages and coleworts are subject to a similar degeneracy, when their seeds are raised promiscuously; the plants neither closing like cabbages, or though they should partly close, not forming a firm and compact head; nor possessing the characteristic properties of coleworts. These circumstances have frequently given rise to law-suits between farmers and seedsmen, who had warranted particular seeds, or even young plants themselves, to be genuine; but which produced a crop of very inferior value to what was expected, and of which the plants did not possess the distinguishing properties of any one species. In these cases, the nurserymen could not help the consequences that ensued, while they raised the seeds of various allied plants in the same or contiguous plots of ground.

I think the celebrated Mr George Culley of Northumberland, was the first practical farmer who adverted to these facts, and who saw the necessity of every farmer becoming his own seedsman. His example has been followed by several eminent farmers in Berwickshire and the Lothians, with great practical advantage.

In order to raise seed, they select those individual turnips, cabbages, &c. in their fields, which have stood the winter best, and which they know to be most palatable and nutritive to cattle. Each spring these are transplanted into some corners of their fields; care being taken to keep the different sorts of plants as distant as possible from each other. When their seed is ripe, it is laid up for use the ensuing season. By following out this practice during a course of years, the farmers find the plants they cultivate, instead of degenerating, gradually to increase in value. This is like always breeding from the best males and females of animals, which at last

raises the breed to the highest perfection of which it is susceptible.

With regard to the breeds of corn plants, we already stated that Blainslie oats originally sprang from a few stalks on a farm of that name, in the upper part of Tweeddale, which was of a moorish or mossy soil, and at a high elevation above the level of the sea. The farmer selected these stalks from a field of the common oats, because he observed them to be much sooner ripe than the other oats, and to abound in straw. Having sown them in a garden, he continued to multiply them until he stocked his whole farm with this breed. This happened upwards of sixty years ago; and they soon spread over all that district, and were in high demand for seed in various parts of Scotland and England. By always selecting the best for seed, these oats have never degenerated on the farm of Blainslie, though they have been continued there without change from other places since their first discovery.

There can be no doubt but the potato oats, and all the different sorts which have been occasionally in vogue have been selected, and brought into cultivation, in a similar manner. It seems also very probable, that the degeneracy of these different sorts has been occasioned by allowing them to mix with oats of a different quality and by neglecting to make an annual selection of the best stalks found in every field, in order to keep up, and to improve the breed. The same observations may be applied to wheat, barley, rye, beans, pease, and all the species of grain usually cultivated.

Were farmers to set about improving the breeds of corn plants, the circumstances that should be attended to in the selection, seem to be, 1. Early maturity; 2. Thinness of husk, which may be ascertained by balancing the grain

grains in scales, and preferring those which are of greatest weight ; 3. Those which produce the most valuable straw, may also deserve attention. But to carry these and similar speculations into full effect, it would be desirable to have experimental farms established, in different districts, under the direction of persons of competent skill in those sciences which are connected with agriculture.

In illustration of what has been stated, it may be mentioned, that, many years ago, I selected three potato plums from the same stem. Early the ensuing spring, the seeds of these plums were sown in well manured garden ground ; and as soon as the plants, which sprang up, could be handled, they were planted in drills, of the usual distance, in the same garden, the bottoms of which had abundance of well rotted horse-dung. A considerable produce, little short of a boll, was raised the first year, part of which was consumed in trying experiments on their quality, which was remarkably good. There were no less than five different sorts of potatoes, evidently distinguishable by their shape, their eyes, their colour and spots ; beside their appearance on slicing them longitudinally, or across. There were also several other varieties, whose characters were more dubious. I directed that each sort should be planted separately, the ensuing spring ; but, in the hurry of work, they were all planted promiscuously. This was continued during several years ; when the several sorts could be distinguished by the colour of their stems and leaves ; but especially by that of their flowers. They continued to yield a more abundant, as well as a more palatable produce, than any other potatoes then cultivated in the parish of Cambuslang, near Glasgow ; until, at last, they degenerated into one sort, which was inferior, both in

quantity and quality, to the other potatoes cultivated in that neighbourhood. This induced their relinquishment as seed; but I cannot account for the rapid degeneracy of these potatoes, except from the promiscuous intercourse of their flowers, while they were planted without each sort being separated from the others. Yet this experiment (which I can warrant as authentic) goes the length of proving, that new varieties of potatoes may be produced by raising them from the seeds formed in their plants or *bullets*, as they are usually called in this country. I would also beg leave to suggest a very probable inference from the premises; that were those varieties whose produce is at present most abundant, most palatable, and most nutritious, by containing the greatest proportion of starch in the same weight, to be selected and cultivated apart from all other plants of the same species, great improvements in the breed of this useful plant might ensue. Were the breed to be occasionally renovated from the seed, it is hard to say to what perfection the useful root might be carried. As Spanish America is now more open to European intercourse than formerly, and M. Humboldt describes some sorts of potatoes, of much larger size, and both more palatable and nutritious than any yet known in Europe, which are cultivated on the higher Cordilleras of the Andes, under a climate so much warmer than our own; it would be advisable to procure and try some of these sorts in this country, and then to keep up, or to improve their breeds, by the means which have been suggested.

As I have no desire to shine in borrowed plumage, I think it incumbent on me to state, that the first hints of what has been offered concerning the breeds of plants, were derived from my worthy and ingenious friend Dr Coventry, Professor of Agriculture in the University of Edinburgh.

Edinburgh. He has collected a great variety of authentic facts on this branch of rural science, which are both curious and interesting; and it would highly promote the public good, were his numerous avocations to admit of his completing his investigations, and communicating the result.

SECT. V.

DISEASES OF PLANTS.

As upon this subject very little is yet known, I shall only offer a few desultory, and very imperfect observations that have occurred to me.

1. *Smut.*

To this disease wheat is peculiarly exposed, though it occurs in barley, and rarely in oats. The infected grains of wheat are commonly larger, and the straw taller, than those which are sound. Often sound and infected grains occur in the same ear. As the ears ripen, the infected grains burst, and emit a dark brown powder; or many of them are burst, and their powder dispersed in the process of thrashing. Those which are not fully ripe, continue unbroken. The diseased grains are of less specific gravity than those which are sound, and float in water, while the latter sink. It seems very doubtful whether the smutty powder, emitted from the diseased grains, will float in water, unless it be well stirred. Hence, in treating of wheat, we recommended first to float and skim off the diseased grains, and then to wash the smutty powder through sieves,

Various are the opinions respecting the cause of this disease. Some think it the same in kind with cancer in the human body, which commences from a bad state of the fluids, and breaks out in the parts most exposed to the air. Those who are of this opinion think that the cancer in plants, like that in the human body, may be protracted by excision of the parts infected; but cannot be radically cured without restoring the circulating juices to a sound and wholesome state.

Others think smut to be analogous to the venereal virus, which first attacks the roots of life, and afterwards spreads itself among the glands, especially those most exposed to external air, until it is reflected upon the bones and solids, and reduces the whole system to a putrid mass. In prosecuting this analogy, they observe, that the grains of corn are glandular substances, which are nourished by absorption, without any penetration of vessels from the stalk; and that the disease increases in proportion as the ear is elevated into the external air.

Without pretending to decide concerning either the nature or cause of this disease, we have already hinted the probability that it springs from the roots of the plants, as it is found in the ear before it escapes from the hose or seed leaf. This observation, however, must be received with some limitations. Experienced farmers here, with whom I have conversed, have assured me, that even the cleanest wheat will throw up smutty ears, on those parts of the soil which are much trodden by the frequent turnings of the plough and harrows, or by the carting of manure; the parts nearest to the compost midden, as they are most trodden, being most liable to the smutty disease. The result of their experience has been confirmed by my very limited observations; though I have not been able to learn if this takes place on soils best adapted for wheat, which
ought

ought more properly to be distinguished by the name of *drilled bean soils*.

However this may be, a probable inference seems to ensue, That the smutty disease may arise from some unfavourable texture of the soil, as well as from the seed. That it spreads and multiplies by infection, is an unquestionable fact.

Having already detailed the means that are used, in this county, for counteracting this disease; we shall only add, that we see no probable method of extirpating the disease, except by carrying into effect what was suggested concerning the improvement of the breeds of plants. If the disease be found to arise from an unfavourable texture of the soil, were this to take place, it would go no farther than this unfavourable texture extends.

2. *Blight, or Blasting.*

The farmers here distinguish such ears of corn, as form no grains, by the name of *blasted ears*. This disease seldom occurs in the white and red wheats, which are usually cultivated here, but it is very frequent in barley, and sometimes occurs in oats. Such plots of the spring wheat as I had opportunity of examining, already stated to have been tried here, had from a half to two-thirds of the ears blasted. But though this seed was subjected to no preparation, I did not observe any of it infected with smut.

Blighted or blasted ears, when they first appear, are distinguished by a thin, pale white film, which incloses clots of a black powder, situated where the grains of corn ought to be. As the ears shoot up, and approach to their highest altitude, the black powder, with the
films

films which cover it, drop off, or are blown away by the wind, and the top of the stalk exhibits only hollow marks where the grains of corn should have been; but no vestige of a grain remains. That this disease arises from the roots, or soil, appears probable from this fact, that I have often found blasted ears in the hose, or seed-leaf, before they reached the open air.

It is not ascertained whether this disease be infectious; but if it be, the only probable mode of cure is the complete washing of the seed, so as to remove the black powder which may have been thrown upon it, from the infected ears. If it arise from the soil, it can only be cured by altering its texture, so as to render it favourable.

3. *Erugo, or Rust.*

This disease seems to derive its origin entirely from the state of the atmosphere, and to be incurable by any means yet thought of. Although it sometimes attacks barley, it commits its most fatal depredations upon wheat. In this disease, the grain, though formed, never arrives at maturity, but appears in the form of a thin, horny, shrivelled skin. The capsules in which the pickles are contained, exhibit an ochreous yellow powder resembling the rust of iron, from which the disease derives its name. This rust, being examined with a magnifying glass, is seen to consist of a congeries of mossy or parasitical plants. The straw also becomes rotten and brittle, so that a handful being twisted, it breaks. The straw is likewise variegated by numerous dark brown spots. In 1808 and 1809, when the rust produced much havoc upon the wheat of this county, I examined some of these spots with a magnifier, and found they consisted

consisted of a *combustive* species of *insects* plants, such as are seen to grow upon decaying trees. They were of a dark brown colour, approaching to black. I did not observe any of these plants to flower, and fructify, as was noticed by the *Illustrations* Sir Joseph Banks: nor did they seem to me to be the cause, but rather the effect, or consequence of the disease.

During these seasons, heavy and excessive rains commenced when the wheats of this country were in flower, and continued with intervals of thick, heavy, warm weather, with hardly a breath of air, during the whole period of the fructifying and ripening processes. As far as my observation extended, the disease seemed to produce the greatest havoc, on low flat grounds, of a porous or puffy soil, and a retentive bottom. On such soils, the foot would sink to the ankles, so that they resembled subterraneous lakes, in which the roots of the plants were constantly immersed; while their tops were surrounded by thick haze, which excluded the action of the sun's rays. On strong clay soils, which threw off the water, and on hanging soils on the sides of hills, the crop was not so much injured.

4. *Slugs and Insects.*

These attack the roots of plants while they are young and tender. It is thought they may be destroyed by rolling the crop during the night, when the slugs and other worms are supposed to come up to the surface, and may thus be crushed by the roller.

The insects which destroy turnips, commit their depredations upon the seed leaves. After the rough leaf appears,

appears, the plants are thought to be out of danger. To prevent this, the intelligent Mr Johnstone of Hillside near Edinburgh, always thins, or pricks out his plants as soon as they appear above ground. I saw those which had been thus treated the day before, and which had been thrown out the rough leaves next morning, and Mr Johnstone thought them out of danger.

BOOK IX.
**GARDENS AND ORCHARDS.**

ALL the resident proprietors have gardens and orchards, varying in extent from about one to three or four acres ; and a few are still more extensive. These are well stored with every variety of roots, and of culinary vegetables, which thrive in this climate ; and with various sorts of apple, pear, cherry and plum trees. They are also adorned with various flowers, and ornamental shrubs. A great proportion of them have hot beds, in which cucumbers, melons, and tropical flowers are reared. Some of them are provided with green houses, in which exotic plants are made to grow in earthen pots ; and a few have hot-houses covered with glass, and heated artificially, in which are raised grapes, pine apples, peaches, nectarines and other fruits, which do not thrive here in the open air. The Honourable William Maule is now constructing a very extensive garden near Brechin Castle, on a plan which combines magnificence with beauty. It is already stored with every variety of fruit-bearing trees and shrubs, which thrive in the open air ; together
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with extensive hot-houses, and hot walls, for those plants which require artificial heat. It is also ornamented with a great variety of flowers and shrubs ; and the parts that are covered with glass, are adorned with various curious plants of the tropical climes.

Many of the apple and other fruit trees here grow much into wood, and do not yield much fruit. This may be owing to the trees being often placed in espaliers around the outward border of the garden, where they are shaded from the sun's rays by silver and other species of firs, that had been planted around them for shelter, and whose roots also draw off the nourishment that should go to the fruit trees. Or it may be owing to an unfavourable subsoil, into which, after the trees have thrust their roots, they die at the top, and become covered with lichens. In the orchards of Kilwinning, Ayrshire, which were originally planted by the Monks, it was found that each tree had a large and deep hole dug below it, the bottom of which was paved with broad flags, to prevent the roots from penetrating to the subsoil, and that the hole had afterwards been filled up with rich earthy compost. Perhaps a similar mode of planting fruit trees would remedy the evil in this county. Where the soil, exposure, and all circumstances are favourable, fruit trees here yield abundance of excellent fruit.

It often happens, however, that the fruit is destroyed by spring frosts, while the trees are in blossom. The late Dr Walker, already referred to, generally covered his fruit trees, in spring, with old herring nets, or any other kinds of nets he could procure. He was decidedly of opinion, although I never heard him assign any reason for it, that these nets kept off the frost from the tender flowers, and prevented their destruction. A lady
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in this county has made the same observation, and she constructs nets of woollen yarn, which she finds effectual in sheltering the delicate blossoms of fruit trees from frost. The yarn is made of the coarsest wool, and twilled to give it strength. The meshes are from three to four inches square, and are composed of two threads parallel to each other, knitted in the usual way. After the net is finished, one thread of each mesh is cut in the middle, which causes them to project in the diagonal of the square, or mesh, and thus increases the surface defended by woollen threads.

All the smaller fruits, such as gooseberries of every sort, currants, raspberries, &c. are produced here in the greatest abundance and perfection. They are eaten when ripe, or are made into jams and jellies for domestic use. Some families make as much gooseberry vinegar as serves them; and gooseberry and currant wine have lately been introduced, and fermented in considerable quantities.

Every farmer has a garden, though few of them pay much attention to horticulture, as they are supplied with pot herbs chiefly from their fields. Every cottager and country tradesman has also his kail-yard, or inclosed plot of ground, of more or less extent, in which he raises cabbages, coleworts, leeks, onions, and all sorts of esculent roots. The gardens of the cottagers and tradesmen are generally much better attended to than those of the farmers; and many of them are stocked, not only with gooseberries and currants, but with fruit trees, and adorned with flowers.

In the neighbourhood of towns there are public gardens for the supply of the inhabitants, and nurseries for rearing fruit and forest trees. The neighbourhood of Dundee has been long celebrated for the perfection to
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which horticulture has been brought; and they have a soil well adapted for the purpose, with a southern exposure, and sheltered from the north and east. Here all sorts of fruits and garden vegetables are raised in the greatest perfection, and the town is amply supplied on reasonable terms. Many individuals in towns have small gardens behind their houses, which are cultivated partly for ornament, partly for use.

It can hardly be said, however, that there is any such thing in the county as an orchard wholly stocked with fruit-trees, where the fruit is the sole or principal object. The fruit-trees that are cultivated are planted in gardens, where culinary and other plants are raised. Often they are trained upon espaliers, along the sides of the walks; and sometimes they are trained upon high walls built for the purpose. For the more delicate kinds of fruits, some of these walls have flues carried through them, by which they may be heated by fires. In some cases part of these walls have a glass hot-house in front of them, in which fruits are raised which do not thrive in the open air.

BOOK X.

WOODS AND PLANTATIONS.

THE large trees found in mosses, and marshy grounds, seem to indicate, that the lower parts of this county, at one period, abounded in forests. Some of the Grampian glens are sprinkled with natural birches, or with oak coppice, containing a mixture of hazels and other shrubs. In other places these glens are adorned with thriving plantations. In all of these glens there are numerous tracts so much encumbered with stones, as not to admit the plough, and even to leave very little soil on which grass can grow; but some kinds of trees would thrive well were they planted between the stones, and would yield both profit and ornament. But trees do not thrive on the higher parts of the hills and mountains; though furze might succeed, and yield wholesome nourishment to sheep and cattle.

In the other districts, plantations are chiefly confined to places which are inconvenient for the plough; or to thin moorish soils, resting on clay or gravel, which are re-

mote from the means of improvement. In gentlemen's parks and pleasure grounds, trees often occupy soils of the best quality. On the declivities of the Seedlay Hills, extensive tracts have been planted with forest trees, and new plantations are every year forming. They seem to thrive very well; and it is probable that all those parts of the county where trees would prove the most advantageous produce, will soon be covered with them. In some places the roads are too narrow, and they are smothered by belts or hedge-row trees on each side of them, whose branches are interlaced above, and exclude the sun's rays, and free circulation of air, so that the roads are converted into impassable mires. But in many parts of the county, the roads have been made of great breadth; and considerable vacant spaces have been left between them and the plantations on each side, so as to admit the sun and air; and the traveller is delighted with the romantic beauty of the prospect, which is varied at every step. Near the sea-shore trees do not thrive, unless they be planted in ravines, or behind banks, where they are sheltered from the sea-spray. They require also to be planted thick and irregular at first; and the deciduous trees thrive better than firs, or those which carry their leaves all the year round. The reason seems to be, that the deciduous trees remain dormant during winter, when the most violent storms from the sea commonly take place; whereas firs and others, which do not drop their leaves, continue always in a living state, and are hence more exposed to injury from the sea breezes. The late Mr Hunter of Blackness, by way of experiment, planted a large body of Scotch firs on the sands of Barry, at a considerable distance from the sea, but without much intervening shelter. As far as they have gone, they seem to have thriven very well; but it is probable that

larches,

larches, or other deciduous trees, might have answered the purpose much better. However this plantation affords a fulcrum, under whose shelter other plantations may be extended in all directions, until these barren and unseemly sands be clothed with thriving wood.

When plantations first began in this county, it was generally supposed that no other sorts of trees would thrive here, except Scotch firs, and this was the species at first planted. But it has been discovered, that, except on particular spots, this is the least thriving, and the most unprofitable tree that has since been tried. Had the first planters been at pains to examine the trees found in mosses and swamps, and the natural stools of wood which still remain, they would have found oaks of enormous size, ashes, elms, birches, and various other trees; but I have heard that Scotch firs seldom occur in such situations. The natural inference from these facts is, that the Scotch fir and the pine tribes are scarcely to be held natives of this county; and that the trees best adapted for the soil and climate, are such as had formerly grown spontaneously.

How it happens that the Scotch fir, when raised from seed, and transplanted from a nursery, never yields such valuable wood as when it grows spontaneously in the forests of Braemar, of Glenmore, of Rothiemurchus, of the Grants' and the Chisholms' countries, and in various other parts of the Highlands of Scotland, naturalists seem to be at a loss to explain. But the fact is unquestionable, that, when this tree is planted, it never attains either the size, the closeness of grain, or durability of wood, which take place when it grows spontaneously. I have seen forests of Scotch firs, in remote recesses of the Highlands, where they could not be floated to a market,

whose trunks were of enormous girth, and they were what is called *red wood*, to the bark.

It has been often observed, that the close texture and durability of wood, depend upon the length of time it takes to grow. Perhaps the firs which grow spontaneously in the elevated glens of the Highlands, may require a much longer time to attain a large size, than those which are planted in low and warm situations, and hence their wood may acquire superior closeness of texture and durability. However this may be, it is certain that the wood of the natural Highland firs is often superior to the best Memel; while that of transplanted firs is soft and porous, and unfit for those purposes where elegance and durability are required.

In all the later plantations, the larch, which is a more valuable tree, and grows much faster, has been substituted in place of the Scotch fir. In many cases, these two sorts have been planted promiscuously, which is an erroneous practice, as the larch soon overtops the fir, and is bent and disfigured by the wind. This being observed, larches are now generally planted, in large bodies, by themselves; where they shelter each other, and form straight stems. The larch thrives much better than the Scotch fir, in high and exposed situations, and on every variety of soil; though its progress is most rapid in good soils, and in sheltered places. There is a large plantation of Scotch firs on the northern declivity of the hill of Turin, parish of Aberlemno, on a shallow soil, incumbent on coarse gravel-stone rock, which has not been observed to make any progress during many years; though a few larches, sprinkled here and there, make annual advances. A similar remark may be applied to another large plantation on the northern and highest part of the parish of Monikie, where the firs seldom exceed the size
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of ordinary bushes, while the larches have generally become trees from twenty to thirty feet and upwards in height. A small black insect, which has committed great depredations on the larches in some parts of Renfrew and Lanarkshires, has begun to appear in some parts of this county. It cuts holes into the tender vessels of the larch, which allow much of its sap to escape. The extravasated sap dries in the air, forming small white flakes of turpentine, resembling hoar frost, on the tender branches. The depredations of this insect are yet confined to a few particular spots. Perhaps it may relieve the trees from a plethora, or too great an exuberance of sap, and may thus ultimately produce good effects. Or the trees may be already in a state of decay, from some unknown defect in the soil on which they grow, which may induce the insect to fasten upon them. I do not feel myself competent to decide this question; but it deserves the attention of those who are skilled in the management of forest trees.

If we suppose larches to be planted at the distance of six feet asunder every way, upon land of medium quality, and at proper intervals, to be gradually thinned, first to twelve, and then to twenty feet asunder every way. This will leave 130 trees upon the Scotch acre. These, at the distance of forty years from the time of planting, will average thirty feet of solid wood; which, at 2s. 6d. per foot, the medium price of such wood, will amount to L. 487, 10s., the value of wood upon a Scotch acre; or to L. 12 : 3 : 9 of annual return for each acre so planted with larches. It is generally understood, that if the plantation be of considerable extent, the thinnings of the trees will defray all expences of planting and inclosing, together with interest of money, while it is in advance. I have been assured, that Scotch firs, if planted on the same or similar land, would not return above 25s. or 30s.

per acre annually, if treated in the same manner; and after paying all expences, with interest, while the money is in advance.—It is with good reason then, that in all our later plantations, larches are generally preferred to Scotch firs. Another circumstance may contribute to give larches a decided preference over Scotch firs, that I have been informed, the bark of larches is preferable to that of oaks, in the tanning of leather*.

Besides larches, the planting of hard wood, as it is here called, has long been a general practice. This term comprehends

* It is generally supposed, that larches were first brought to this country by one of the Dukes of Athol, about eighty or ninety years ago. But I saw three larch trees, of extraordinary size and age, in the garden near the mansion-house of Lockhart of Lee, on the northern banks of the Clyde, a few miles below Lanark. The stems and branches were so much covered with lichens, that they hardly exhibited any signs of life or vegetation. The account I heard of them was, that they had been brought there, by the celebrated Lockhart of Lee, who had been ambassador to Oliver Cromwell, at the court of France, soon after the restoration of Charles II. After Cromwell's death, thinking himself unsafe, on account of having served an usurper, he retired some time into the territories of Venice. He there observed the great use the Venetians made of larches, in ship-building, in piles for buildings, in the construction of their houses, and other purposes; and when he returned home, he brought a number of larch plants in pots, with a view to try if they could be gradually made to endure the climate of Scotland. He nursed his plants in hot-houses and a green-house, sheltered from the cold, until they all died, except the three alluded to. These, in desperation, he planted in the warmest and best sheltered part of his garden, where they attained an extraordinary height and girth.

My ingenious and accurate friend, George Robertson, Esq; in his Survey of Kincardineshire, p. 305, states, that—"Small branches [of larch] of the first year, twelve or fifteen inches long, have been planted in moist earth, early in the spring, and have taken root, and grown vigorously. Should this experiment, (which was in some degree the work of chance) succeed always, what an easy mode of acquiring plants! At any rate, it must be very easy to make the trial."

It must certainly tend much to facilitate the raising of this tree, if it be found to grow from slips, as well as from seeds.

comprehends all sorts of deciduous trees, as oaks, ashes, elms, planes, beeches, poplars, &c. &c. Among the hard wood, Scotch firs are generally planted, in order to shelter the young trees, and cause them to send up tall and straight stems. For this purpose, spruce and silver firs are now generally preferred, as they grow more rapidly, and yield more shelter. They are also much more ornamental, and for this reason are frequently planted in gentlemen's parks and pleasure grounds. It often happens, that through neglect, the firs that are planted among hard wood, are allowed to smother, in place of sheltering it; or if the deciduous trees should succeed in their struggle for air and light, their stems are so slender that they cannot support their tops, after the firs are removed. This has induced many to plant the deciduous trees in large clumps by themselves, after they have attained such an height in the nursery, that they are in no danger of being suffocated by the grass which grows around them. If any firs are used, they are generally arranged in a row, or belt, around the outside of the plantation.

The time of planting is generally from the fall of the leaf, in open weather during winter, until the buds begin to swell in spring. Some think early spring planting best; but when there is much of this work on hand, it must be done when opportunities offer. From 2000 to 3000 seedlings are planted upon a Scotch acre; exposed land requiring double the number of seedlings that are necessary for sheltered land. For good sheltered land, one year's seedlings, that have been two years transplanted, answer best. Scotch firs are commonly planted by raising an angular clod with the spade, thrusting down the roots of the plant, and then pressing the clod, with the foot, into its original position. For all other sorts of trees, the method of planting, by pitting, is esteemed the best. When the subsoil is hard and imper-

vious, the bottoms of the pits are sometimes loosened by the tramp-pick. The greater proprietors have nurseries of their own, from which they plant out a certain proportion annually. Others purchase the plants from public nurseries in the neighbourhood of towns, and employ persons to plant them by days wages. In some cases this work is done by contract, and the price varies according to circumstances. They are not always sufficiently careful to make such drains as may discharge superficial, and other water, from plantations. For this purpose, some recommend to form the land into drills by laying two furrows together by the plough, and to plant the young trees on the tops of the drills. But we have not learnt that this recommendation has yet been adopted. In some cases, willows, and allers, are planted in marshy grounds, that had previously been thrown into lazy beds.

In many cases, plantations are secured by stone fences and it costs much more in proportion, to inclose a small plantation, than one of large extent. But on barren moorlands, the fence most commonly adopted is a deep ditch, and mound of earth, faced with a turf wall, on the top of which a row of whins or furze is sown. When there are no sheep, this fence generally suffices until the plantation be beyond the reach of injury from cattle.

In some cases, about twelve years after planting, in others about twenty, the plantation receives the first weeding; after which young cattle are generally admitted, and the pasture, ever after, may be worth from 5s to 10s. per acre. In some cases, Highland cattle, which had not been accustomed to be foddered or housed, are wintered and fed in plantations. In others they are let for wintering sheep from the Grampians. After the first thinning, the plantations continue to be gradually
thinned

thinned from time to time, until the trees which are left to attain their full size, be at the distance of about twenty feet from each other. It is generally understood, that the thinnings defray all the expence of planting and inclosing the ground, with interest; and in favourable situations, somewhat more. The tallest and straightest sticks are exported to the south of England, to serve as hop-poles. Much of the wood is consumed as fuel, for which, in a country destitute of coals, and whose mosses are nearly exhausted, there is a great demand.

In the parks of our nobility and gentry, there are many tall and stately trees, of unknown antiquity. There are also some very large old trees, near the sites of farm-houses; often in high and exposed situations. Whether these be the remains of ancient forests, or if they have been planted there singly, we cannot take upon us to decide. But it seems difficult to account for detached trees attaining such size, in such situations, unless they had originally been part of a large body, where they might shelter each other. All the trees in the county, which are exposed to the wind, lean, more or less, from the south-west, towards the north-east. This shews the prevailing current of the winds to be in this direction; which is indeed the case in all parts of Scotland, if not also of the British isles.

To enumerate all those noblemen and gentlemen who have adorned their estates, and the county at large, with extensive and thriving plantations, would be a tedious and unnecessary task; and where all have made exertions suited to their circumstances, comparisons would be odious. Owing to the high price of wood, this improvement, in place of relaxing, is still going on with increasing activity. Several tracts, which had been originally planted with Scotch firs, have been trenched and converted

verted into corn land. Or the firs have been cut down, and more valuable trees planted in their place. We may here remark, that the Scotch fir is not only the least valuable, of all trees, but that it adds less fertility to the soil on which it grows, than any other sort. In this it is far surpassed by the larch, which drops its leaves annually, and thus helps to fertilize the soil. The oak, and other deciduous trees, from the great quantity of leaves they annually drop, tend most to fertilize the soil, by the accumulation of vegetable mold upon its surface. Hence the Americans always avoid those soils which carry firs, and prefer those who carry the largest oaks. The leaves which had dropped and rotted on such soils form a manure which had been accumulating for ages, and which enables the ground, after it is cleared, to carry luxuriant crops, without any other manure.

Owing to the annual extension of plantations, it is difficult to assign the proportion of surface planted at present. But from Mr Ainslie's very accurate map of the county, it appears that in 1792, there were about 15,764 Scotch acres of plantations in the county, and this without taking into account small clumps, hedge-rows, or detached trees. Since that time, there cannot be less than 5000 additional acres planted, though many of the later plantations are not yet so far advanced as to attract the notice of the traveller, so as to admit of calculating their extent. This brings the whole plantations of the county to 20,764 acres, which are annually increasing.

BOOK XI.

WASTES.

By this term we mean lands which have never been cultivated, but which might be reduced to cultivation with advantage. With regard to high mountains, such as abound in the Grampians, and many parts of the Seedlay ridge, these are either so much encumbered with stones and rocks, or are so much elevated above sea-level, that they must be allowed for ever to remain in their present state. But many of the declivities of these mountains, as already hinted, might be planted with advantage, and many tracts might even be subjected to the plough.

In England, waste lands are commonly understood to mean lands that are not only uncultivated, but which are common to different proprietors and their tenants. In this county there is hardly any such thing as waste lands in this sense of the term, as almost all the commons have been divided among the contiguous proprietors, so that each has his share lotted out. But in this country, the division of commons does not necessarily

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ly imply an obligation to inclose, and cultivate, the lands so divided.' There are, accordingly, waste lands in this county which were formerly commons, and though they have long ago been divided, they have neither been inclosed nor cultivated. But it is in the power of any individual proprietor, when he chooses to inclose such lands, to compel the conterminous proprietors to straighten marches, and to defray one half of the expence of common fences. Much of the waste lands in the lower parts of the county, have accordingly been inclosed, and improved by planting; and this mode of improvement is still going on.

But although there be no waste lands which are common to different proprietors, we have often hinted, that among the Grampians, there are mountain pastures which are common to the sheep and cattle of several tenants on the same property, who occupy small run-rig farms in the valleys. Even in the lower and best cultivated districts, a few examples still remain, of run-rig farms being possessed by the inhabitants of a straggling village, while their cattle graze promiscuously on a contiguous tract of waste land. In such circumstances, inclosing, draining, or improvement of any kind, cannot be expected; and it would promote the advantage both of proprietors and of the public, were such lands lotted into separate farms, and the whole reduced to cultivation.

There are in the county about 191,600 English acres of land, which is not subjected to tillage, of which 20,764 are planted. But this includes the mountains, the declivities of which, as stated, might be planted; but the greatest proportion is not susceptible of any improvement. In the Strathmore and Seedlay Districts, there are considerable tracts of waste land, which are every year diminishing, being either planted or subject-

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ed to tillage. The north side of the Seedlay ridge is, in several places cultivated, or planted almost to its summit. But extensive tracts on its southern declivity remain in their natural state. In the maritime district, hardly any waste land now remains, the whole being either planted, or subjected to tillage. From this must be excepted a few jutting rocks, where there is not sufficient depth of soil to nourish trees, or to admit the plough. We must also except the sands of Monyfieth, Barry, and those near Montrose. We have stated, that where these are covered with herbage, they may be improved by watering, by lucern, or by tillage; and the latter improvement is gradually extending on those parts which are most remote from the sea. From the experiment already described, it appears also, that trees would thrive on certain parts of them. But where these sands are blown up into hills, and are moved about by winds, all improvement seems hopeless. In the whole county, the extent of waste lands which may be profitably improved by tillage, may amount to about 20,000 acres. In this are included several tracts of swampy and mossy ground; while the many tracts where planting would be the most adviseable improvement, are omitted.

In the elevated territory southward of the Seedlay ridge, there is much barren land, covered with short heath; considerable portions of which have been improved by tillage and planting. In a part of this district, situated between Auchterhouse and Dundee, great improvements have been made by the spirited exertions of Captain Laird of Strathmartine. A large tract of elevated land, which carried only heath and furze, has been inclosed and torn up by the plough; and by the judicious application of dung, lime, and marl, has been converted into excellent corn land. Handsome farm-houses
have

have been built, and luxuriant crops are produced where all was waste and desolation. The example of this spirited improver has been followed by other proprietors in that neighbourhood; and the vicinity of Dundee affords not only a ready sale for land produce, but also abundance of dung and of imported lime.

Although a farmer, at the commencement of his lease may be induced to bring a few waste acres into cultivation, unless his lease be of sufficient duration, he is generally induced to undo his improvement by severe cropping before the conclusion of his lease. But such schemes do not enter into the contemplation of a proprietor, who considers the money he has advanced as a purchase of the profit he receives, and who can let this profit to a farmer in such a way, that in place of being diminished, it may be increased at every renewal of the lease. In order to bring into cultivation what remains of the improveable waste lands, proprietors should either embark themselves in the adventure, or induce tenants, by length of tenure, and the terms of the lease, to complete the improvement. One great inducement would be, to allow selling or subsetting; and thus, after a farmer had sunk a capital in improving one farm, he might recover, and apply it in the improvement of another. The effect of this would be to create two sorts of farmers, namely, *improving* farmers, whose object it is to bring land into a productive state; and *ordinary* farmers, who merely keep up, or increase the productiveness of land already cultivated. The more the division of labour is attended to in the management of land, and the more encouragement there is held out to invest capital in the melioration of the soil, the more will the permanent prosperity of the nation be increased.

Mr Cruickshank of Strickathro has effected very extensive improvements on waste land, in the following manner. After completely draining a field, he ploughs it five times before sowing. The first and second furrows are about fourteen inches deep, and are drawn by six or eight strong horses or oxen. The remaining furrows are not much above the ordinary depth. When the field is to be sown, between 50 and 70 bolls of lime shells are slacked, and spread on the surface of each acre, and are well incorporated with the soil by frequent harrowing. After such treatment, a considerable return is generally reaped; and the land is afterwards subjected to a regular rotation of cropping, with putrescent manure in its course.

The late Mr Drocket, farmer at Flemington, near Aberlemno, adopted a very singular mode of improving a field of waste land, which was covered with stunted heath, and moss plants. He first ploughed with a shallow furrow, and then cross ploughed, to cut the furrows into pieces. These clods being laid up to dry, were carted home, and used as fuel in his kitchen and out-houses. The earthy ashes they left were carefully preserved, and equally spread over the whole field, which had been subjected to a winter and spring fallow. Part was planted with potatoes, and part sown with turnips, which were excellent crops. The field was afterwards subjected to the same rotation with the other lands of the farm. But excepting on mossy and swampy grounds, we entertain doubts of the propriety of paring and burning, as a mean of improvement. This, however, is so uncommon a mode of conducting this process, and though laughed at while it was going on, it proved so abundantly successful, that we thought proper to describe it.

Patches

Patches of waste land are daily bringing into cultivation by tradesmen, who obtain long leases, or perpetual feus of such lands. Near Arbroath, there is an extensive moor, of a strong clay soil, which was formerly planted with Scotch firs, but is now nearly all reduced to cultivation, by gentlemen who have feued lots of it and have built elegant and commodious villas upon their several lots. They pay L. 10 per acre in advance, and 40s. per acre in perpetuity. It costs about L. 4 per acre to trench, and remove the fir roots and stones. After which the land receives a strong dose of lime and dung from Arbroath, and carries excellent wheat or oats the first year. In other situations the cultivators pay nothing in advance, but they get the land at 20s. per acre the first nineteen or twenty years, with option of converting their tenure into a perpetual feu, at 40s. per acre, at any time before the first tenure expires. This mode of improving land is rapidly extending in the neighbourhood of towns and villages, where waste lands still continue on which to operate. When these persons operate upon land that had previously been planted with Scotch firs, they first tear out the roots with the spade and tramp-pick; and the roots of these trees make much better fuel than their trunks or branches, which is an inducement to hole them out. They next plough the land, and it sometimes yields from four to five bolls of oats per acre, without any manure. But, in general, they first trench the land all over with the spade, which enables them to clear it of stones as well as roots; though it brings up a sterile subsoil. They next apply what marl or lime they can procure, and reap from five to six bolls of oats per Scotch acre. Their next crop is generally potatoes with a part turnips, or green kail and cabbages, with

with dung. After which follows barley, or wheat, with clover.

Many gentlemen have reduced into cultivation extensive tracts of waste or unproductive land, by draining, and afterwards subjecting them to skilful husbandry. Their example has been followed by many farmers; some of whom have drained, or embanked, tracts of swampy land, which yielded luxuriant crops during many years, without any manure.

When we stated, that a great proportion of the mountainous districts admitted of no improvement, we meant to restrict the observation to improvement by tillage, for the production of corn. But any mountain whose sides are covered with a sufficient depth of soil, may admit of having the quantity and quality of the herbage it carries, improved to a certain extent, provided the scene of improvement have a favourable exposure, and do not exceed 1500 feet above the level of the sea. We already stated the improvement that would result from first draining, and then causing water to trickle over land that is extended from the bottoms and sides of hills; and the improvement of the pasture, as well as shelter, which would be effected, were furze made to grow even among the rocky precipices of the mountains.

In the mountain ranges of the south of Scotland, which are chiefly occupied by sheep, great pains have been taken to drain their pastures by means of small ruts or ditches, dug with spades, across the sides of the mountains, so as to intercept and discharge the water which trickles down their sides, and which soaks and renders miry the pastures lower situated. Where springs break out, they are conducted into burns, or natural discharges of water, by similar drains.

At

At one period, I superintended operations of this kind, on a large scale, in the upper part of Lanarkshire, at an elevation of 1500 feet, and upwards, above the level of the sea. Very wet and sterile moorlands, had furrows drawn across them, in a slanting direction, at regular distances, with a draining plough, aided in some cases with the spade. Before this was done, sheep were always plashing up to the bellies in water on these moors; but this operation rendered their pasture dry and wholesome. A piece of very wet, mossy, and moorish ground, at 1000 feet elevation, of 17 acres and upwards, was cut by the same plough into stripes of 12 or 14 feet broad, resembling ridges. The fur-slices were dried, burnt, and the ashes spread over the natural herbage, that remained untouched. A considerable part was also top-dressed with lime. The consequence was, that this field threw up a luxuriant crop of nutritive grasses, mixed with white clover. Another field, of from 30 to 40 acres, and from 1100 to 1200 feet above the level of the sea, of a very sterile till soil, in several parts mossy, and covered in some parts with rushes, in others with heath and moss plants, was subjected to drill fallow, after the method invented by Mr John Mackenzie of Glasgow, only so far that all the land received one stirring. It was then left in drills, and, as far as I know, still remains in this form. In course of the next and succeeding year, this field threw up the most palatable and nourishing grasses, with such a mixture of white clover, that from a distance it seemed sprinkled with snow. It now forms a valuable pasture for sheep or cattle, and it received neither seed nor manure of any kind.

My ingenious friend, Mr Steele, writer to the Signet, Edinburgh, has made many improvements upon his sheep-pastures, situated at the highest elevation on the

road

ed between Edinburgh and Lanark. He first ranches, so as to take off springs, and drain the swampy lands extending from the bottoms of the hills. With regard to the hills themselves, he has run slope drains across them, so as to intercept, and convey into the lower tracts, the superficial moisture, along with any springs that may break out. The subsoil is a red friable earth, formed from the decomposition of red sandstone rock; and he finds that this earth, being shovelled from the bottoms of the drains, and scattered upon the moorish surface, extinguishes moss plants, and encourages the growth of nutritive grasses. The drains are such as not to injure sheep and lambs; and the pasture, from being rendered dry and wholesome, must long continue to improve.

From these facts, it may be seen, that the natural herbage of mountain pastures may be very much improved, both in quantity and quality; while the sheep which browse upon it, are relieved from those diseases which arise from dampness and unwholesome herbage.

The only improvement that has yet been attempted on the natural pastures of the Grampians, is burning the heath; which has been too much discouraged, on the foolish notion of preserving the game. There are extensive tracts on the sides of these mountains, where there is no visible herbage, but heath, and *sphagnum palustre*, and other moss plants. It occurred to me, that after these are burnt off, it might be useful to scatter the seeds of the most nutritive grasses which grow naturally in these situations. These would take possession of the soil; and were its dampness removed, by any of the methods already detailed, the moss plants would not so easily recover their dominion.

It has been already observed, that the tillage lands of the county, from the agricultural system which generally prevails, are in a progressive state of melioration; or at least, are not becoming less productive than they were formerly. The importance of reducing all our waste lands, that are capable of improvement, into a productive state, has often been insisted on by political writers, as a mean of employing more hands in agriculture, and of affording a greater surplus of land produce for sustaining our increasing population, so that we may cease to depend upon foreign, and even hostile nations, for the necessaries of life. At no period of the British history were these considerations of more urgent importance than at present; and had only half the money that has lately been expended in purchasing foreign grain, been laid out in improving our own lands, this nation would have been independent of the world for provisions. It would also be sound policy in this nation to aim at being independent on foreign nations for wood; and the larch tree, which thrives in the stony glens of our mountains, and in many other situations, to which the plough cannot have access, seems to promise, if duly multiplied, in time to effect this independence.

Mosses.

We formerly stated, that among the Grampians, the mosses which furnish peats and turf, are chiefly situated in hollows, near the summits, or on the elevated sides of the mountains. In Strathmore there are various sheets of mossy ground, from which peats of no great value, are occasionally dug. The moss of Restennet, which was drained for its marl, has long supplied the town of Forfar, and neighbourhood, with good peats; but is nearly exhausted.

exhausted. In the parishes of Auchterhouse, Kirriemuir, Airly; and in the district of Caerbuddo, and several other places, there are considerable mosses, which yield good peats, and must be reserved for fuel. All the other mosses may rather be considered as swampy grounds, consisting of a thin stratum of moss, mixed with alluvial earth, than as mosses adapted for fuel. Though necessity may occasionally induce people to take a bad sort of fuel from them, we have classed them along with those waste lands, which being completely drained, are better adapted for tillage than for planting. We stated, that about fifty acres of this swampy sort of ground, has lately been drained and put under tillage, to the north of Forfar. The intelligent Colonel Kinloch, has adopted a very singular mode of disposing of the moss which covers his marl, formerly described, on his property of Logie. This moss has such a mixture of alluvial earth, that it is scarcely inflammable. He uses part in composts for his solid land. As his drain reaches the bottom of his marl, he places the moss in a regular bed, on the space that was occupied by the marl, after the latter is removed. Here it must form a soil of extraordinary fertility, and, in fact, resembling a compost midden. Thus, what was formerly a shallow useless lake, after the marl is removed, will be converted into a most fertile field*.

There is, therefore, very little occasion for recommending moss improvements in this county, because such tracts as go under the name of mosses, excepting those reserved for fuel, after they are completely drained, generally become solid land, which can bear the tread of cattle, and may be subjected to the plough.

* See Appendix, E.

 IMPROVEMENTS.

 SECT. I.

DRAINING.

THIS is the first and most necessary of all improvements, without which, manures and labour upon land, are absolutely thrown away. The water which infests land is either superficial, or what breaks out from springs. The superficial water is that which falls from the heavens, and remains upon flat or hollow surfaces, until it either sinks through the earth, or is evaporated into the air. Or it descends from higher grounds, along an extensive declivity, and soaks, and renders miry, the lands lower situated. Superficial water is discharged from flat grounds, by forming the land into ridges; and when it descends along a declivity, it is intercepted, and turned aside, by open ditches. When it accumulates in hollows, in a ploughed field, the best way of drawing it off is by what is provincially called a *slope gaa*, or drain, which does not interrupt the plough. Or such hollows may be filled up, and have their surface raised, so as to discharge

the water, by throwing into them earth from such eminences as may occur in the field.

Water which breaks out from springs, is commonly drawn off by covered, or concealed drains. Such springs arise either from the solid strata of the earth below the land, or they rise from beds of sand, interposed between two beds of clay, in the subsoil. It often happens, that knolls of sand and gravel, imbibe rain-water, which is thrown out in the form of springs, at different points around their bases. Sometimes a porous or puffy soil, rests upon a retentive clay bottom, and the water which falls upon the upper part of the field, trickles along this bed of clay, and renders the lower parts miry and unproductive.

In draining land, it is of great consequence to ascertain the source from which the water flows; as, without this, it often happens, that the drains do not answer the purpose, and the expence is thrown away. When water rises from regular beds of sandstone rock, or from sand interposed between beds of clay, it often happens, that a single drain, run along the outburst (as it is here called) of the springs, is sufficient to draw them off. But there are extensive tracts of soil here, which rest upon whinstone, or what is provincially called *scurdy rock*. Though these soils, where of sufficient depth, be generally of good quality, they are often much infested with springs, which require great labour and expence to drain. This rock is very full of cracks and apertures, from which water issues, and almost every eruption would require a separate drain.

Much has been done, both by proprietors and farmers, in the way of draining, and much still remains to be done. Some proprietors employ professional men to plan and mark out the drains necessary upon the lands

in their own possession, and some have drained their whole estates by the assistance of such persons. This is especially the case with the estate of Idvies, in the parish of Kirkden, where Mr Baxter, the proprietor, has executed all the main or principal drains, in a very superior style, and has caused the lesser drains to be marked out, and to be executed by the farmers at their leisure. Mr Ford, upon his estate of Finhaven, parish of Oathlaw, and many other proprietors, have set a laudable example in draining, and making other permanent improvements upon their estates.

When open drains are thrown around fields, they are generally about four feet wide at top, from three to four feet in depth, and about two feet wide at bottom. Sometimes such drains are made to serve the purpose of fences, and, in such cases, they are often sloped on the outside, like a glacis; the turf being built into a perpendicular facing, about a foot within the interior edge of the ditch, and the earth heaved up into a mound behind. Sometimes a thorn-hedge, or one of furze, is planted on the top, or stuck into the side of this mound. The external side of the ditch, being sloped, prevents cattle from attempting to leap over the mound.

Concealed, or covered drains, are generally made three feet in depth, one foot wide at bottom, and two, or two and a half feet wide at top. If the subsoil of drains be hard, or tenacious, it is first loosened by the tramp-pick, for which this instrument is well adapted; and then it is thrown out with the scoop spade. The sorts of drains most commonly used here, are called *box-drains* and *rumbling syvers*. When several rows of springs are seen to ooze out of a field, a large box-drain is led up through the centre, or across its declivity, from which arms are extended on each side, so as to cut the ground immediately

Immediately above where the springs are seen to break out, and the arms, or branches, as they are not required to hold much water, are commonly rumbling syvers. The box-drains often receive all the water collected from an extensive surface, in which case they are of proportional dimensions, sometimes a foot square, or upwards, and discharge a very copious stream. From the great abundance of flag-stones in this county, box-drains are often paved below, to prevent moles from choaking them with earth; they are built up with square stones at the sides, and covered with flags above. Over the flags, rounded stones are thrown, which are gathered from the land; and above these, either the grassy turf inverted is placed, or a stratum of straw, rushes, or twigs of broom, to prevent the earth from falling in. The remainder of the drain is filled with earth, to the depth of twelve or fourteen inches, so that the plough cannot reach, or disorder its structure.

When a box-drain is not required to discharge much water, it is often made by placing a row of stones on one side of the bottom, and a series of flat stones inclined upon these, so as its section is a right angled triangle, within which the water moves. The upper parts are filled as in the former case.

The rumbling syver is made by filling the drain to within about fourteen inches of the surface, with rounded stones gathered from the land. Over these grassy turf, straw, rushes or twigs of broom are placed, and the remainder of the ditch is filled with earth. Sometimes these drains are filled with broom, furze, thorns, or branches of trees, which are forcibly trampled down with the feet; and the upper parts are finished as already stated. Such drains will last from fifty to one hundred years; and from their cheapness, they seem particularly

particularly advisable for porous and puffy soils, on a retentive clay bottom. In order to remove the dampness of such soils, from which the rust of wheat appeared to derive its origin, in so far as the long immersion of its roots in water can be supposed to have contributed to this effect, it is not necessary to make drains of the depth and dimensions usually employed for drawing off deep seated springs. It seems only necessary to cross the field with parallel ruts, so situated as to draw off the water, which might even be scooped out with the draining plough. Faggots of broom, or of any other sort of brushwood, being sunk so deep in these ruts, as to be below the reach of the plough; would answer all the purposes of concealed drains, to draw off the water; so that such fields would no longer be subterraneous lakes during moist weather. If a sufficient number of these ruts are made, the faggots placed in them need not be of greater diameter than a man's arm.

In the eastern glens of the Grampians, considerable progress has been made in draining and other improvements, because the generality of the farmers there have not only separate farms, but long leases; and making such improvements, to a certain extent, was one of the conditions on which their leases were granted at moderate rents. In the western glens, draining is still more obviously necessary, but cannot be expected from farmers who have mixed possessions, and whose leases are only from seven to nine years. Along the foot of the Grampians, and in the hollow of Strathmore, there are numerous tracts of swampy ground, which call loudly for draining. The same observation applies to many hollow vallies among the Seedlay Hills, most of which were formerly lakes. Many of these have been so far
drained

drained as to draw the water from the surface; though it regurgitates upon some of them during wet weather. Were the main outlet made a few feet deeper and broader, and were concealed drains thrown round the margin of such vallies, where the springs break out, these unseemly swamps would be converted into very fertile land. In the maritime district, very little remains to be done in the way of draining.

As this is a permanent improvement, of much more value to proprietors than to farmers, it is manifestly incumbent on the former to take an active part in its execution. They ought to advance the necessary expence, and charge interest on the tenants for the money so advanced. When leases expire, they will find money so expended, amply returned by the rise of rent. The landlord's interest consists in having such drains finished in the most substantial and most effectual manner. But if this work be wholly left to tenants, it occasions a great diversion of their time and capital; and they have no interest in any improvements, the effects of which may survive the period of their leases. The public have also an interest in the complete drainage of wet and marshy grounds, as it is demonstrable that these render the climate colder; and the vapour they throw up into the atmosphere, is often returned in hoar frost, which carries blight and destruction among the neighbouring crops.

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SECT. II.

PARING AND BURNING.

THIS mode of improving waste land, excepting in the case of Mr Drocket of Flemington, formerly described, as far as I have been able to learn, has never been practised in this county. On the Grampian mountains, as stated, shepherds usually burn a portion of the heath early in spring. But I entertain very strong doubts of the propriety of paring and burning thin shallow soils, whether they be incumbent on a sandy or clay bottom. Such a practice must soon effect the utter destruction of the vegetable matter in such soils, and reduce them to total sterility.

The only soils where this practice seems at all advisable, are swampy grounds, composed of a great depth of mossy mud, mixed with alluvial clay, which we recommended as proper for trying the growth of hemp. Perhaps also lint would thrive well on such soils, after being pared and burnt.

SECT. III.

EMBANKING.

IN this county, there is very little opportunity for this improvement on a great scale. Many farmers have straightened the courses of rivulets, filled their old chan-

nels with stones and earth, and embanked them so as to prevent them from spreading on their haugh grounds. The only great embankment that the county admits of, is in the bason of Montrose, which was nearly completed by a Dutchman, but is wholly in ruins. Having already detailed our ideas concerning this great improvement, at considerable length, it seems unnecessary to repeat what has already been stated.

SECT. IV.

TRENCHING.

TRENCHING with the spade is the mode most generally adopted for bringing waste land into a state of cultivation, especially if the land had been previously occupied by trees, or encumbered with stones. But it often happens that a very sterile subsoil is brought to the surface by this operation, while the vegetable mold is thrown down below the reach of the roots of plants. Hence land that had carried trees, after the roots are holed out, and the ground once ploughed, has been known to carry a better first crop of oats without, than the trenched land with manure. Trenching, however, has one advantage, that it immediately gets rid of stones and tree roots, and lays the land into the best state for future cultivation. After the sterile subsoil is sufficiently meliorated by exposure to the air, and the application of manures, it acquires great fertility; and trenched soils are distinguished by their depth, and their adaptation to deep rooted, as well as to corn plants.

Red

Red clover, in particular, thrives well on trenched soils. Trenching also renders soils, of a retentive clay bottom, fit habitations for potatoes, turnips, carrots, and other large rooted plants.

SECT. V.

MANURING.

WE have already hinted a probability that the soil discharges functions towards plants, somewhat similar to those which the stomach performs towards animals; that is, it prepares their food, and adapts it for being absorbed by their roots. For this purpose a sufficiency of moisture is necessary, neither too much nor too little, with heat imbibed from the sun's rays, and contact of atmospheric air. In fact all those requisites are necessary that are known to promote the putrefaction of animal and vegetable substances. The preparation of the food of plants in the soil, seems to be nothing else but a continuation, or rather a completion of this putrifying process. Now putrefaction is ascertained to be a sort of slow inflammation, during which water and carbon mutually decompose each other, atmospheric air is absorbed, and new products are formed, which appear in the shape of aerial or elastic fluids. These aerial products combine with that portion of the water which remains undecomposed, and which, from the great heat of the soil, exceeding generally 120° of Fahrenheit, is so far attenuated, that it is expanded into a vaporific state of no great elasticity. This compound of aerial and of watery vapour, is entangled in the soil, as carbonic acid gas is retained in yeast, until it can be absorbed by the roots

of

ts. If any of this escape, it may be partly absorbed by the lower surfaces of their leaves, which are to absorb gases when they are combined with

roof of what is here suggested, chemists have discovered that those soils are always the most fertile, by distillation, yield the greatest proportion of inflammable air, or carbonated hydrogen gas. Subject of manures, therefore, must be to throw such substances into the soil, as, with the aid of heat and fire, may be elaborated into this gas, which, with oxygen, seems to be the principal food of plants. This seems to receive still farther confirmation, by following this food after it is absorbed by the roots of the

The sap in those plants which yield it most copiously, is always found to be in a frothy state, and mixed up with innumerable air-bubbles, which probably consist of this aerial fluid, combined with water, and a mucilage. When this frothy sap is presented to the action of light, in the external vessels of the leaves, a part of the water perspires into the atmosphere; another part, together with the aerial fluids combined with it, is decomposed; oxygen gas is emitted, while its combustible basis combines with the other ingredients of the sap, forming vegetable fibre, and what is called the peculiar juice of the plant. This peculiar juice decays again by a particular set of vessels, through all parts of the plant, and is elaborated by organs, somewhat analogous to the glands in animals, into those peculiar products which distinguish the several parts of the plant. Subject of manures, then, is to furnish food for plants; or rather the raw materials from which their food may be prepared in the soil.

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The soil not only serves the purpose of a stomach, to receive and prepare the food of plants, and to retain it for their use; but, as far as we know, it yields a part of their sustenance from its earthy ingredients. Silica, or flinty earth, abounds in all soils; and this earth is found in the ashes of all plants. Thus silica abounds in the outer coating of straw, and of the skins and husks of grain. Alumina, or pure clay, is also found in the ashes of plants, and seems not to be confined to particular parts, but to pervade their whole substance. Lime and magnesia are also found in every part of plants. It is true, chemists entertain strong doubts whether these earths be actually absorbed by the roots of plants; and they seem rather inclined to be of opinion, that like lime in shells and in the bones of animals, these earths are elaborated by the vegetative powers of the plants themselves. The greatest difficulty is with silica, which is wholly insoluble in water, and alumina, which can hardly be called soluble. But since the illustrious Mr. Davy has demonstrated that earths are metals combined with oxygen, it is possible they may enter plants in their pure or metallic state, in which state they are liquid at low degrees of heat, and extremely volatile. Thus the soil may not only be a sort of chemical laboratory, in which the manures that are thrown into it are decomposed, and new compounds formed for the use of plants; but part of its own earthy ingredients may be subject to a similar decomposition, for the same purpose.

Another use of manures, is to change and modify the texture of soils, so that they may most effectually discharge their functions in preparing, retaining, and readily giving out to the roots of plants, the food which is adapted for their nourishment.—It has often been observed, that silica, or flinty earth, is by far the most abundant

tant ingredient in the rocks and solid parts of our globe. Were all soils wholly composed of this earth, they would be like the blowing sands of Arabia, which could neither retain moisture, nor any other food of plants; nor could they hold their roots with sufficient firmness to enable them to rear their stems and branches into the air. But in mercy to his creatures, the supreme Architect has mingled in the mass, a sufficient proportion of alumina, or pure clay, an earth of very opposite qualities from silica, which forms a tenacious paste with water, and binds with it into a very hard body. When there is too much clay in the composition of soils, they are subject to a defect the very reverse of what takes place when there is too much sand or silica. They bind with water into a hard mass, through which the roots of plants cannot penetrate in quest of food; nor can the atmospheric air act upon the putrescent substances, so as to promote those decompositions, and new compounds, which are necessary for the sustenance of plants. On the other hand, soils which contain too much sand, do not retain sufficient moisture; the putrefactive process is in them by far too rapid; and its products, which should go to nourish plants, are thrown out, and dissipated in the air. We may hence see the propriety of the old adage.

‘ Lay clay on sand, and you buy land.’

Of all clays those are the fittest for this purpose, which contain a proportion of lime, as this insures against containing any mineral salts which may be poisonous to plants. The converse of this adage is also well founded, and I have known the best effects result from laying river sand upon strong tenacious clay soils.

Independent of the suitable proportions of clay and silica in the composition of soils, their fertility is very much increased by adding a sufficient proportion of

lime, magnesia, and the other primitive earths. These, beside being themselves manures, as we shall endeavour to shew, tend to improve the texture of soils, so that they can more effectually discharge their peculiar functions. The proportion of lime necessary to render a soil completely fertile, is not known, but it depends upon the quality of the soil to which it is applied; clay soil requiring more, and sandy soil less of this ingredient. Thus a fertile soil cannot be formed from one or two, but must contain a mixture, in due proportion, of several of the primary earths. This is conformable to the practice of the Chinese and Japanese, who, I have been assured, apply earths of opposite qualities, as manures to their cultivated soils. Vegetable mold, or the earth formed from the decomposition of animal and vegetable substances, is apt to become effete and unproductive, when allowed to accumulate too much in particular spots. But when mixed with soils in whose composition the mineral earths predominate, it renders them highly fertile. This earth contains a portion of unchanged vegetable and animal fibre, and hence it deflagrates with nitre, though it does not burn in the usual way. It hence seems to act partly by improving the texture of such soils, and partly by their promoting the decomposition of the vegetable matter which remains unchanged. This mold is carted from the old Monastic gardens of Arbroath, and from other towns, with a view to improve hungry soils in the country. As this vegetable earth improves such soils, so a mixture of the mineral earths would improve soils which have become effete by an over proportion of vegetable mold.

MINERAL MANURES.

Lime-Marl.

Great quantities of lime are imported at Dundee, at east and west Haine, and at Arbroath, partly from the Frith of Forth, but chiefly from Sunderland, for the purposes of building and manure. The neighbourhood of Montrose, and the north eastern parts of the county, are chiefly supplied with lime from the Budden and Heatherwick quarries, formerly described; and from those in Logie Pert, Strickathro, and towards the north of Brechin. The coals employed in burning this limestone into lime, are chiefly small coals, imported from the coaleries in Fifeshire, into the harbour of Montrose, and from thence carted to the places where they are used. Pure limestone, that is what contains no other mineral earth but lime, loses more than one half of its weight during the burning process. The parts expelled consist of carbonic acid and water of composition, which formed a part of the solid stone; though the heat causes them to assume the state of elastic vapour. It may hence be seen of what importance it is that lime should be well burnt; for if this process be imperfectly executed, though in slacking it should crack and split into small pieces, it never will resolve into that impalpable powder, which is most favourable for mixing with the soil. By exposure to the air, the lime soon recovers the carbonic acid and water which had been expelled by the fire. Though these increase the weight, they do not add to the value of the lime. The farmers here seem well aware of this circumstance, and endeavour to cart home the lime they use, as soon as possible after it

comes out of the kiln. If any remains uncartered, it should be covered as much as possible from rain, and excluded from the air.

The quantity of lime, applied to an acre, depends very much on the quality of the soil; tough clays requiring much more than friable sandy soils. Upon strong clay soils, from fifty to sixty bolls of shells, wheat measure, after being slacked, are sometimes applied to a Scotch acre. This quantity of shells will yield from 150 to 180 bolls of slacked lime. But it must be understood that such large quantities are only applied when the land is first dressed with this manure. A subsequent dressings, about the half, or even less than the half of this quantity is used. It is generally applied to fallow, or when the land is torn from a state of nature. To light friable soils, much smaller quantities are applied, and these are varied according to the opinion entertained by the farmer of what the soil may bear with advantage, and without risk of injury.

It was formerly stated that there are large beds of sea-shells, in the lower parts of the parishes of Barry and Panbride, and in different places along the coast; and I have not been able to learn that any of them were ever used as manure. In many cases these shells are reduced to small particles, so as to be fit for this purpose. Where they are entire, they might be ground down by a stone or iron roller, moving round a hard surface, in the way bark is ground at the tan works. Or the farmer's straw yard, and the roads around his premises, might be covered with a bed of them during summer, where they would soon be broken down by the tread of his horses and cattle, and impregnated with the juice of dung. I have known the latter experiment tried successfully with oyster shells, which are more difficult to reduce than

shells in question; these being chiefly muscles and wilks. At all events an experiment of this sort is worth trying, as these shells are likely to furnish a much cheaper manure, and of greater value and permanency, than the lime which is here imported. Were even a large quantity of these entire shells laid upon the land, they would gradually moulder down, or be broken by the plough and harrows, and by the tread of cattle, so as to supersede the necessity of ever needing to apply any lime to the soil. The oldest cultivated lands near Edinburgh, having been long manured with street dung, containing a large proportion of oyster and muscle shells, bones of fishes, and coal ashes; which latter operate in a way similar to lime upon land, are already saturated with calcareous matter, so that any addition of lime does no good, but rather harm. This my late worthy friend Mr John Forman, farmer at Corstorphine, found to his cost. He had come thither from a district in Fife, where lime is reckoned the farmer's right arm, and threw away several hundred pounds in liming that farm, before he discovered that lime applied in such circumstances, did no good, but, in some cases, harm. The limestone gravel, which the Irish apply in such large quantities to their land, is another case in illustration of what has been stated. Were this gravel, or the shells with which the old lands near Edinburgh are so abundantly stored, to be immediately reduced to small particles, by burning or otherwise, so that the whole could at once be brought to act as manure, it is evident that the soil would be instantly destroyed, and would become as sterile as a heap of slacked lime, or a bed of shell sand on the sea shore. But when a soil is well stored with large shells, or with chips of limestone, these only come to act gradually, as they either dissolve in the soil, or are worn down by friction:

Thus they are a sort of magazine of calcareous matter, which only comes to act in proportion as it is needed.

Shell-marl is carbonate of lime, and possesses the same properties with limestone which has been reduced to small particles. Though its shells should be entire, they are of small size, and so fragile that they are easily reducible to powder. This marl also contains a portion of animal matter, which, when it is dissolved in acids, forms flakes, that gradually subside towards the bottom of the liquor.

Marl was only discovered in this county about eighty years ago; and it was long before farmers could be induced to use it. At last, however, they did use it, in excessive quantities, and followed its application by severe cropping, which reduced some of the lands of Bakie, and others in that neighbourhood, to a state of utter sterility, which they have not recovered to this day. This excited great alarm among proprietors, who discouraged the use of this manure; while it served to cherish the prejudices of farmers against it.—The same thing happened in some districts of Scotland, when lime first began to be applied to land. Many proprietors prohibited their tenants from using it, under severe penalties. In this county, after green crops, and sown grasses, came to supersede the old system of outfield and infield, the prejudices against marl subsided, and it began to be used extensively, and with the best effects.

The general opinion of the farmers here, is, that shell-marl answers best for sandy, friable soils, and lime for tough binding clays. The reason may be, that lime, by burning, is reduced to finer particles than shell-marl, so that it more readily penetrates and incorporates with stiff soils; and being applied in a caustic state, when it has a strong attraction for water, it may rob such soils of

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the water which occasioned their adhesion; rendering them more friable, and permeable to moisture.

The quantity of shell-marl applied to a Scotch acre, is exceedingly various, and depends much on the judgment of the farmer. From fifty to sixty bolls is the most usual allowance as a first dressing; but some give from eighty to a hundred, while others allow no more than from thirty to forty: each boll being eight cubical feet. It is commonly applied with fallow, or when the land is first broken up from a state of nature. Some think this marl is best applied upon hay stubble, or when the land is in pasture, as its clods are mouldered by frost, and bruised by the tread of cattle, so that it has time to incorporate with the soil before it is restored to tillage. This mode of application has one advantage, that it improves the pasture in the mean time, and prepares the land for returning a heavy crop when it is first broken up. For future dressings, much smaller quantities are used, sometimes not more than ten bolls per acre; and it is then generally mixed with dung, or with compost. This marl is reckoned to be more slow in its action than lime; but its effects are thought to be more permanent. This may be owing to the superior size of its particles, from which it does not so soon mix and incorporate with the soil, so as to put forth its whole strength.

Clay, or rock-marl, has never been used except in the parish of Lethnot, and places adjacent. From 200 to 300 small cart-loads are sometimes applied to an acre. This is reckoned a sufficient dose, which adds a permanent fertility to the soil. The most convenient time for applying it, is while the land is in pasture; and it should be allowed to remain one or more winters on the surface, that it may be reduced by the frost, and incorporated with the soil. It very much improves the pasture in the

mean time. We have stated, that this sort of marl abounds in various other parts of the county, where it has never been used. It is peculiarly calculated to correct the defects of puffy, porous, and sandy soils; or such as are apt to throw up broom, which abound where this marl occurs. The marly clay, studded with soft pulpy shells, found in the bason, and near Montrose, may be considered as a rich calcareous compost, particularly applicable to sandy soils, prepared for use. This and the other sorts of clay-marl, would answer well for making composts with putrescent manures.

Much controversy has taken place, both among agriculturists and chemists, concerning the mode by which lime operates as a manure. The general opinion, at present seems to be, that it only operates as a stimulus, ~~is~~ bringing into action all the dormant animal and vegetable matter already contained in the soil; but that it does ~~not~~ directly furnish any part of the food of plants. But ~~as~~ those who use the word stimulus, have not chosen to explain how lime produces the effect ascribed to it, the use of this word leaves us as much in the dark as we were before. Though discussions of this sort may seem foreign to the objects of this survey, I hope there can be no harm in briefly stating the ideas that have occurred to me upon the subject. They may be more erroneous than those that have been already advanced; but if they recall the attention of the inquisitive, they may prove a step in the progress towards truth. It is well known that men of science, as well as those who never think at all, are apt to be led astray by words which have acquired a fashionable currency; and they think every question settled to which they can contrive to make a plausible application of their technical terms. A French count travelled through this country, and some of the Hebrides, and found at every step volcanoes, more terrific than those

those of Etna and Vesuvius, with which he often drew comparisons, very much in favour of the Scottish volcanoes, in point of horrors. Another sect alleged, that the fire which produced these tremendous effects, was much deeper seated, even at the centre of the earth, and that the whole globe was only a thin crust, floating upon a mass of liquid lava, which every moment threatened to break out, and overwhelm all the animal and vegetable creation. Thus, between the Vulcanists and the Plutonists, a man could not pick up a pebble without seeing evident marks of fire; and the alarming cry of Fire! Fire! was reverberated from Land's End to Johnny Groat's House. Something similar to this has happened since manures came to be divided into *stimulant* and *nourishing*. The question concerning the mode by which manures produce their effects, has been declared to be settled, and all farther enquiry to be impertinent.

Here we must distinguish between lime in its insoluble or stony state, commonly called *limestone*, and the same substance in its pure state, commonly called *caustic*, or *quicklime*. In its stony state, which chemists name carbonate of lime, the lime is combined with about one half of its weight of carbonic acid and water, which are expelled by heat in the process of burning, before the lime is brought to its pure, or caustic state. Even in this state, Mr Davy has proved that lime is not a simple substance, as was formerly supposed, but that it is a metallic oxide, compounded of a peculiar metal and oxygen. But agriculturists have nothing to do with lime in its metallic state, unless we can suppose, what is not yet ascertained, that some process may be going on in the soil, by which this and the other earths are decomposed, and that they enter plants in their metallic state.

Lime, in its pure or caustic state, possesses all the properties of an alkaline substance. It changes blue vegetable

vegetable colours to green, corrodes dead animal and vegetable substances, and is soluble in water, in the proportion of 1 part of lime in weight, to about 500 parts of water. If lime water be exposed in an open vessel, it soon absorbs from the atmosphere, the carbonic acid that had been expelled from it by burning, and returns to its stony state. A white crust is formed upon the surface of the liquor, which breaks and falls down; and successive crusts are formed, until the whole lime is thrown out of solution in the water. If a stream of carbonic acid gas be conveyed by a pipe through a vessel containing lime water, the liquor instantly becomes milky, which is owing to the lime reverting to its stony state, in consequence of combining with the carbonic acid; and if the stream of gas be continued, the whole lime will be thrown from solution. This operation may be performed by blowing air from the lungs through the liquid with a straw. If the stream of carbonic acid gas be continued a considerable time longer, the lime is again dissolved, and the liquor becomes limpid and transparent. This is owing to the lime having combined with an excess of carbonic acid, forming a compound called *hypercarbonate of lime*, a salt which is soluble in water. The experiment succeeds the sooner if the lime water be put into a well corked bottle, and the stream of carbonic acid gas be conveyed through a tube inserted in the cork. This excess of carbonic acid, which occasions the solution of the lime, has but a weak adhesion to it, and is easily expelled by a moderate heat; or by spreading the liquid out to the air; or by its coming in contact with vegetables of any kind; and the carbonate of lime returns to its stony or insoluble state. It may be farther stated, that pure, or quick lime, attracts water with great force, so that their union excites a heat, which is luminous in the dark, and that pure lime, or the carbonate of lime in powder, especially if they be well
mixed

mixed with other earths, are capable of retaining a considerable quantity of water, while they freely part with that portion which does not enter into chemical union.—Having made these preliminary observations, we proceed to state,

1. That one great effect of lime as a manure, must be ascribed to its improving the texture of the soil, so as to render it better adapted for discharging its functions in preparing and imparting the food of plants.—There can be no doubt but clay marl operates more from the proportion of clay, than of lime it contains; and that it ought chiefly to be regarded as an alterative of the soil. With regard to lime, it diminishes the tenacity of clay, by absorbing the moisture which caused it to bind. For this purpose, the hotter it is applied the better. It hence renders the clay permeable by moisture, and by the roots of plants; while it causes the soil to impart more freely to their roots, the moisture it has imbibed. If there be sulphate of iron, or of alumina, or other poisonous salts in the soil, it decomposes these, and renders them harmless. Lime, on the other hand, helps to consolidate porous sandy soils, if it be not applied in excess, or followed by severe cropping; which last only serve to aggravate the defects of such soils. Perhaps for such soils, the carbonate of lime, or marl, is better than pure or burnt lime; and it should be applied when the land is in grass, or the soil thrown into grass, and allowed to rest, as soon after as possible. We already stated, that a good soil could not be formed from any one, or even two of the primary earths; and thus lime may appear to be necessary to correct the defects which are consequent on the composition of the soil. When quick lime is applied to puffy, moorish, or mossy soils, it consolidates them into a fit receptacle for the roots of plants.

2. Lime

2. Lime promotes the decomposition of such animal and vegetable matters in the soil, as would otherwise remain inert and unchanged. In this respect it may be said to act as a stimulus; but the mode by which this stimulating power is exerted has hitherto remained unexplained. We apprehend, that the effect is produced in consequence of the attraction of the lime for the gaseous products, which are evolved during the putrefactive decomposition of animal and vegetable substances. This is analogous to many other chemical processes, of which one or two may be mentioned by way of illustration. Thus, neither the nitric nor the muriatic acids, if applied separately, will attack gold: But if they be mixed, the one furnishes oxygen, to convert the gold into an oxide; while the muriatic acid readily combines with this oxide, forming with it salt of gold. Neither water, nor sulphuric acid (commonly called oil of vitriol) attack iron. But if they be mixed in suitable proportions, the water furnishes oxygen to the iron, while the acid dissolves the oxide thus formed, and converts it into sulphate of iron. In a similar way, lime seems to promote the putrefaction of animal and vegetable substances, by combining with the carbonic acid, carbonated hydrogen, and other gases which are evolved during the process; and which would not be formed, were not lime present to absorb the gasses in the act of their formation, as was stated respecting the oxides of gold and iron.

3. Lime seems to operate as a manure, by directly imparting nourishment to plants. I have often seen considerable quantities of hyper-carbonate of lime flow from composts during heavy rains, which were compounded with earth or moss, putrescent manure, lime, marl, or sea shells. The same remarks I have often made on soils that had been well limed. Dr Coventry relates a fact

fact that seems decisive of this point. A large field had been strongly limed, part after fallow, and part upon the grass when it was in pasture. The soil was chiefly a strong tenacious clay; and it was allowed to remain twenty years in pasture after the liming. When broken up, the whole lime was found to have sunk through the soil, as far as the earth had been stirred, and to form a regular crust of carbonate of lime upon the subsoil. Now the lime could not possibly have sunk through such a tenacious soil, unless it had been in a state of solution. It must therefore have been converted into hypercarbonate of lime, in consequence of combining with carbonic acid, which it either imbibed from the soil, or from the air. In this state, it would readily dissolve in water, and would be washed down through the soil by the rains. It also appears, that in its progress downwards, it had given out this excess of gaseous matter which occasioned its solution, to the roots of plants, and had returned to its stony or insoluble state. A part of the lime, while thus in solution, may enter the plants along with water; but it appears from the facts stated, that lime chiefly operates as a direct manure, by attracting and retaining those gases of which charcoal is the basis, that are generated in the soil, or which float in the atmosphere. These form but a weak adhesion to lime, and it readily imparts them, in union with water, for the nourishment of plants. We may hence see a reason for a remark that is made by many experienced farmers, that though lime should be well mixed with the superficial soil, it should never be buried deep, as it soon finds its way downwards of itself. When buried deep, it can neither attract the gasses, which nourish plants, from the atmosphere, nor from the soil; nor can it impart them to the roots of plants. It may, however, by
its

its mechanical mixture, serve to correct defects arising from the composition of the soil.

PUTRESCENT MANURES.

Farm-yard Dung.

The use of lime as a manure, is said to have been discovered, in ancient times, by an Italian statuary, who had spread the chips cut from his marble blocks, over a plot of grass, with a view to convert it into a dry area. To his astonishment, the grass grew with much greater luxuriance than before. When the fertilizing qualities of the dung of animals were discovered, is not known; but it is probable they could not escape the observation of men when they first began to cultivate the earth.

Great exertions are made by the farmers in this county, to accumulate as much farm-yard dung as possible, by wintering and feeding cattle on straw and turnips. Great quantities of dung are also carted to considerable distances from the towns, where a double horse cart-load often costs half-a-guinea and upwards. The dung is generally laid out, from time to time, on some dry part of the field, where it is to be applied, and placed in a long heap, smoothed at top, and formed like a wedge to throw off rain. In general, it is turned oftener than once, to promote its putrefaction. Very often, during the turning, it receives a mixture of earth, or of shell-marl, or of both; which are dropped along-side of the heap for that purpose. The quantity of this manure which is applied to the Scotch acre, is exceedingly various. In general, from 40 to 50 cart loads of a single horse, are reckoned a sufficient dose. But when the land is already in good condition, often from 15 to 20 cart loads are sprinkled

sprinkled for barley after turnips, or for wheat after potatoes, grass, or lint.

In one point the farmers here appear to be somewhat deficient, in so far as they are not at sufficient pains to prevent the escape of juice from their stables, cow-houses, and dunghills. My ingenious friend, Mr Reid of Ratho, near Edinburgh, has constructed large reservoirs under ground, in which he collects every drop of this juice, together with foul water of every sort from his kitchen and premises. It is conveyed to the field in a large cask, mounted on a cart, which has a long trough fixed across its hinder part, whose bottom is perforated with holes. On pulling out a plug from the rear of the cask, the juice flows into the trough; and the horse moving slowly along, it is equally distributed over the ridge. It is applied to sown grass, or to young wheat, during winter, and to other crops in spring. In summer it is made to flow into the drills on which turnips are to be sown; and part of the juice is mixed with moss, or earth, and used as compost. He derives nearly as much, if not even more benefit from this juice, than from his solid dung.

The Chinese and Japanese apply the greatest part of their putrescent manures in a liquid state. As most of their crops are raised in straight rows, they drop a little of this putrid juice at the bottom of each plant, soon after it gets above the ground. Perhaps lime might also be applied in a liquid state; and thus all sorts of manures might be made to go much farther, and to produce far greater effects than they do at present. What cannot be dissolved, or diffused in water, must doubtless be administered in a solid state.

Weeds.

I have tried several experiments with rag-weeds, thistles, docks, nettles, annuals of various sorts, leaves
of

of trees, and various green plants, which were gathered before they had formed seed. They were laid up in alternate layers, and each layer carefully covered with the richest earth that could be procured. They soon raised a great heat; and when the heap came to be turned over next spring, it could not be distinguished from the best cow-dung; the whole having resolved into a soft pulpy mass. Nor did the effects of these rotten weeds on the soil seem any way inferior.—It would certainly be a fit subject of legislative interference to prevent farmers from nursing a mass of weeds, particularly those with winged seeds. In vain shall an individual labour to clean and pulverise his land, if this only render it more easy for seeds of weeds to strike root, which are blown in upon him from all points of the compass. By cutting or rooting them out, before they run to seed, they may be converted into a valuable manure, much more than adequate to defray all the expence. Perhaps a portion of marl, or of lime, might be usefully mixed with the earth with which they are covered.

Sea-weeds.

Great quantities of these are occasionally blown in upon the sea-coast. The sort which abounds most, is that which is known by the name of *red-ware*, or *tangle*. They are chiefly used as manure for barley, the quality of which they are thought to improve. About fifty cart-loads are usually given to the Scotch acre.—Perhaps it would be an improvement to mix these weeds with earth or moss, and with sea-shells. This would enable farmers to store them up, as often as they were blown upon the coast; whereas, at present, they are seldom collected except in spring.

Whale

Whale Blubber.

This is the refuse that is left after the oil is boiled from the fat of whales. It is much used in the neighbourhood of Dundee, and of Montrose. It is always distended with a large quantity of the richest earth that can be procured. Mr Baxter brings large quantities of it from Dundee to his estate of Idvies, a distance of more than fourteen miles. He throws down an old turf fence, near the bottom of which a ditch is dug, into which the liquid blubber is poured from large casks. It is then mixed and well covered with the earth that had been thrown from the top of the fence, and left to rot. After it is well incorporated with the earth, the whole is turned over once or twice, and then it is carted to the land.

Soot is sometimes applied as a top-dressing, in the neighbourhood of towns.

A question has been much agitated among agriculturists, whether raw, or well-rotted dung, answers best for land. The ingenious Mr Naysmith, in his *Essays on Vegetation*, declares in favour of raw dung. Perhaps this may have answered best for the tough clay soils near Hamilton, on which his experiments were made. Accordingly, experienced farmers here have assured me that raw dung answers best for such soils, as it tends to keep the soil open and friable, but for light soils, which are already too friable, they prefer well-rotted dung; or that which is so far rotted that the litter in its composition can be easily torn asunder, or cut with the spade. Such dung does not increase the porosity, which is the chief defect of the soils in question.

Composts, Moss.

Composts, or mixens, as they are here called, have been used in this county from time immemorial. They are

are generally made of the cleanings of ditches, old turf fences, or the richest earth that can be procured. If a field be under fallow, if the head or foot ridge, or any other ridge, be too high, it is ploughed, and a compost made of the earth for the remainder of the field. But where moss can be procured, it is generally preferred for making compost. They generally use the powdery stuff that is left in the moss after the peats are removed. No general rule is followed with respect to the proportions of dung that are mixed in composts; as this depends much upon the opinion entertained of the richness of the earth, and the quantity of dung that can be procured. Sometimes rich earth is carried to considerable distances from towns, and used without any addition of dung. The most common proportions when moss is used, are one cart of dung to three or four carts of moss. A proportion of shell-marl, or of lime, are generally mixed in the compost. After being made up, the midden is allowed to remain a considerable time, until the first heat be over. It is then turned repeatedly, until the materials be thoroughly mixed, and the whole be resolved into a friable powdery mass, which can be equably spread upon the ground.

The ingenious Mr Stirling of Howmuir, near Forfar, has a small patch of moss upon that farm, by the application of which, he has raised it from a very sterile unproductive state, to great fertility. His soil is generally a hungry clay, of a reddish colour, mixed with veins and spots of white. The moss is a black friable substance, which does not make good peats, and it is covered with coarse herbage. It soon crumbles down when laid out in heaps, and exposed to the air and frost. Mr Stirling has tried various ways of converting it into manure, all of which have proved abundantly successful. The method that has proved most rapid in its operation

is as follows. Upon a plot of dry ground it is laid out in large clods, about fourteen or fifteen inches in depth, before or during winter. Here horses and cattle, and empty carts, are always driven over it when they are passing, and the ploughs cut and mangle it in various directions. By these operations, joined to the action of the weather, it is soon reduced into a friable powdery mass. He has mixed this moss with various proportions of dung, marl, and lime, and treated the mixtures as compost middens are usually treated, and could not observe any difference in the effect, corresponding to the variations in the modes of preparing it. Nay, he has found, that the reduced powder of the moss, when applied without any mixture, produced as good crops, so far as appearances could be depended on, as the parts that had received mixtures of dung, &c.

I have always observed that raw moss, when laid upon land, did not increase its fertility, but encouraged the growth of sorrel, and of other weeds which delight in a puffy astringent soil. Here it appears that in order to bring moss into a rotten state, so as to be fit for manure, it is only necessary to expose it to the air, and to tread, cut and mangle it, until it be reduced to a crumbling powdery state. In an experiment which I detailed in the *Farmer's Magazine*, it was found that throwing water upon moss, in a large midden, hastened its reduction into a rotten powdery mass.

At Burn, on the confines of Angus and Mearns, Alexander Brodie, Esq; has drained a loch, the bottom of which contains a thick bed of a black mossy mud, abundantly stored with aquatic plants in a state of decay. This stuff he lays out in large long heaps, which are turned occasionally until they crumble into a friable mass. A part is mixed with dung, in various proportions, and applied as manure to arable land, with the best effects.

The soil of the parks and pleasure ground is a gravelly sand, on which the grass was apt to be burnt up in dry weather. To prevent this, Mr Brodie thought proper to top dress the grass with this mossy stuff, after it had been several times turned in the heap, and reduced to a friable substance. Some of it had dung in various proportions; but by far the greater part of it had no mixture whatever. When I saw the place, August 1803, the top-dressings were not completed, but the places which had been thus treated, were distinguished by the verdure and luxuriance of the grass. It appeared evident to me that this stuff would make a most valuable manure, either for arable or grass land, with no other preparation than that to which Mr Brodie was subjecting it. This is the place which the genius and taste of the late Lord Adam Gordon, converted from a moor such as that in which the witches met with Macbeth, into a terrestrial paradise. He planted 526 acres, in the most judicious style, and reduced 475 acres into cultivation. In order to hide deformities, and create agreeable prospects, he likewise planted 87 acres on the Honourable William Maule's property in this county. He also made six miles of elegant gravel walks, in many places blasted through solid rock. Since Mr Brodie acquired this property, he has made many experiments on this mossy stuff, by which he has clearly ascertained its great value as a manure, and set an example well worthy of imitation.

On the subject of converting mosses into manure, it may be only necessary further to observe, that mosses are of very different qualities, and some are much more obstinate than others. But there are hardly any which the means here stated, if persevered in, will not reduce into valuable manures. Mossy earth might be advantageously used to absorb the rich juices which every day

are

are allowed to escape from the farmers premises. With regard to composts, we have no doubt but the clay marl formerly described, would answer well for that purpose, though we have not learnt that it ever has been used in this way. In making composts, farmers should endeavour to cross the soil as much as possible, by using earth of a different quality from that of the soil on which it is to be laid. They might also enrich their composts by mixing in them ferns, where they abound, and every species of weeds which infest the farm; provided they be gathered before they run to seed.

The organs and structure of plants, and the way in which they discharge their functions, are much less understood than those of animals. It is hence very difficult to assign a reason why putrescent manures contribute to the nourishment of plants. The fact is known; but the reason of the fact, hitherto, has only been guessed at. The general opinion now seems to be, that putrescent manures furnish carbon, or charcoal, which being dissolved in water, enters into plants, and constitutes their food; and this opinion is supported by the ingenious and scientific Mr Naysmith, in his Essay on Vegetation. There are, however, circumstances which induce me to doubt if this be a just solution of the difficulty. That carbon enters into plants is an undoubted fact; but that it enters by simple solution in water, appears to be very questionable.

It may first be observed that charcoal does not form a perfect solution with water. It may be diffused through water in small particles, so as to give the liquid a dark porter colour; but it does not seem capable of such perfect solution as would enable it to enter the very minute vessels of plants. Physiologists have discovered that plants are furnished with two sets of vessels, one in which the sap rises through the body of the plant,

in the same state in which it was absorbed by the roots, until it reaches the leaves; and another by which it is returned from the leaves, and goes to increase the size of the plant. A very great proportion of the rising sap is discharged from the leaves, by insensible perspiration, similar to the perspiration of animals, and has frequently been collected in considerable quantities. It was found to contain a minute portion of mucilage, which is very soluble in water, and to emit the peculiar odour of the plant, which may have been owing to some essential oil, that exhales from the leaves and flowers of most plants. No carbon, or charcoal, could ever be traced in the water discharged by this perspiration, which must have happened had this substance risen, in solution with the water, from the soil.

It is extremely difficult to obtain the rising sap unmixed with that which descends; but as far as it has been traced, from the roots upwards, it no where exhibits the porter-like appearance of charcoal diffused in water. It is a white frothy liquid, blown up with aerial fluids, with a portion of mucilage dissolved in it, which might readily be obtained from the soil, or the manures that are mixed with it.

It seems to follow that the charcoal, or carbon, contained in putrescent manures, through the action of water and atmospheric air, aided by heat, and by the mineral ingredients in the soil, is converted into carbonic acid gas, carbonated hydrogen gas, and the other gases of which carbon is the basis; and that these gases uniting with water, the carbon enters plants in an aerial or elastic form. We stated that the most fertile soils yield these gases in greatest abundance, when subjected to distillation. Putrid dunghills also yield them copiously, and their
emission

emission occasions the fetid smell of these substances. It has also been ascertained that these aerial fluids are absorbed by the leaves of plants, as well as by their roots : that the carbon in their composition is retained, while the oxygen is set free, and discharged into the atmosphere.

Let us now attend to what happens when this rising sap reaches the leaves of plants. We stated that a very great proportion of it goes off in perspiration. Upon what remains, very remarkable changes take place. The aerial fluids, of which carbon is the basis, together with a portion of water, are decomposed. The oxygen, or pure air, is thrown out into the atmosphere, and the inflammable ingredients are retained. A new juice, which is peculiar to each plant, is formed, (hence called *succus proprius*,) in which among other ingredients, are always found portions of woody fibre, or the material of which woody fibre is composed. This is well known to consist chiefly of charcoal. These remarkable changes never take place unless the leaves of the plant be exposed to light, or to the sun's rays; and hence it has been inferred that they are entirely the effect of some unknown property of light. But that part of the effect must be ascribed to the vital energy of organs situated in the leaves, appears probable from this fact, that each kind of plants fabricate a juice peculiar to themselves, some white, some green, some red, and possessing various properties. Perhaps these organs cannot discharge their functions, unless they be stimulated by the impulse of light. Plants which grow in places whence light is excluded, are found to contain mucilage, but hardly any carbon, or woody fibre. This seems inconsistent with the opinion, that carbon enters into the composition of

plants, in union with water, and in the same state in which it is found in the woody fibre*.

The juice thus elaborated in the leaves, returns by another set of vessels, which seem chiefly to be situated in the bark. In its progress it is still acted upon by light, and those products which are peculiar to the different parts of the plant, are secreted from it by organs which seem to be analogous to the glands in animals. That the returning vessels chiefly pass along, or within the bark, seems to follow from this fact, that all accumulations of wood in a tree, are made in concentric rings, the latest being always that which is nearest the bark; and when the tree is cut down, its age may be known from the number of these rings. That there are descending, as well as ascending vessels, appears evident from this fact, that if a tree be surrounded with a hoop of iron, it will continue to increase in girth above the hoop, while it never increases below. This also proves that the descending

* Mr Ellis, in his late Treatise, has proved, that plants, like animals, constantly emit carbon from their leaves, branches, stems, and roots, which, combining with the oxygen of the atmosphere, forms carbonic acid. He has also proved, that carbonic acid is only decomposed in the green parts of plants, and oxygen gas emitted, while they are exposed to light.—This rather helps to strengthen the conjecture we have offered, that carbon enters plants, in union with oxygen, in the gaseous form, or combined with water. After being decomposed, by the action of light, the carbon discovered by Mr Ellis, seems to exude from the descending sap.

In animals, the carbon chiefly exudes, and combines with oxygen, in the cells of the lungs; and by this combination, the animal heat is kept up. Animals which have no lungs, even those which are hollow tubes, Mr Ellis found emitted carbon from the pores of their bodies; and by the combination of this ingredient with oxygen, some degree of heat is generated, which enables these creatures to resist, to a certain extent, the effects of cold. The same observation he found applicable to every species of plants.

descending vessels are not very deep seated; while the ascending ones rise through every part of the tree.

The cause of the rise and circulation of sap in vegetables, is yet wholly unknown. The sap has been ascertained to rise in a vine branch, with a force sufficient to balance a column of mercury, more than thirty-two inches of perpendicular altitude; which exceeds the pressure of the atmosphere. Whether the vessels of plants, like the tubes which circulate the fluids of animals, be endowed with irritability, so as to impel the sap by their muscular contraction; and whether these vessels, like those of animals, be also furnished with valves, which prevent the sap from returning when the contraction of the vessel is relaxed, are points which human curiosity is not likely soon to ascertain. But the facts which are ascertained, establish a remarkable similarity between plants and animals. In the latter, the chyle may be regarded as the rising sap, which is absorbed chiefly from the lower intestines, which may be called the roots of the animal. It is a juice very much resembling milk; and being collected into one tube from numerous ramifications of vessels, it is poured into the heart through the subclavian vein. It is immediately projected into the lungs, where, by the action of that organ, stimulated by atmospheric air, it is changed into blood. Thus the leaves of plants, by the functions they perform, bear a striking resemblance to the lungs of animals, as they elaborate the peculiar juice of the plant, which may be regarded as its blood. In the blood of animals, a substance called fibrin is found, of which the muscular fibres are composed; and this corresponds with the woody fibre in the juice of plants. Like the peculiar juice of plants, the blood also contains all the other ingredients which enter into the composition of the animal body; and being projected
through

through all its parts, each assimilates to itself those ingredients in the blood which are adapted for its nourishment. The only difference that appears, is, that animals are much more complete than plants; their organs are generally larger; and their uses more easily traced.

We may see, however, that many curious and interesting chemical processes take place in the soil, which the ingenuity and labour of man only puts into a condition that is favourable for their commencement and completion. That similar processes take place within the body of plants; though these are changed and modified by the vital energy with which they are endowed, so that chemical mixtures do not produce the same effects that would happen in inert vessels. Though human ingenuity should never be able to penetrate within the veil which adumbrates these wonders, we see enough to excite our admiration of the wisdom of the Supreme Architect, and to strengthen our confidence in his goodness and beneficence.

SECT. VI.

WEEDING.

In former times, thistles were annually weeded from the corn, by means of a large wooden forceps; or the operator had his hand defended by a thick woollen or leather glove. These thistles were laid in heaps in the furrows, and after their prickles had somewhat collapsed, they were given to horses and milch cows. In those times, a crop of thistles, and of other weeds which are eaten

eaten by cattle, was thought advantageous to the farmer, as such weeds were the only resource he had for green house-feeding during summer. In those times, too, the straw was reckoned most valuable, which contained the greatest proportion of grass, or of other edible plants in its composition. But since fallows, green crops, and sown grasses were introduced, the practice of hand weeding the corn in summer, excepting in very few cases, has gone entirely into disuse, being unnecessary; and clover has been substituted in place of thistles for summer house-feeding. Small patches of lint are still hand-weeded by the women; but when the farmer raises this plant on a large scale, he generally sows it on clean land which requires little or no weeding. All the weeding operations are performed when the land is under fallow, or turnips, or potatoes, or other drilled crop; as was explained when treating of these crops.

The rag-weeds, and others which we recommended to be made into compost manure, spring up when land is first laid down in pasture, or grow beside hedges and fences, and places inaccessible to the plough. In many places ferns spring up on old ley, or grow on stony dry places on the sides of the mountains. In some cases, a great crop of wild mustard and other annual weeds, notwithstanding the land had been cleaned by a drill crop, springs among the corn, and they are removed by the hand. These weeds, I found, made excellent manure, when mixed in compost.

SECT.

SECT. VII.

WATERING.

When treating of natural meadows and pastures, we formerly stated what we had learnt concerning the progress which this mode of fertilizing land had made in this county. We also recommended watering as a very cheap mode of improving the herbage, along the declivities, and in the glens of the Grampians; in the swampy hollows and on the declivities of the Seedlay Hills; and on various tracts of useless land near the sides of streams of water.

It was stated, that watering does no good to land, unless subterraneous springs be discharged by concealed drains, and passages be made sufficient to let off all stagnant water, so that as soon as it is thought proper to let off the water, the whole field may soon become perfectly dry. When the ground has much declivity, the water should be made to trickle, in small quantities over the surface, and be frequently intercepted by horizontal ruts, that it may not collect into a torrent, and sweep away the soil. When the land is level, or has but a small declivity, the water should be let on the highest part of it, and be made to move slowly over the surface.

There seems no doubt but a chief part of the effect of watering, must be ascribed to the moisture it conveys to the roots of plants. Powerful springs, which issue from a great depth, being commonly about 54° of Fahrenheit, keep grass at the vegetating temperature, in winter and spring,

spring, when other plants are checked with cold. These springs, and also river water, are commonly charged with those gases, which we have stated, may probably furnish food to plants. With regard to the mud and sediment which water conveys along with it, if this be of vegetable or animal origin, it may operate in exciting putrefaction in the soil; and whether it be of vegetable or mineral origin, it may operate in altering and deepening the soil, so as to increase its power in preparing and imparting food to plants. Though almost all sorts of water be capable of improving the herbage which naturally grows upon land; it will hardly be doubted but that the stinking dirty water from a great city, such as Edinburgh, is better adapted for the purpose than that which is pure. Water which flows over, or springs from, limestone or fossil marl, is also of superior efficacy to that which comes from rocks which contain no calcareous matter. This I saw most strikingly exemplified in some districts of the Island of Skye, where immense rocks of excellent limestone, and great beds of fossil marl, resembling soft chalk, abound. The water which flows from these strata, where it regurgitates on dry spots at the sides of rivulets, raises grass of the most extraordinary luxuriance I ever beheld; pointing out the great value of this water, could the people be brought to make a proper use of it.

perform other operations where there are either no roads, or those very steep and rugged. There, except during the occasional periods of hard labour, the horses seldom get any thing but what they can pick up on the sides of the mountains. In the lower and well cultivated districts, the native breed has improved in size and shape, in proportion as they have been regularly well fed, and amply provided with winter provender. They are now sufficient for the two-horse plough, at least upon friable soils. They are very docile, and earnest about their work, in which they put forth all their strength without reserve. They have also good appetites, are not nice about their food, nor much subject to accidents. This breed is short, and round in the body, much resembling the Suffolk punch; and the only defect in their shape is in being too broad in the forehead.

The Lanarkshire breed now prevails very much in this county, and they are, unquestionably, the best breed of working horses in the world. They are brought here by dealers from the south, and purchased by the farmers at extravagant prices. Some gentlemen have brought Lanarkshire stallions to the county, with a view to improve the breed; but the farmers generally discovered some defect in these stallions, and they got little employment. It does not seem advisable to cross mares of the native breed with Lanarkshire stallions, the latter being considerably larger than the former. Dr Coventry has shewn, in his Treatise on the Breeds of Animals, that in crossing different breeds, with a view to combine the good qualities of both; in the first cross the advantage of comparative size should be on the side of the female, rather than on that of the male. This rule is more applicable to horses than to any other species of animals; and when a large stallion is matched with a mare of a
smaller

smaller breed, the progeny is commonly a thin-bodied, raw-boned animal, without spirit or activity. This has turned out to be the effect of covering small mares here, of the native breed, with large stallions; and this has helped to disgust farmers, who were possessed of the native breed, with large stallions brought from a distance. But were the order of proceeding reversed, and a Lanarkshire mare first matched with the best native stallion; and then her progeny covered with a good Lanarkshire stallion, it is to be hoped that all that is excellent in both breeds would be concentrated into one.

Many of the farmers who have got mares of the Lanarkshire breed, get them covered with stallions of the same breed, which have either been reared here, or which annually visit the county; and their progeny cannot be distinguished from the best of the native breed of Lanarkshire. There is not, however, a sufficient proportion of horses reared to supply the demands of the county, and considerable numbers are annually purchased at the fairs, from south country dealers. The great demand for horses to the army, has raised their price so much, that farmers might well engage in rearing them on a more extensive scale, as an article of profit. A pair of good horses, for the double horse plough, now cost L. 60, L. 80, or even L. 100.

A few gentlemen keep a stud of full blooded racers, and rear horses for the turf. A still greater number keep stallions of larger size, of half or third blood, and rear horses for the saddle or carriage. This latter breed was wont to be propagated by stallions from Yorkshire, which annually frequented the county; but of late these have made their visits less frequent than formerly.—Perhaps the best way to accomplish the object of breeding good horses, would be for a number of persons to com-

bine, and procure, for a stipulated price, such a stallion as they judged best adapted to accomplish their object, to serve them for the season. In this way, they would no longer be exposed to such casualties as take place at present, nor to take any stallion that chance throws in their way, whether he suits their purpose or not.

Calculating upon data which we cannot affirm to be perfectly correct; though we conceive them to be not far from the truth, we are induced to conclude that there are, of permanent stock of work horses in the county, 5558

Saddle horses, 951

6509

Horses under 4 years of age, and those under 13 hands high, may amount to 2500

Total of horses, 9009

The average value of horses of the first class, is very moderately estimated at L. 30 each, *inde*, L. 195,270

Horses of the 2d class may average L. 10 each, *inde*, 25,000

Total estimated value of the permanent stock of horses, at present prices, L. 220,270

There are also upwards of fifty-four wheeled carriages kept by gentlemen in the county, or let to hire; beside a greater number of gigs and taxed carts, kept for private use, or for the conveyance of travellers and goods.

SECT.

SECT. II.

CATTLE.

BEFORE the introduction of inclosures, turnips, and sown grasses, the size of black cattle was diminutive, and eight or ten of them were usually yoked in one plough. Among the Grampians, where the old system still continues to prevail, the cattle are of smaller size than in the well cultivated districts, and when fed they seldom exceed 16 or 20 stones Amsterdam. In the latter districts, the cattle generally feed to from 40 to 60 stones. Cases are not unfrequent, of oxen that were seven years old or upwards, which were fed on grass during summer, and on turnips and hay during winter, whose four quarters exceeded 100 stone.

The grazing and feeding of cattle are prosecuted to a much greater extent than the rearing of them. For this purpose, great numbers of cattle are purchased at the several fairs, from the counties of Mearns, Aberdeen, Moray; and graziers frequently travel to the north Highlands and isles to lay in stocks for their pastures and turnips. At Danichen, there is an annual sale of small Skibo cattle, from Sutherland, which are eagerly purchased by gentlemen who have woods and plantations, where, in the course of one or two years they get excessively fat; or they are finished off on turnips and hay. These feed to from 12 to 15 stones, and they are distinguished by the delicate flavour of their flesh, which somewhat resembles venison. The numbers of cattle

which are annually fed here, and prepared for the butcher, considerably exceed those which are reared in the county. But as these numbers are very fluctuating, and depend much upon the goodness of the season for grass, and the quantity of fodder and turnips on hand, it would be fruitless to attempt their enumeration. Many graziers lay stocks of cattle upon their grass, and after they are half, or third fat, they dispose of them to dealers at the southern fairs; and they make their way to England, to be finished off on turnips. Many others, as they get fat, are disposed of to butchers, and are slaughtered for the use of the inhabitants. The remainder, and chiefly those which are kept upon turnips and hay, are sold in spring to butchers from Edinburgh, Glasgow, and other manufacturing towns in the west of Scotland.

The price of cattle has been progressively rising for more than fifty years past. This must be partly ascribed to the depreciation of the value of money; partly to butcher-meat being more abundantly consumed, than formerly, by all ranks of the people. Of late years, the price of cattle has varied from 8s. to 10s. the stone, according to their estimated weight when purchased, sinking offal. At no remote period, in this country, tallow fetched a much better price than the flesh. This shews the state of the country at that time, when cattle were killed and salted about the end of autumn, whether they were fat or not. But since feeding them upon cultivated pastures, and upon hay and turnips, were introduced, the proportion of tallow has been so much increased, that while beef sells at 8d. or 10d. a pound, the tallow only fetches from 6d. to 7d. There are instances of cattle which had been well fed in this county, the weight of whose tallow was very little short, and in

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some cases, even exceeded the weight of their flesh. This shews the propriety of cultivating those breeds of cattle which mix their fat with the muscular fibres, so as to produce marbled beef. The English run chiefly upon those breeds which throw their fat on what they call the most valuable parts. The consequence is, that their beef consists of great masses of fat, the sight of which excites loathing in those who are not accustomed to it; joined to a small proportion of muscular fibres, dry and tough like oakum. For delicate tender beef, and a proper mixture of fat and lean, no cattle excel those of the Isle of Skye, together with those of the opposite mainland, such as Glenelg, Kintail, Lochalsh, &c. But even among these great varieties occur, which must be ascribed to the skill with which the breeders are selected, and their future management. The greatest part of Scotch cattle partake, more or less, of this quality of mixing the fat and the lean; though some are far superior to others in this respect. Some accumulate the fat chiefly on the intestines; and this appears to me to mark the breed best adapted for giving milk. Others mix the fat chiefly with the muscular fibres, throwing but a small proportion upon the intestines; and this appears to mark the breed best adapted for feeding. There seems to be a radical distinction between the best milking, and best feeding breeds; though, in practice, they are jumbled together, and no pains are taken to separate them. This is not the case in Ayrshire, and other parts of the west of Scotland, where dairy husbandry is brought to great perfection. There the established marks and points of good milking cows, and of bulls qualified to propagate them, are very different from the characteristics of those animals in the districts where feeding is the principal object.

It sometimes happens, when there is a scarcity of turnips and fodder, that farmers are obliged to reduce their stock by selling off all those they are unable to maintain. This occasions a great and sudden reduction in the price, not only of lean cattle, but of beef; especially to those who purchase the latter in considerable quantities. But when the food of cattle is abundant, the competition for lean cattle to consume it raises their price, and after they are fat, as the farmers must sell before their food is exhausted, the price of beef falls. A singular case occurred in 1810. There never was a greater extent, nor a better crop of turnips in the county, than in 1810. This produced a violent competition for cattle to consume them, and they were purchased at extravagant prices. But a great proportion of farmers were obliged to sell them off in spring 1811, at the same, or even a lower price than that they had paid for them in autumn 1810. This was owing to the deranged state of commercial credit, preventing the usual demands from the manufacturing towns. Yet the price of beef in the county, instead of falling, continued to rise, in proportion as the fat cattle fell. This was owing to the butchers having the whole market to themselves, as the season was too far advanced to admit of consumers clubbing together and sharing a beast among them, which they might salt for future use. This is frequently done when a great fall takes place before winter, owing to a scarcity of food; and it not only prevents the fall from being so great as it would otherwise be; but it obliges the butchers to lower the retail price in the market.

Though a considerable number of the cattle which are annually prepared for the butcher be reared in the county, yet this may be considered as the flying stock. With regard to the permanent stock, they are of various breeds,

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and differ very much from each other both in shape and qualities. Little attention is paid to the selection either of the males or females, by whom the breed is propagated; and no pains have been taken to elicit a breed distinguished by any peculiar properties, either as a good milking, or as a good fattening breed. A great proportion of the permanent stock are *bumlies*, that is, they have no horns; and in this particular they seem allied to the Galloway breed. Among those which have horns, the middle sized horn is almost universal. The horns are neither slouched, nor high raised, but form a semicircular arch projected at right angles to the forehead, and turned up in a spiral form towards the points. The horns are white and clean towards their roots; but tinged with blue, or greenish blue, towards their points. A few individuals have the short horned Teeswater breed. Some have tried the Guernsey breed, but they were thought too delicate for this climate. Breeds have also been introduced from different parts of the north and west Highlands; but as all these animals are allowed to propagate promiscuously, there are many gradations, or mixtures of breeds. The colours most generally esteemed are dark brown, or black, or brown brindled with black. A few white spots, as they give the animal a showy appearance, are not objected to. But if a great proportion of the animal be white, and if, in place of brown or black spots, she be dotted or variegated with blue, she is universally disesteemed. I confess I can see no reason for this, as I have a cow of this latter description, of an uncommonly handsome shape, and during the best of the season, she commonly yields from fifteen to sixteen Scotch pints of milk daily; being little short of eight English gallons. They also prefer those animals which have a shaggy but soft pile, as they are best adapted to endure the rigours

of winter. But the pile of these animals increases with the cold to which they are exposed.

The farmers usually rear as many calves as serve to keep up their permanent stock. The calves get about four Scotch pints, nearly two English gallons, of milk warm from the cow, each day, during fourteen or sixteen weeks; which may be worth from thirty to forty shillings in the interior parts of the county. Some, from views of economy, have tried to rear calves upon skim-milk, or with this milk mixed with hay tea or the warm juice of boiled turnips; but the animals so reared soon become feeble and paralytic. A great proportion dies; and those which survive are of little value. Hence a common proverb, That the most thriftless of all economy is starving an animal in its calf's skin. The calves that are not intended to be reared, receive milk for a fortnight and in some cases for a month or six weeks, and are then disposed of to the butcher. The feeding of veal is not practised here with the skill and address with which it is carried on at Strathavon, and in the Middle Ward of Lanarkshire. Indeed our citizens in towns have not such delicate palates as those in the west of Scotland, and generally prefer the cheapest article they can find. Hence butchers will not give an adequate price for calves highly fed. When the milk is withdrawn from the rearing calves, they are put upon the richest of the grass; and they generally get a little turnips along with the feeding stock, during winter. Some think turnips given to the young stock, more profitable than using them for feeding.

The quantities of milk yielded by cows are extremely various. Among the Grampians, from four to six pints Scotch per day, is the usual quantity; but the milk is rich in cream, and the animals being chiefly
fed

fed on wild herbage, it is high flavoured. In the well cultivated districts, from eight to ten pints is the general average; and she is reckoned a very good cow that yields twelve Scotch pints a day during the best of the season. A few individuals that are well fed, yield from fifteen to eighteen pints during the best of the season. It may be observed that two Scotch pints are nearly equal to one English gallon. The cows are milked three times a day. The general opinion is, that cows which yield the smallest quantity of milk, afford the greatest proportion of cream; and that those which yield the greatest quantities abound most in curd. The Ayrshire cows are of this description, and their whole milk is made into cheese. Nearly a half of the milk in the interior parts of the county, is consumed in the families of the farmers. The remainder is made into butter, and skimmed milk cheese. Part of the butter is sold fresh, and part is salted. It is very clean, of a good colour, and well flavoured. The cheese is not so good, and does not fetch so high a price as that which is made without abstracting the cream. The profit upon a milch cow, in the interior, may be from L. 7 to L. 8 a-year, besides the dung she accumulates. The former is very little more than the value of the food she consumes. But near towns, where the milk can be sold fresh from the cow, and where the whey and butter milk find a ready market, the profit upon a good milch cow, may amount to L. 15 or L. 20. During the heat of the day, milch cows are generally fed in the house. This not only makes them give more milk; but the dung accumulated is more than an equivalent for the expence of cutting and bringing home their food.

In former times, oxen were generally employed in rural labours, such as ploughing, harrowing, &c. &c.
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and horses carried home the fuel, and conveyed the produce to market, chiefly on their backs. But in the progress of improvement, oxen have been universally laid aside, and horses are employed in all sorts of labour. Even in ploughing, which is the work for which oxen are best adapted, horses will do a third more work in the same time. Those who have argued in favour of oxen, as animals of rural labour, have constantly left out of view the wages and maintenance of the servant who attends them, which are running on, whether any work be done or not. A gentleman near Edinburgh tried a fair comparison between horses and oxen, on a corn farm, during upwards of seven years; and after a mature calculation of every circumstance, he dismissed his oxen, and wrought his farm, of 500 Scotch acres, wholly with horses. It is very true, that on a grazing farm, where aration is wholly subservient to the rearing and feeding of cattle, oxen may be profitably employed. But where crops are the principal object, the slow movements of oxen render them incapable of snatching and improving opportunities, especially during spring and harvest. Nor can they carry the produce to market, or convey manures to the farm. Even in ploughing, the gentleman to whom I have alluded, found, that when the servant's wages and maintenance were taken into the account, the labour of oxen was considerably more costly than that of horses. In this county, oxen are seldom employed, except to tear up land from a state of nature, or to plough that which is overrun with broom and shrubs. Their steadiness of draught give them an advantage in these operations, where celerity is not necessary.

We may hence see that the tax upon labouring horses, which was intended by its contrivers to turn the balance in favour of oxen, has not only failed to produce this ef-

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fect. but is as imolitic as a tax upon ploughs, or other implements of labour. Such a tax, as far as it operates, can only have the effect of preventing labour from being performed.

The only argument in favour of oxen is, that they may be fed, and converted into human nourishment, after they are unfit for work. But if the horse performs such a superior quantity of work, during the period of his employment as is more than sufficient to balance the value of the ox when he ceases to work, together with his own price, and expence of maintenance so far as it exceeds that of the ox, it is evident that the advantage is wholly on the side of the horse as an animal of labour. We are not certain but it may be mere prejudice, or inveterate habit, that lead us to loathe the flesh of horses, while we devour that of oxen. The antient Egyptians held the Israelites in abhorrence because they fed upon oxen. Some of the Hindoo castes reckon them sacred, and loathe their flesh as much as we do that of horses. The Tartar tribes prefer horse flesh to that of all other animals, and keep great droves of horses for food, as we do cattle; and they have a greater relish for mare's milk, than for that of cows. It is certain that the horse is a very clean feeding animal, and that he very soon gets fat when he is relieved from labour. I once partook of a ham which had been made from a young horse that killed himself in leaping over a fence, and found it extremely palatable. A patriotic gentleman of my acquaintance fattened an old horse, upwards of twenty-two years of age, and unable to work, of part of which I partook, and could not distinguish it from the best ox beef that had been recently killed. The Irish purchase a great many old garons in the west Highlands and Hebridian isles, and convey them to Ireland, where it is supposed they feed and dispose

pose of them as beef. These circumstances may lead us to conclude that our aversion to horse flesh is merely a prejudice; and if ever superannuated horses should come to be fed and eaten, the balance in their favour, as animals of labour, will be decisively turned.

We are furnished with no certain data from which to calculate the number of cattle, of all ages, which constitute what may be called the permanent stock of the county. The nearest approach we can make to the truth, is to state them at 37,400. Although their value be subject to much fluctuation, we cannot be far from the truth, in rating their average value at L. 7 a head. This will give L. 261,800, as the value of the whole permanent stock of cattle in the county. With regard to the flying stock, which are purchased from other counties, and either grazed, or fed on turnips in this, no estimate can be put upon either their numbers, or on the increment of value they receive. It can only be stated, in general, that this county not only supplies its growing population with butcher meat, but also exports a considerable annual value to other districts.

SECT. III.

SHEEP.

ABOUT fifty years ago almost every farmer had a flock of sheep, numerous in proportion to the extent of his farm, and they were pastured promiscuously on the waste lands, which abounded in every parish. But since these wastes were subjected to the plough, or planted,
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the sheep have been gradually banished to the mountainous districts of the county. They are now confined chiefly to the Grampians. A few flocks occupy the higher pinnacles of the Seedlay Hills, which are above the region of planting or aration; and about 1000 sheep are kept upon the Sands of Barry, where their pasture and shelter are scanty. In all probability a stock of rabbits would be more profitable in that situation. Almost every residing proprietor, and several farmers, keep small flocks in their inclosures, varying in numbers from about half a dozen to several scores. These are principally meant for family use, and the overplus is disposed of to the butcher.

The original breed of this county was the small white faced breed, or spotted with yellow, which seems to have been the original breed of the British Isles. Small parcels of these still remain in some districts of the Grampians, where very little care is taken of them; and they have been much crossed with the black-faced or Linton breed. When full grown, they average from 6 lb. to 9 lb. a-quarter, their mutton being very delicate and well flavoured. The wool of some parts of their fleece is coarse, of others it is remarkably fine. As this is unquestionably a very hardy breed, in so far as it has kept its ground during many ages, even on the most barren and exposed situations, it is a pity but proper experiments had been made to ascertain, whether by abundant food and skilful crossing, the weight of its carcase might not have been increased, while the fineness of its fleece was rendered more equable.

The breed which most generally prevails is the black faced sort, of which considerable numbers, of a year old, are annually brought from Linton, in the county of Tweeddale. These are thought to be very hardy; and indeed

indeed it requires hardy animals to subsist on the barren mountains which they occupy. They are of larger size, and their wool coarser, than that of the native white-faced kind. It is thought that tender heath, and short sweet herbage, render the wool finer; while rough-grass, and wet marshy ground render it coarser.

Sheep from the mountains are often fed off in gentlemen's parks; but each has generally a small flock of the long-woolled Bakewell breed; or of the Culley breed; or of the South Down and Cheviot breeds; or sometimes breeds made out of crosses of two or more of these several breeds. All these seem to thrive remarkably well; and in winter they get hay in racks, with a few turnips scattered upon the grass. The Honourable William Maule, in his park at Panmuir, has a considerable flock of a mottled breed of sheep, which is nowhere else observed in the county, nor indeed in this island. They are rather long in the body, much about the size of the original Cheviots, their fore-shoulder somewhat depressed, and their neck set on somewhat like that of a deer. Many of them are pure white; others have dark brown or black spots, of various dimensions, in various parts of their fleeces; and a few of them are wholly of a dark brown colour. I was informed that their wool is remarkably fine; and that this breed was originally brought from the region of Mount Atlas in Africa, from whence the celebrated Cardinal Ximenes is said first to have imported the fine-woolled Merino breed of sheep into Spain. But it seems more probable that a fine-woolled breed had been imported by the Moors when they conquered Spain; which this cardinal only improved.

In the western Grampians only a few tenants occupy separate farms of hill and dale. The flocks of these average

rage from two hundred to four hundred sheep. The greatest part of the mountains are common to a number of runrig tenants, whose sheep range promiscuously, and they are generally overstocked. Some tenants have not more than sixty sheep. Few employ shepherds; but the children hunt the sheep up the hill, each from their own corn. In the eastern Grampians, many of the farmers have long leases, and separate hill and dale farms. Of course there is more cultivation in the valleys, and more correct management of the sheep upon the mountains. Some of these have farms in the low country, to which they drive a great part of their sheep during winter. This enables them to keep a greater number upon the mountains in summer, than they could venture to do without this resource. Others are obliged to take grass for their sheep in the low country, during hard winters, which they procure chiefly in plantations that have been thinned, and that have got beyond the reach of being injured by sheep. Very few sheep are reared in any of the Grampian districts. The most general practice is to buy in lambs, or hogs, at the fairs of Linton and Larnark, and other markets of the south. Lambs are bought for about 8s. or 9s., are kept four years, and sell for 19s. or 20s. Hogs are bought for about 14s., are kept three years, and sell, on an average, at the same prices with the former. On the eastern Grampians, some buy in one half of their flocks, and breed the other half.

It is usual to smear only the hogs with a mixture of tar and butter, or of tar and oil. But since these became very costly, they are now sparingly used. The more general practice is to smear with tobacco liquor, containing a mixture of flour of sulphur; or the liquor is used without any sulphur. This they find to be effectual in killing vermin, and preventing the scab. At

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the clipping time all the sheep of a district are collected, and are driven several times backwards and forwards through a pool of water, to wash their fleeces. About ten fleeces at an average make a stone of wool, and it sells at from 12s. to 18s. the stone. As the common pastures are always overstocked, they do not yield such good sheep, either in point of wool or carcase, as those which are held in severalty. Although very good effects have resulted, in many parts of the Highlands, from consigning an extensive range of mountains as a sheep walk to be occupied by a number of small tenants, as a joint stock concern; yet the flocks were always under the direction of one or more common shepherds, and every individual share of stock, as well as the whole, was limited to a certain number of sheep. Such a confused and unprofitable way of occupying land, as takes place in some districts of our Grampians, it behoves proprietors to remedy. Every man marks his sheep by tar on certain parts of their bodies; or by burning his initials on certain parts of their horns, with a hot iron; or on their noses, or foreheads. In other cases they cut particular marks upon their ears; and though they should be all mixed together, every one knows to whom each sheep belongs. Those who rear lambs, of which the proportion is not great, select as many as may be sufficient to keep up the stock, which may be a fifth or fourth of the whole, and dispose of the remainder to the butcher; when they fetch from about 6s. to 8s. a head.

They all complain of depredations committed by foxes, though huntsmen are kept for extirpating these ravenous animals. They also complain of being prohibited from burning heath on the mountains, except early in spring, when it is seldom practicable, the ground being frozen, or covered with snow. Many persons are of opinion that burning heath during summer, when it is full of sap,
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would prove more effectual for its extirpation than during spring. Proprietors ought to consider whether they are likely to derive more benefit from increasing the number of sheep upon their properties, which yield them rent; or from moorfowls which yield only a little amusement. We have already detailed the further operations that seemed necessary, for improving the natural herbage of these mountains, so as they might support a much more numerous, and more valuable stock.

We have not heard of any diseases to which sheep are here liable, excepting the scab; and the only effectual cure that is known, is rubbing the infected with ointment made from mercury and hogs lard, into which some introduce a mixture of sulphur. This disease is very infectious, and even the places where the animals have rubbed are apt to communicate and revive the disease.

It is not easy to ascertain the number of sheep kept in the county, as this fluctuates considerably. But the average which seems to approach nearest to the truth, is, that they amount to 60,000, of all ages. Rating the average value of these at 14s. a head, this will make their whole value amount to L. 42,000.

SECT. IV.

GOATS.

THESE were formerly kept in the mountainous districts, but they have been wholly extirpated on account of their hostility to plantations. Excepting a very small

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number kept for giving milk to private families, there are none now in the county.

SECT. V.

HOGS.

THESE are kept chiefly at mills and breweries, and by gentlemen and farmers, where there is much offal that would otherwise run to waste. Many cottagers also purchase a pig or two, and fatten them for their private use. In the interior they are reared chiefly on whey and butter milk, and upon clover and grass. They are afterwards fattened upon potatoes, and receive a portion of beans or pease, or of light corn, to consolidate their flesh. Much of the pork here produced is consumed in the families of those by whom it is reared and fed. The remainder is purchased by salters in the sea port towns, who cure and prepare it for the mercantile service, and the Royal Navy. Pork does not seem to be much relished by the inhabitants at large, as it always fetches less in the market, by a penny or twopence a-pound, than beef or mutton. Yet the quantity of swine reared and fed, has been on the increase for some time past.

Two breeds of swine generally prevail here, with many various intermixtures and crosses of these. The first has large slouched ears, long bristles, long shaggy hair, a long tapering snout, somewhat like that of a wolf, and is generally of a dun or yellowish white colour. This is a thin-backed raw-boned animal, and seems to be
the

he remains of the ancient wild boar of the forest, which was, in remote times, a favourite animal of chase. The male is furnished with long tusks, extending beyond his mouth. They feed to sixteen or eighteen stones Amsterdam; and when well fed, make excellent pork. But the small Chinese or Siam breed abounds most, of which it is unnecessary to offer any description; and the shades of gradation between these are so numerous, as not to admit of enumeration. As this county is so well situated for maritime commerce, it appears adviseable to introduce the Berkshire breed of hogs, which has been brought to so much perfection in Dumfries-shire, and other districts of the south; and, like them, to establish the rearing, feeding, and curing of bacon, as a regular branch of trade. The Berkshire breed seems better adapted for these purposes than any that are used in this county.

SECT. VI.

RABBITS.

THESE are only kept by a few gentlemen for their private use. They are kept in cottages paved with flags, and provided with boxes in which the can nestle. They are regularly fed with the offals of the garden, or with clover, and sometimes get corn. As there are extensive tracts of sandy downs on the sea-shore, we are induced to think that rabbits would be the most profitable stock that could be put upon them.

SECT. VII.

POULTRY.

THESE are very numerous; almost every family in the country, and a considerable number in the towns, having a stock of them. In some districts the farmers are still obliged to pay a part of their rent in fowls; though this practice is now generally abolished. Common hens abound most, and in some cases their numbers seem to exceed the means of feeding them properly. Next to these, ducks prevail among almost all classes of people. Turkeys and geese are chiefly kept by gentlemen. By them, too, a few peacocks, and guinea fowls are kept, more for ornament than for use. Eggs and fowls find a ready sale in the towns; though they can hardly be stated as articles of profit to the farmers. They are merely a small perquisite to the thrifty housewives; and excepting where they are supported on what would otherwise run to waste, they very soon consume their value.

SECT. VII.

PIGEONS.

ALMOST every proprietor has his pigeon-house, and these voracious birds are much more destructive to the farmers, and the community at large, than they are advantageous to the proprietor. They consume little short
of

of their own weight of grain in a day, and what they eat bears no proportion to what they destroy by treading it down. If proprietors cannot be prevailed upon to root out these destructive vermin, certainly in common justice, farmers ought to have full power to defend their property, and the food of the people, by destroying them if they encroach upon their premises.

A few wild pigeons nestle in the caves of the rocks, upon the sea-shore; and wood pigeons abound among the plantations. The latter never encroach upon the cultivated land, except when the ground is covered with deep snow, they sometimes commit great havoc upon gardens, and upon turnips and other green crops in the field.

SECT. IX.

BEES.

ALMOST all the proprietors, a great proportion of the farmers, feuars, and country tradesmen, together with a considerable number of the cottagers, keep one or more bee-hives in the gardens. Among the two first classes, the honey is chiefly consumed in their own families. The latter classes dispose of the greatest part of it in the towns. There is a general complaint that the seasons are much more adverse to bees now than they were in former times. This may be partly owing to the country being more extensively cultivated than formerly, which has destroyed the wild flowers and herbs, from which these industrious insects might collect a more abundant

store of honey. Part of the waste lands, which still remain uncultivated, are too elevated, the frost remains too long, and returns too soon, to be favourable for their operations. Whatever be in this, it is certain that very little profit is generally made from bees in this county; and when they must be supported by artificial food, they are often attended with loss. But many people engage in the cultivation of bees, more for amusement than for profit. The honey produced here is of excellent quality; and it differs in colour and flavour according to the plants from which it is extracted.

SECT. X.

GAME.

Deer and Roes.

THE Honourable William Maule keeps a fine flock of fallow deer in his park at Panmuir. When the high wall which confines them is blown up with wreathes of snow, some of them occasionally escape, and propagate in the neighbouring woods, where they are sometimes killed by sportsmen. These are beautiful animals, and not so difficult to confine as the roes and red deer. In England they are fed like other domestic animals, and kept as a source of profit. Were it not that they require an extensive range, and a high wall to confine them, no cause appears why they should not be as profitable a stock as sheep, or any other that can be put upon land.

Their

Their rarity renders their flesh more valuable in the English markets, than that of any other animals. In this case they are not kept for profit, but to supply the family, and to regale the friends of the munificent proprietor.

Roes frequent the extensive plantations on the Seed-lay Hills, and many other parts of the county. They are small timid animals, of the deer tribe, but the most untameable of any. No fence has ever been constructed that was found sufficient to confine them. They are often killed by sportsmen.

The red deer, or stag, at one period, abounded among the Grampians. The forest of Alyth, which bounds the county on the north-west, indicates by its name, that this district abounded in natural woods, and was wholly stocked with red deer. But many of these antient forests still retain their names, though neither a tree nor a stag, can now be seen upon them. When a great part of the country was covered with woods, and our ancestors lived chiefly by hunting, the red deer appears to have been the principal stock, and their chief dependence for food. They are now banished from our Grampians; though, in hard winters, a few stragglers sometimes come down through the glens, from the remote mountains. The horns of the mouse deer, which are branched like those of the stag, only much larger, are sometimes found in mosses. Whether this be a different species from the stag, or only the same species which had attained a much larger size from more abundant food in the low vallies, naturalists seem not to be agreed. But horns of extraordinary size, which are supposed to have belonged to the Urus, a large and ferocious ox described by Julius Cæsar, have also been found in our mosses. As this animal is certainly now extinct, we may infer that

the mouse-deer had formerly existed, but has shared the same fate.

Hares

abound in some parts of the county; but in all the more populous districts, they have become very scarce. The alpine hare, which in summer is of a greyish white colour, but in winter assumes a snowy whiteness, with a very soft and delicate fur, is said to occur in the higher Grampians.

Badgers

burrow in the woods, and in stony places on the sides of hills. This animal is very delicate and cleanly in all his economy, and lays up a stock of hay and tender twigs to serve him during winter. The fox is said to drop his excrement in his hole, the smell of which is so offensive, that the badger is compelled to excavate a new abode, leaving his commodious habitation to his malicious rival. This animal seems to be a diminutive variety of the hog, and I have been assured that in some parts of the Highlands they salt and smoke them into hams, of a most delicious flavour.

The Hedge-Hog

frequents hedges and places overrun with brushwood. He is fond of apples and all sorts of fruits, and of the seeds of trees and shrubs. When these cannot be procured, he feeds upon the most palatable grasses and plants

he

is found. This animal seems also to be allied to the porcupine; and as he is a very cleanly feeder, he would probably make excellent food for man. The only beasts of prey in the county, are

The Fox.

This animal abounds very much, and commits great devastations on lambs and poultry. But it is thought still more destructive to hares, partridges, grouse, and all sorts of game. The ancient Scottish Parliaments enacted measures which proved effectual in extirpating foxes; and it would be desirable if some method could be devised for extirpating foxes from the whole British island.

The Polecat

Known here by the name of *foumart*. He destroys poultry by sucking the blood from their jugular vein; and leaves the carcase entire.

The Weasel

Also called the *whitrit*, and is much liked by the farmers on account of his implacable hatred to mice and rats. The only harm he does is sucking eggs occasionally when they fall in his way.

SECT.

SECT. XI.

WINGED GAME.

PARTRIDGES abound very much in the cultivated districts, and grouse on the heathy Grampians. The Honourable William Maule has introduced a stock of pheasants into his woods at Panmuir, which he is anxious to preserve, until they have so far multiplied that they have stocked the country. These birds are not natives of Scotland; but they are likely to thrive in this county, where there are such extensive plantations. On the highest Grampians ptarmigans are found, but they are not numerous. The kappercaillie, a species of wild turkey, which once abounded in all parts of Scotland, is now extirpated, and even his race seems to be extinct. The black cock, which abounds in many parts of the Highlands, is never seen here. The crane, or *long necked heron*, which some reckon a delicate bird, is often seen in marshes, and hatches on trees in different parts of the county. Wild ducks and snipes abound, and breed in marshy grounds. The grey plover is seen in vast flocks on the moorlands. The rail, or *corn-craik* abounds among the sown grass, but very few of them are killed.

Of migratory birds, the woodcock appears in great numbers in October, and departs in March. The green plover, or *peesweep*, appears early in spring, and goes off in autumn. As they only come north for the purpose of incubation, and are very lean, none of them are killed for food. They return to the fenny districts of England,

England, where they get very fat, and are killed in great numbers. In consequence of the inveteracy excited by the ambitious pretensions of Edward I. to the Scottish crown, an old Scottish Parliament passed an act, ordering all the *peesweeps* nests to be demolished, and their eggs to be broken; assigning as a reason, *That these birds might not go south, and become a delicious repast to our unnatural enemies the English.* Such unnatural animosity then existed between two nations, who are now happily incorporated into one! Great flocks of wild geese, and sometimes a few swans, visit the county in November; but none of them breed here, except perhaps a few on the sides of lakes among the Grampians. The cuckoo and swallow appear about the first of May, and depart in October. It appears to be very doubtful whether the cuckoo be a migratory, or a sleeping bird; but his inactivity would rather lead us to throw him into the latter class. He lays his egg in the nest of the hedge-sparrow, the yellow-hammer, or moss-cheeper; and these birds hatch and feed the young cuckoo, with as much assiduity as if he were their own offspring. The cuckoo is a ravenous bird, feeds much upon vermin, and he generally devours the eggs or the young of those birds in whose nest he deposits his egg. That swallows are sleepers appears from this, that I once witnessed a large mass of them being taken out from below the rubbish of an old house, in the dead of winter. Some of them being placed before the fire, began to stretch out their wings, and to crawl about. They feed entirely upon insects, which, if they were not thus reduced, would become very destructive.

Rooks are very numerous, and are much protected and encouraged by several gentlemen, from an opinion

that

that they pick up grubs, cutworms, and other vermin which destroy the crops. But the farmers are not satisfied with this, as they see the harm these birds do to their crops, though they do not see the vermin they destroy. In the maritime district, great flocks of gulls, mews, kittiewakes, and other sea fowls, frequent the ploughed lands before they are covered with the crop. With these the farmers are well pleased, as they are sure they never touch any thing but pernicious vermin. Rooks are never used here as food, as they are in England. The magpie and jaypie inhabit the woods, and commit depredations on gardens.

Of birds of prey, the raven or corbie, and hooded crow, inhabit the Grampians, where they feed upon dead sheep and other carrion. They sometimes kill feeble lambs; and frequently traverse the county. Kites and hawks of various species are frequent. The eagle seems to be extirpated from the county.

The most conspicuous of the singing birds are the thrush, or mavis, the blackbird, the linnet, and goldfinch.

If there be any adders or vipers in the county, their number must be very small, and they are not known to do any harm. The toad seems to be beholden to his ugly appearance for the aversion in which he is held. He destroys much vermin that would otherwise prove injurious to crops. Frogs abound in marshy places, and destroy the insects which infest springs of water. Moles are very numerous, notwithstanding all the efforts that are used to extirpate them. It appears that they should become the object of a general agricultural police. If one individual gets his land cleaned of moles, while his neighbours neglect theirs, he is soon in a

worse

worse state than before, by moles which pour in upon him from all quarters.

The large brown Norway rat has nearly extirpated the small black aboriginal rat from the maritime district, and has penetrated far into the interior. To scare rats and mice from corn stacks, which are not built upon pedestals, some sprinkle a little Scotch snuff upon the different tiers of sheaves while the stack is building. This has hitherto proved effectual; and a few ounces serve a large stack.

BOOK XIV.

RURAL ECONOMY.**SECT. I.**

THE learned and indefatigable Mr Chalmers has demonstrated, that the first inhabitants of this country were various tribes of the Celtæ, who passed over, at different periods, from the opposite coasts of Gaul, or France, and gradually spread themselves, until they occupied the whole British Islands. The only remains of this ancient race, are the Welsh, and the Highlanders of Scotland; together with the aboriginal Irish. That these had originally sprung from the same common stock, appears from the close affinity of their several languages, which do not differ from each other so much as the different dialects of the Gothic are found to differ. This also appears from the monuments that still remain, of their religious and political institutions. From these, it is evident, that Druidism prevailed, from the Land's End to the Orkney Isles, including Ireland and the Hebrides. Upon
their

their religious creed was grafted their system of government, in its several departments, of military, executive, and judicial. The Druids conducted their religious ceremonies, exercised their judicial authority; and discharged the functions of a legislative or deliberative body; while the chieftains, or heads of the small communities, to which they were divided, commanded them in war, and discharged all the functions of the executive authority. This farther appears, from the remarkable similarity in the style and manner of their ancient poetry and songs, which have been transmitted, by oral tradition, to modern times. That Celtic tribes originally inhabited the whole of this country, Mr Chalmers has proved, with all the force of demonstration, from the old names of places, rivers, mountains, &c., being all of Celtic origin, and exactly descriptive of their local position, their obvious appearance; their figure, colour, or some peculiarity which distinguishes each individual object.

It is singular, that the same general conclusions, at which Mr Chalmers has arrived, through a laborious investigation of records, and a deliberate comparison of the monuments of antiquity, had occurred to me, from conversing with intelligent persons in various parts of the highlands, and learning what the Gael Albanach, or highlanders, had to say for themselves. There are, however, a few lesser points in which I am forced to differ from Mr Chalmers, and it is with the utmost diffidence I venture upon me to express the grounds of that difference*. And, 1. Mr Chalmers derives the word Caledonia from a British word "*Celyddon*; signifying literally, the *coverts*, and generally denoting a *woody* region."

Now,

* Caledonia, vol. i. p. 65.

Now, it must strike any person, that as a very great proportion of the British Island, at the time this name was imposed, was covered with wood, this circumstance would not readily be made use of, to distinguish one district from another. The district he points out as distinguished by the name of Caledonia, was likely to be the least wooded of any; for it is chiefly occupied by high mountains, elevated above the level that is favourable for trees; and few of them contain a sufficient depth of soil on their rocky sides.—The more probable meaning of this word, is that which persons skilled in the Gaelic affix to it. They say its original is, *Gael*, or *Cael-dun*, the *Gael of the hills or mountains*, to which the Romans clapt a Latin termination. I observed, that G and C, or K, in Gaelic, are pronounced so like each other, that it requires a nice ear, in a stranger, to distinguish betwixt them. Thus, *Caledonia* is of the same import with our modern term *Highlands*; and the Caledonians meant, the people who inhabited the mountains, or the *Highlanders*, when distinguished from the inhabitants of the vallies, or *Lowlanders*.

2. From p. 268, &c., &c., Mr Chalmers is at great pains to prove, that the Scots came originally from Ireland; and that this island was known by the name of Scotia, and its inhabitants called Scotti, some time before the Scots emigrated to Argyleshire.—It happens, however, that all the authorities he brings in support of this position, resolve themselves into the vague and ignorant conceits of Roman authors, a people who never learnt any thing of nations, or of countries, until after they had desolated them with fire and sword.—The Romans called all the countries, situated to the west of their provinces in Britain, by the general name of Iberia, Iernia, or Hibernia, for the same reason that they called Spain Iberia, denoting

noting its western position, in respect to the other parts of their empire.—But where is the proof that the Irish ever called themselves Scots, or their country Scotland? As the words Sceite, Souite, or Scot, in Gaelic, are of the same import with Highwayman, thief, or robber, in English, there may have been gangs of thieves in Ireland, who acquired this name as a term of reproach; but I never heard it was assumed as a title of honour, to distinguish a community or nation. As far as I ever could learn, the aboriginal Irish called their country *Erin*, denoting its green colour, as abounding in grass; and themselves *Erinach*, or inhabitants of the green land.

As these Irish Scots are represented to have brought their name, their laws, customs and manners into the west Highlands, one might expect to find some traces of their name, at least, among their descendants, in the west Highlands. But the Gaelic people of the Highlands never did, nor do they at this day, call themselves by the name of Scots; nor their country by the name of Scotland. They call themselves *Gael Albanach*, *Gauls of Albion*, and their country *Alban*, denoting it to be high, mountainous. They never heard of the names *Scot*, or *Scotland*, except from the *Sassanach*, or inhabitants of the low country. So far from deriving their descent from Ireland, they assert, that Ireland itself was originally colonized by Gael, from the western shores of *Albion*; the voyage being but short, and the island constant in their view. They acknowledge the most intimate connection, both in peace and war, between their ancestors and their friends in Ireland, during many ages; and that the founders of their Gaelic monarchy, may have been, as well as the founders of several powerful clans, such as the *Macdonels*, *Mackenzies*, &c., certainly are

of Irish extraction. But they insist, that neither the founders of their monarchy, nor of their most potent clans, ever gained a footing among them by right of conquest. — They say they came among them, as their ancestors often went to Ireland, with a view to help their friends in time of need; and that the power and influence they acquired, were voluntarily conferred, as a reward for their services.

3. In page 203, &c., Mr Chalmers explains the Picts, or *Peitbi*, to mean *the people of the open country*; also *those who scout, or lay waste*.—The first explanation seems inconsistent with what he elsewhere states, that the Picts were in fact Caledonians, or inhabitants of the concealed or covered country.—It seems more natural to suppose, that this name of Picts was imposed upon the Caledonian tribes which lay contiguous to the Roman wall, by their adversaries, on account of their adhering to the ancient practice of painting their bodies, which seems at one period to have been common to all the British tribes, but which the Romans seem to have abolished among those who were subjected to their dominion. Or it may have been a term of reproach fixed upon them by the provincial Britons, on account of their frequent inroads into the Roman province, and laying waste their territories.

Whatever may be in this, there is at least some semblance of probability in the supposition, that the names Scuite and Peithi, (Scots and Picts), by which two classes of people were distinguished, were originally terms of high reproach thrown out by the Romanised Britons, in consequence of the restless and wandering habits of the western Caledonians, and their predatory incursions into that part of the Roman province; together with the waste and havoc committed by the Picts on

the eastern part of their territories. We may observe, that the mountain Gael, from the nature of their country, lived chiefly by hunting and pasturage, and wandered about without any fixed residence, with their flocks and herds, and were literally Scuite, though the idea of theft and rapine seems also to be included in this opprobrious name. The Picts again, being chiefly settled in the level country on the east of Caledonia, had early applied themselves to Agriculture, the rudiments of which art they seem to have learnt from the Romans. Accordingly, as the Gael never called themselves by the opprobrious name of Scots, I understood that they never reproached their ancient rivals with the degrading epithet of Picts, or Peithi. As far as I could learn, the Gaelic name of this ancient people was Drinnach, labourers; alluding to their rural occupations.

But laying these conjectures aside, it appears that the country to the north of the Friths of Forth and Clyde, originally inhabited by independent tribes, had been gradually moulded into two monarchies, that of the Gael on the west, and that of the Picts on the east. That in consequence of the right of succession, enforced by arms, these two monarchies were united into one, in the person of Kenneth, A. D. 843. By this union, the Gael became the dominant party; their king was afterwards styled king of Scots; and their country Scotland. The Scottish territories were gradually extended beyond the friths, so as to include Lothian, the British principality of Strathclyde, Galloway, and even some provinces in the north of England; and the language of the court, and of the great body of the people, together with the laws and customs, were all Gaelic. It does not appear that the Gael assumed the name of Scots, until long after they

had conquered the Picts; though their enemies may have reproached them with that epithet.

During this Gaelic period, very little progress appears to have been made in agriculture, or in the useful arts. They were too much engaged in external wars, and especially in repelling the incursions of the Danes and Norwegians, to allow time for peaceful pursuits. Each district being inhabited by a particular clan, under the command of its Maormor, or chief; the king had very little influence over his nominal subjects. The different clans, when not engaged in some foreign war, seem always to have been occupied with bloody contests among themselves. Hunting and pasturage seem still to have been the chief employments from which the people derived subsistence. As among the Greeks, in the days of Homer, commerce was carried on by barter; and cattle were the current money by which the value of all other commodities was estimated.—At an after period, meal, or flour, seems to have been substituted as money in estimating the value of commodities; shewing that cultivation had now begun to make considerable progress.

Malcolm III. surnamed Ceanmore, ascended the Scottish throne, A. D. 1057, and married the pious Margaret, a Saxon princess, grandchild of Edmund Ironside, king of England. This lady brought many of her Saxon relations to Scotland, and many more of that nation followed, in order to escape the fury of William the Conqueror. Malcolm, in his expeditions into England, brought off great numbers of that people, and distributed them among his Gaelic subjects; so that historians remarked they might be seen, not only in every village, but almost in every house. He afforded an asylum to Edgar Atheling and his followers; and many Normans who had followed the fortunes of the Conqueror, were encouraged

encouraged to settle in Scotland. But after the death of Malcolm and Margaret, the Gaelic people, out of jealousy, combined to expel the followers of Margaret; though it is not probable that this expulsion affected any, except those who were near the persons of their king and queen. However, the posterity of these sovereigns, being of Saxon blood, encouraged persons from England to settle in their country, and assigned lands, to be improved and cultivated by them and their followers. These being incorporated with the natives, the Gaelic language was gradually exchanged for the Saxon, or English, in all the low country of Scotland. At the same time, in imitation of what was established in England, and other countries, the feudal * institutions were gradually introduced. The king came to be esteemed proprietor of all the lands in the kingdom, and estates came to be held of him by charter, on condition of military service, and payment of the feudal incidents. In progress of time, the laws, customs and manners of the Saxons, in church and state, came to supersede those of Celtic original. The Flemings were in those times the most commercial nation in Europe; and when towns began to be incorporated by royal charters, many of that nation were encouraged

G g 3

raged

* The feudal system never seems to have made much progress among the Gael, whose government appears always to have been patriarchal. The families of their chiefs always exercised hereditary authority; but the person best qualified was generally preferred to the office of chief. Thus a bastard was often preferred by the clan to a lawful son, and the uncle to either.—At no remote period, a chieftain, in the west of Argyleshire, being required to take out a charter, and hold his lands of the Crown, drew his sword, and swore, that while he could wield a claymore, he never would hold his lands in a sheep's skin.

raged to settle in them for the purposes of trade. This colonization of Scotland, by planting in it English and Flemish families, with their followers, continued through the whole Saxon dynasty of Malcolm Ceanmore, until the demise of Alexander III., A. D. 1285. But it excited great animosity among the original Gaelic inhabitants, who often rose in rebellion to expel the new settlers; and to resist the introduction of a language, laws, and customs which they did not understand. This engendered an animosity between the Gael and the Saxons, the embers of which were not fully extinguished, until long after the suppression of the rebellion in the year 1745; as may more fully appear from Mrs Grant's late Treatise on the Manners and Customs of the Highlanders.

During this long period of Saxon and Flemish colonization, the founders of a great proportion of those families who afterwards made a conspicuous figure in the history of Scotland, were introduced and settled in the country. Of these we shall only mention one or two, who were more immediately connected with this county.

The first of the Grahams settled in Scotland in the reign of David I. From what country he came, does not appear; but this name abounds in the Orkney Islands, one of which is named Graemsay, that is, the Island of the Grahams; and also in the Island of Lewis, and others formerly occupied by the Scandinavians. From this circumstance, he seems to be of Danish or Scandinavian extraction, and his predecessors may have come to England in some of those expeditions which long harassed, and at one time conquered that country. From England, this Graham came to Scotland, and acquired considerable estates in the Lothians. This first Graham was named William, and from him several distinguished families
branched

branched off. In particular, the posterity of his second son, John, obtained considerable property in the neighbourhood of Montrose, from William the Lion, and became the founder of the Grahams, now Dukes of Montrose. Though this branch of the Grahams afterwards acquired great property, in the counties of Stirling and Dunbarton, they seem to have resided chiefly at Montrose, as the house was but lately demolished in which James Graham, Marquis of Montrose, was born and educated, who made such a considerable figure during the civil wars, in the reign of Charles I. The heads of this family acted a most heroic part in the wars for the independence of their country, under Wallace and Bruce, and from them there sprang several noble and distinguished families, of which we shall only mention Graham of Claverhouse, afterwards Viscount Dundee, who was slain, in the moment of victory, at the battle of Killcranky.

The Douglasses are proved, by Mr Chalmers, to have been of Flemish extraction. The first of them was called *Theobald the Fleming*, and obtained a grant of lands on Douglas water, in the upper part of Lanarkshire, from Arnald, Abbot of Kelso, about A. D. 1150. As it was customary, in those times, for persons to be named from their place of residence, William, the son of this Theobald, acquired the name of De Douglas, or Duglas, from the colour of the heath-clad hills round Douglas-dale*. A son of this William was bred to the church, and became Bishop of Moray, whither he carried some of his younger brothers, and provided them settlements; and these became the fathers of the Douglasses of the north. The *lairds* of Douglas continued to extend their properties and connections, chiefly by marriage,

* *Douglas* gaelic, *Dark-green*

riage, and became the founders of several noble families in the south. But after six descents, it was the good *Sir James Douglas*, who first raised this family to an exalted pitch of power and renown. He was the friend, and companion in arms, of the illustrious Robert Bruce, who rewarded his services with the most ample donations. At the dying request of that hero, he carried his heart to Jerusalem, to be deposited in the holy sepulchre, and filled all Europe and Asia with the fame of his gallantry, and military exploits. During the Stewart dynasty the Douglasses became distinguished by their turbulence and insatiable ambition; so that it was long doubtful whether the race of Bruce, or that of Douglas, should rule Scotland. Their unceasing endeavours to usurp, or degrade, the royal authority, occasioned one of the Stewarts to exclaim, that there could not be two kings in Scotland, any more than two suns in the firmament, or two Gods in heaven! At last, by means which nothing but imperious necessity could palliate, the Stewarts prevailed. The main stem of the house of Douglas was forfeited in 1455; but their power and pretensions were revived in the collateral branch of the house of Angus. This new race of the Douglasses proving as turbulent as the old, was again forfeited under James V. They were again restored; but never after affected to make their domineering mandates a law to king and people; nor in forwarding their ambitious projects, to lay waste their country with fire and sword. Their Ducal and other titles expired with the male line; but the estate which was annexed to the Earldom of Angus, in this county, belongs to Lord Douglas, who is the lineal representative of that illustrious, and at one time, too potent house.

The

The Maules are a very antient and illustrious family in this county, and Guarin de Maule, the founder of the family, came from Normandy with William the Conqueror. This Guarin left two sons; one of whom, Robert, followed Earl David, afterwards king, into Scotland, who assigned him lands in Lothian. Roger, the second son of this Robert, married the heiress of William de Valoniis, Lord of Panmuir, and Chamberlain of Scotland under Alexander II. From this marriage sprang the Maules who were afterwards Earls of Panmuir, in this county. Individuals of this family frequently filled the highest offices of the State, and they always acted a conspicuous part in the public transactions of their country. The Honourable William Maule, M. P. is their lineal heir, and representative.

It appears that a Sir John Lyon married a daughter of Robert II. king of Scotland, and obtained a grant of the castle and lands about Kinghorn in Fife, as the lady's portion. He also obtained, from the same king, the castle and lands of Glamis, in this county, *propter laudabili et fideli servitio, et continuis laboribus*. The Lyons seem to have been of Norman extraction, and this Sir John became the founder of the noble family, Lords of Glamis, and Earls of Strathmore. But to enter into an investigation concerning the origin of the Ogilvies, the Carnegies, the Scrimgeours, and many other distinguished families connected with this county, would be both a tedious task, and foreign to the object of this Survey. We only mean to point out the effect of this Anglo-Saxon colonization, and the gradual incorporation of these strangers with the native Gael, upon agriculture and commerce.

It appears that with the feudal system which these colonists brought along with them, they also introduced the

the practice of villenage, or *servitude*, which was then established, not only in England, but also in every country of Europe. A great proportion of the cultivators of the soil were *adscripti glebae, ierfs*, or slaves, and were bought and sold like cattle, along with the lands they cultivated; or they were granted in presents, or disposed individually with their children and posterity, according to the necessities, or caprices, of their imperious masters. These unhappy persons were regarded as a part of the live stock upon the farm. The royal lands, and those of the great proprietors, were subdivided into districts called manors, on each of which a thane was established, to keep the serfs at work by the terror of the lash, and of corporal punishment. On the ecclesiastical lands, the term *grange* seems to have been adopted in place of manor, and their thane was distinguished by the name of ab-thane, that is the thane of the Abbot. These thanes do not seem to have been such dignified personages as they are represented by some of our historians, or as they appear in the magic page of Shakespeare. They were merely land-stewards, who directed the agricultural operations on the several manors, and rendered an account to their employers of the produce. Many of these villains, or slaves, were persons who had voluntarily consigned themselves and their posterity to this condition, in order to insure a subsistence, which their masters were bound to provide for them. Others were captives taken in war; and when the Scottish kings made inroads into the north of England, they not only carried off cattle and other spoil, but all the people they could get hold of. Every prisoner, that was not ransomed, became the property of his captor, and was either consigned to work upon his own land, or sold to those who needed his labour.

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The persons concerned in this white slave trade, might advance the same arguments in its defence that are now employed by the advocates for the slavery of the African negroes. They might say, that during the long contest for superiority between the Saxons and Danes in England, and afterwards between William the Conqueror and his opponents, great numbers of the people had been cruelly put to death, and many were reduced to a rigorous servitude. That conveying these unfortunate people from such scenes of horror, was rendering them a most essential service, as the slavery to which they were now exalted, was freedom compared to what they endured in their own country. If in carrying into effect their benevolent purposes towards this unfortunate class of people, bloodshed and loss of lives should ensue, this ought wholly to be ascribed to their own blindness and obstinacy, in resisting what was so manifestly for their advantage.

It is very singular, that though slavery, both domestic and predial, was established in the too much extolled republics of Greece and Rome; among all the nations of Gothic extraction; and that even among our modern Americans, who are perpetually stunning our ears with violent declamations in favour of liberty, men, both of a black and white colour, are reduced to abject servitude; yet this practice never was known among the Scottish Gael, nor in any nation or community, that sprang from a Celtic original. Our Gael regarded their Maormor, or Chief, with veneration, as the father and protector of his tribe; and as his greatness consisted in the numbers and strength, as well as in the enthusiastic zeal of his people, he was careful on his part not to oblige any one, but eager to do all the kind offices in his power. Their clanships were founded on a generous self
devotion,

devotion, and enthusiastic attachment, of which the natural connection of birth, and of blood, was the source and spring. In every clan a sort of community of goods was established, and what was produced by the joint labours of all, was distributed, under the direction of the chief, for the general support. The meanest member never feared the pressure of want, because, though unable to labour, he knew his wants would be provided for from the common stock; and he always cherished a grandeur and elevation of mind, from his connection with the chief, and with the community to which he belonged. From every hill, and every dale, they daily flocked to the residence of their chief, to partake of the festivities in his hall. To leave him solitary, and unattended, would have been the most detestible of all crimes. The days were passed in hunting with their chief; or in athletic exercises, displaying agility and strength; or in the mimic semblance of war. To obtain the approbation of the chief was the highest object of their ambition, for which every one was ready to sacrifice his life. The evenings were passed in music and song, and concluded with dancing. Their dances, like their songs, represented love adventures; though more frequently they represented battles, in which the performers brandished their military weapons, and went through all the evolutions of advancing, fighting and retreating; and displayed all the then approved stratagems of war. There can be no doubt but the pathetic and heart-affecting Scottish music, however it may have been afterwards polished and improved, took its rise among the Gael. The dances which are peculiar to Scotland, appear also to have owed their origin to them; though their war-dances, some of which I saw exhibited in early youth, seem now to be extinct. Some respectable

old

old gentlemen in the Highlands, have explained to me what they recollected of the manners of their predecessors, before they were perverted, as they esteemed it, by modern innovations and corruptions. The farm contiguous to the mansion of the chief, was cultivated by the joint labours of the clan; and this not from compulsion, but from voluntary choice on the part of the people, who all esteemed it a high honour to serve their chief. They also provided peats and fuel sufficient for his and their own use. The tenants were not bound to pay any specific rent; but among them it was a contest who should do most to exalt the glory of their chief, and keep him uppermost. In his hall there was a feast every day, of which every member of the clan, who chose to attend, and the stranger who sojourned among them, partook. Even the doors were kept open, night and day, lest the wearied traveller, who needed refreshment, might have reason to reproach their want of hospitality. On grand occasions, such as the birth-day of the chief, or his accession, the whole clan was assembled, with many of their allies and friends. For their accommodation, a long shed was generally constructed upon the lawn contiguous to the house, or castle. At all times, the chief and his wife sat at the head of the table; their children next to them, in the order of their seniority; and the members of the clan in the order of their propinquity to the chief. Strangers, if in the rank of gentlemen, were always placed next to the chief and his wife. To support this festivity, of which they always partook when they chose to attend, the tenants emulously poured in fat cattle, sheep, goats, poultry, and venison of every description, as well as every article of provision which their farms produced. Some of these gentlemen have assured me, that when strangers came to their father's house,

house, without any hint being given, they have known more provisions sent in by the tenants in one day, than could be consumed in a month or two. Mead, and afterwards beer, was their common drink, and these were prepared in the house of every chief. Almost every tenant occasionally distilled whisky, with which they took care that the household of the chief should be well provided. At last, whisky generally superseded the use of every fermented liquor, except wine, which was reserved for the chief and his nearest friends.—It can be easily seen, that in such a state of society, slavery was impracticable. In their feuds and contests with rival and hostile clans, they were not influenced by the cool calculations of self-interest, but were animated by passion and revenge. They never thought of killing any except those who opposed them in arms, or of carrying off the peaceful who made no resistance. If any of their rivals should fall into their hands, they were either exchanged for their own friends in a similar situation, or adopted, and incorporated as members of their clan. Indeed, the several chiefs laboured earnestly, by their affable and obliging demeanour, to induce as many as possible to join their standard; where, in place of being doomed to slavery, they were admitted to all the rights and privileges of the members of their own clan.

As this was the last country in Europe which adopted the practice of villenage, or slavery, so it also appears to have been the first in which it was abolished. Excepting the slavery of colliers and salters, which was lately abolished by act of Parliament, no trace of villenage was left in Scotland before the conclusion of the fifteenth century; more than a hundred years before bondage was discontinued in England. Nor was this brought about by any legislative enactments, but by the volunta-

ry deeds of the parties themselves. It appears there were always a considerable proportion of free tenants, who cultivated farms under leases, in which their rent and services were specified. The celebrated Wickliff in England, among other doctrines which were then condemned as damnable heresies, had declared it to be Antichristian in man to make a property of man, or to reduce his fellow creatures to slavery. Although violent laws were enacted against his followers in Scotland, in the reign of James I., at the instigation of churchmen, yet it appears that the serfs were always treated with more lenity, on the estates of the clergy, than on those of the laity; and that they first set the example of manumitting, and restoring them to freedom. Whether this should be ascribed to their conviction of the inconsistency of slavery with the religion of which they were the teachers, or if it arose from more enlightened views of their own interest, we cannot take upon us to decide. But it seems, that the beneficial effects of free cultivation, were soon visible in the enhanced value of their estates; and the practice of manumission began to prevail upon the royal manors, and gradually increased until it became universal.

The mode by which slavery was abolished, was by granting farms to the slaves for a certain period of years, on condition of rendering certain services, and paying a specified proportion of the produce, or a sum of money, in name of rent. A certain number of cattle, horses, and other animals, together with the necessary implements of husbandry, were delivered over to the tenant, and he was bound to leave the same number and quality of stock at the expiry of his lease. Thus, the landlord furnished not only the land, but also the stock necessary for its cultivation. This mode of occupying land is known by the

name

name of *steelbow*; which word Mr Chalmers shews, meant the *same state*, or the obligation imposed upon the tenant to leave the stock in the same state in which it was delivered to him, at the commencement of his lease. In process of time, industrious tenants acquired property and stock of their own, so that they could bargain with landlords for farms, on a footing of equality. But there were farms in this county, on which, if not the whole, at least a part of the stock was steelbow, after the middle of last century. This practice is now, however, entirely obliterated, and all farmers furnish their own stock, without any assistance from the landlord.

It appears, that before the demise of Alexander III., A. D. 1285, this country had attained a considerable degree of comparative prosperity; that is, when compared with the state of neighbouring nations. Though the Roman armies, and other warlike invaders, had destroyed great tracts of the ancient forests, in whose place peat-mosses were gradually substituted, yet great and extensive forests still remained. These were perpetually encroached upon for wood to build houses; for fuel to the inhabitants; and for boiling salt in the numerous salt-pans which were stationed along the coast*. As the land was cleared, it was reduced to tillage, and like similar lands in America, it yielded a long succession of crops without any manure. The forests afforded shelter to the cultivated lands; and abundance of mast, or seeds of trees, for feeding swine. They also afforded abundant pasture for numerous herds of horses and cattle. Sheep and goats were also reared in great numbers. The crops
chiefly

* Hence the small-coal used for boiling salt, is called *pan-wood*, to this day.

chiefly cultivated were oats, which furnished bread and beer to the lower orders; wheat, which received all the manure, and furnished bread for those of higher rank; barley, which was partly consumed as bread, partly manufactured into beer for the higher classes; together with a proportion of pease, beans, and lint. As towns had not yet begun to make much figure, the population was arranged in villages and hamlets, on the cultivated tracts contiguous to the forest. In every hamlet there were breweries, where beer was manufactured from the malt of oats, and this beer was the common beverage of the people. They also manufactured a sufficient quantity of woollen cloth, of linen, and of leather, for their domestic use. Meanwhile the fisheries in the lakes and rivers were prosecuted with great vigour and success, nor were those of the sea altogether neglected. As it does not appear that any great proportion, either of flesh or fish, was exported, they must have been chiefly consumed by the people themselves; and it is more than probable that the lower orders consumed a much greater proportion of animal food than at any future period. The whole produce of the land and waters, being consumed by the natives, must have sustained a numerous population. From the great armies that were afterwards brought into the field, it seems probable that this country was then as populous, as ever it has been since.—We beg leave to quote a passage from Mr Chalmers, *Caledonia*, vol. i. p. 788.,) which refers to this period.

“ But, agriculture was the universal object of pursuit, from the prince to the peasant. In this view of the subject, the kings were, within their own realm, the greatest barons, who possessed manors, in every shire; who manured them, under their own thanes, or bailiffs; and

who lived upon their own produce: they were induced, frequently, to shift their residence, in order to consume the products of their farms. The nobles followed the agricultural example of the kings. They, also, as they had many manors, in their proper demesne, made similar concessions to the monks, whom they wished to favour. The great barons, as well as the kings, were ambitious to possess large studs, the tenth of the produce whereof, they sometimes granted to the monks. The bishops, and abbots, emulated the nobles, in the extent of their possessions, and the greatness of their georgic establishments: from the variety of their granges, and the number of their flocks, they may be considered, next to the kings, as the greatest farmers of those times."

It does not appear, that commerce, during those ages, kept pace with agriculture, in the race of improvement. Indeed the means that were adopted by the kings, in order to promote commerce, appear to have been the most effectual that could possibly have been contrived, to fetter, and nip it in the bud. These were, granting charters, or exclusive monopolies, to particular towns, which were thus constituted into royal burghs. Each town had a district assigned to it, called its *liberties*, though it might have been more properly named its *slaveries*, within which none but the guild brethren of the town, or persons authorised by them, were allowed to buy or sell any of the commodities which were reckoned staple. Thus the town of Dundee had a very extensive district annexed to it, which is said to have extended all the way to Cupar Angus, on the one hand, and to Kirriemuir, on the other. Their district interfered with that which was assigned to Perth, which was sometimes the cause of bloodshed, and excited violent animosity between the citizens

citizens

tizens of these several towns, that is hardly yet extinguished. When a foreign vessel arrived with a cargo, they found only a few guild brethren entitled to purchase their goods, who could fix what price they pleased upon them; and as the same persons only could sell, they imposed what price they pleased upon the cargo that was taken in return. These exclusive monopolies, thus tended to scare foreigners from frequenting our ports; and the native shipping was altogether inadequate for an extensive foreign trade. The chief imports were wines, spice-ries, and frequently corn. The chief exports were wool, hides and skins; and occasionally linen cloth.

The monks, and dignified clergy, were not only extensive farmers, but carried on commerce as well as the towns; and they seem to have been exempted from the exclusive monopolies of the latter. In the monasteries, persons were accustomed to deposit their money, and more valuable effects, as places of security. These bodies early acquired the command of monied capitals, which they lent upon landed security; and if the money was not repaid at the time specified, the land became their own, and thus increased their territorial possessions. They also employed their capitals in fisheries, and in commercial adventures. Thus these establishments came to resemble banking offices, and commercial companies, rather than religious fraternities.

In the towns, there were armourers, for the making and repairing of arms; a trade of great importance in a warlike age, when every free man was a soldier. There were also smiths, masons, carpenters, skinnners, bakers, and all the crafts which furnish articles of the first necessity. In some there were goldsmiths and jewellers; the latter of whom seem chiefly to have operated on the gems that are known by the name of Scotch pebbles. These

were worn by the great men, and their retinues, on days of ceremony, or when they attended court. Each of these crafts contrived to secure for themselves the same exclusive monopolies, within the liberties of their respective towns, which the kings, with the best intentions, but without much political foresight, had incautiously conferred upon the merchants, or brethren of the guild. Such monopolies have tended much to retard, not only commerce, but the progress of arts and manufactures; and those towns have flourished most where the fines of entry, and other obstacles in the way of exercising a trade, or craft, are lightest; that is, where the monopolies approach nearest to a non-entity. This may be illustrated by the case of the city of Glasgow, where the weaving of linen was the only sort of weaving known, when the weaving craft was clothed with an exclusive monopoly. After the silk-gause, and muslin manufactures, were introduced, the weavers of these fabrics were prosecuted for the fines of entry, (which were very high,) with the weaver craft, and to conform to all the rules and regulations which these sapient craftsmen had established for the weaving trade. Happily the Supreme Court decided that the new sort of weavers had nothing to do with the old, as they were not in contemplation when their exclusive privileges were obtained. Now there are no linen weavers in that city, and their craft has died a natural death. But the weaving of muslins, being clogged with no restraints, has been carried to an unrivalled pitch of perfection, and to an unparalleled extent. Had the silk and muslin weavers been subjected to the rules of the craft, these manufactures never would have existed.

The long and bloody wars for the independency of Scotland, against the ambitious projects of the English Edwards, occasioned much destruction of property, of
public

public and private edifices; and not only checked the farther progress of improvement, but annihilated a great part of that wealth which the nation had already attained. So much was this the case, that when a new extent was established, in the reign of David II., it fell short of the old extent, which had been established some centuries before, by nearly one half. The extent was a land-tax, for the maintenance of the government, imposed according to the value of land, which was ascertained by proper officers in each county. The old extent always continued to be levied, until a change of circumstances induced a new valuation of the lands. Thus, the old extent of the county of Forfar, was L. 3370, 6s., 8d.; and the new extent only L. 2240 : 6 : 8. It appears that some other counties had suffered in a much greater proportion than this; and the old extent of the whole kingdom amounted to *

The new extent to	-	L. 45,301 14 4
		23,106 4 4
Difference,		L. 22,195 10 0

During the Stewart dynasty, the princes were often minors, or captives. No systematic plans of improvement were carried on; and the nation suffered much from the anarchical factions, and oppressions of the nobles, who were left without check or controul. The reformation of religion, although by relieving the minds of men from the trammels of superstition, it paved the way for manly thought, and the cultivation of reason; yet, from the violence with which it was attended, it certainly did retard the progress of improvement, in agriculture

H H 3

and

* Caledonia, vol. i. p. 816.

and the arts. Had our princes taken the lead, in carrying into effect what they were unable to resist, they might have prevented the excesses that ensued. But their unceasing endeavours to cram a form of religion down their peoples throats, which they abhorred, exasperated them even to madness, and urged them to extremities, that would, in other circumstances, never have been thought of. It has often been observed, that morality has generally been at the lowest ebb, during those periods, when men were most inflamed with religious zeal; and when they were worrying each other about abstract tenets, or about the modes and forms of ecclesiastical government. We have seen the rancour, and acrimony, of religious sects, and even their whimsical oddities and peculiarities, gradually to subside, after they ceased to be persecuted, and government chose to let them alone.

Though Scottish vanity was very much flattered by having the honour of furnishing a race of kings to England, yet they soon found the effects did not correspond with what they had fondly contemplated in theory. They were governed by English councils, composed of persons who had no interest in the prosperity of this country, but who rather thought, most absurdly, that its prosperity was inconsistent with that of their own; and of whom the privy council of Scotland were the abject and servile tools. These were merely the hangmen, whose business it was to execute every act of fraud, injustice and oppression, which their masters, on the other side of the Tweed, chose to dictate. Numberless examples of this might be adduced; but we shall only refer to the Darien expedition, in the reign of William; of whom the Scotch deserved better things than that he should sacrifice them to the clamours of his English counsellors, in a project which he had solemnly sanctioned,

and which could injure no nation, nor individual, upon earth.

All the evils that were occasioned by the accession of our kings to the English throne, and by the violence which preceded this event, were happily corrected by the Union of the two kingdoms. The suppression of heritable jurisdictions; the extension of general law and government, administered with impartiality, and tempered with mercy; subjecting men to general rules, and not to individual will and caprice; have had a powerful effect in cherishing a feeling of security, and in exciting industry and virtuous exertion.—It may appear strange, though it is not more strange than true, that the Scotch were, at first, much more violent against their union, than the Irish now are against theirs. But after they began to experience its good effects, their antipathy was converted into warm approbation.

It was not until after the commencement of the reign of his present Majesty, that the latent energies of this portion of the empire were roused into full exertion. Agriculture, manufactures, and commerce, have advanced towards perfection, with a firm and rapid pace. The establishment of the Board of Agriculture, must form an æra in the history of this art; and of the means by which the national prosperity has been increased. This establishment has already done much good, and is likely to do much more; though it is needless to detail, what to every one is well known. Though they had done no more than collect, and circulate information, and direct the public attention to this important subject, they would have deserved well of their country.

From the annexed excerpts from the Minutes of the Proceedings of the Barony Court of Lower, near Forfar, some idea may be formed of the mode of process in these

once formidable courts; and likewise some hints are given concerning the rural economy which prevailed previous to the abolition of feudal jurisdictions, and before modern improvements began to be introduced*. It appears, that even in criminal cases, the baronial courts sometimes had recourse to the oath of the accused, who was made to swear against himself; which is not permitted in any other court of law. This may have been necessary, when they took cognizance of offences that were committed beyond the bounds of their jurisdiction, from which they had no power to enforce the attendance of witnesses. It appears also, that a riot, committed in Dundee, was punished by fine, in the barony court of Lower; when one would more naturally have expected, that it should have been punished by the Magistrates of the place where the crime was committed.—It appears, that the proprietors, as well as the tenants, in those days, had a large field sown with broom, and called the broom-park. This afforded shelter and pasture to their cattle during winter; and the broom being cut from time to time, served, along with peats, for fuel. It also appears, that each tenant had a certain portion of moss assigned him, called his *leet*, to which he was restricted in casting peats. But what is most extraordinary, thistles were reckoned an advantage among the corn in those days; for Alexander Arnot complains against his neighbour Andrew Douglas, and gets him fined for pulling his thistles. This corroborates what we stated on that branch of the subject, that before the introduction of clover, and cleaning crops, the farmers had no other house-feeding, dur-

* See Appendix, F.

ing summer, but thistles, and other weeds that grew among the corn. It also appears that females, as well as men, if they possessed any land, were bound to give attendance on the baron court; for we find their attendance enforced by penalties.—Some are of opinion, that it would have been more expedient to have regulated these courts, than to have abolished them entirely; as they checked petty offences, and enforced the payment of small debts, without any expence to the parties. It has been found necessary to establish the small debt courts, as a substitute for the courts baron.—But it seems doubtful if any rational, or general system of jurisprudence, could ever have arisen out of the decisions of courts, which acted on no permanent principles; and where the only rule of decision was the whim, or caprice, of the baron, or of those to whom he deputed his authority. The same objection is partly applicable to our national courts, in a country which never had a *common law*, or a system of rules and regulations handed down from immemorial usage, which might be referred to in settling the rights and claims of individuals. Before them, one learned gentleman says this is law; another says the contrary is law, and the judge, puzzled and perplexed, perhaps finds something to be law, very different from the statements of the learned counsel. The parties find they have paid very dear for law, which, they at last discover, to be hardly worth its price*.

SECT.

* I heard of some old men in the Highlands, who maintained that the whole kingdom belonged to the Gael, from immemorial and indefeasible right. That the Sassanach, or Lowlanders, were intruders into their country; and although their forbearance

SECT. II.

LABOUR.

We must distinguish between mechanics, who are wholly, or chiefly, employed in trades or manufactures, and

forbearance may have permitted them the usufruct, still the right of property remained unalienably with the Gael. From these premises they inferred, that carrying off booty from the low country, could not be chargeable with the disgraceful epithets of theft, or robbery, as it was only taking a small part of what was their own, and what the Lowlanders had no right to possess.—Though the Gael always held stealing from the members of their own, or of friendly clans, in the greatest abhorrence, (except in the way of joke, or as a display of address); and their chiefs would punish it with the utmost severity; yet they held theft, or robbery, from hostile clans, or from the Lowlanders, to be meritorious: especially if the deed was accompanied with displays of valour, or of ingenuity. In former times, it was usual for a chief to promise a Michaelmas moon, that is the booty that should be acquired at that period of the year, as a marriage portion with his daughter. But while these sentiments and practices prevailed among them, a stranger might travel from one end of the Highlands to the other, with a load of gold. No one would injure either his person or his property; but on the contrary, the contest would be who should shew him most kindness and civility.

When a Highland chief went to visit a friendly chief, he always carried a number of the most valiant champions of his clan, in their military weapons, as a guard to his person; also some of those who had acquired renown by ingenious acts of theft. It was usual for the two chiefs so match a certain number of their champions, on each side, in trials of skill in the art of fighting. From a trial of skill, the battle sometimes de-

generated

and labourers who are wholly, or chiefly employed in agriculture. The latter are of several denominations, and

generated into downright earnest, and the champions would kill each other. If the parties happened to be heated with liquor, the battle sometimes became general, and much bloodshed ensued.—The chiefs would also take bets which of their thieves would commit the most ingenious acts of theft; one instance of which I had from a respectable old officer who had served under the great General Wolfe. Two chiefs having taken a bet of this sort, each ordered his man to cross the mountains into the confines of a rival clan, and try who could steal with most address. The thieves set off in the dusk of the evening, and after travelling until about midnight, and reaching the hostile confines, the one said to the other, that their masters were great fools in sending them on such a fruitless errand: that they had better wrap themselves in their plaids, and take a sleep upon the heath; and when they returned to their masters, they could tell them they found no opportunity of stealing. This was agreed to; but when the sly fellow observed his companion to be fast asleep, he pulled out scissars, and cut a pair of hose [Highland stockings] from the back of his plaid. At the same time he stitched them very neatly with a needle and thread, and drew them on his legs. When they returned; one of them told his master that they had wandered all night, but found no opportunity of stealing any thing. The other man told his master that he had stolen a pair of hose, which he shewed upon his legs. Being asked, where he had stolen them?—He answered, from his antagonist's plaid;—and the man's back being turned round, the hole was seen from which they had been cut.—This excited immoderate bursts of laughter, and his master gained the wager.

The clans contiguous to the low country were accustomed to make predatory incursions into Moray, Banffshire, and all the districts contiguous to the whole range of the Grampians, (among which this county was not spared,) in a regular and systematic manner, until a very late period; and this obliged the people of these districts to be constantly on the alert, to repel their attacks by force. To prevent raising alarm, they generally advanced, in small parties, by different routes, to some convenient place of rendezvous. Having formed a junction, they drove off all the cattle that lay between them and their home, and

and they may be classed under the designations of ploughmen, day labourers, and occasional labourers.

The ploughmen seldom do any other work but what is executed by the assistance of their horses; such as ploughing, harrowing, carting the crop from the field, conveying the corn to market, and importing manures to the farm. Each man has a pair of horses, a plough, a cart, with all the necessary harness and tackle, under his charge. When the yoking is over, each man rubs down, cleans, and feeds his own horses, and repairs any part of the harness that may have met with an accident. They all assist at the thrashing mill; and on small farms, the ploughmen generally thrash as much in the morning, and during bad weather, as serves to fodder the live stock upon the farm. In many cases the business of thrashing is executed by barnmen, who work by the piece. It was formerly stated that the ploughmen, in this county, with a few exceptions, are very dexterous in that sort of work. They display much vanity and emulation in having

and carried off meal, money, furniture, and every article they thought they might convey to a certain distance within the mountains, before a force could be collected sufficient to overpower them. If they reached a certain distance with their booty, they knew that no force would venture to pursue them farther. These inroads were so frequent, and so harassing, that many proprietors were glad to compound with the chiefs of the Katrine, or freebooters, by paying them an annual tribute, which was known under the name of *black mail*. In return for this tribute, the chief to whom it was paid, undertook to keep the lands of the proprietor *skaitless*; and if any thing was carried off, he was bound to make good the loss. Such bargains were always most religiously implemented on the part of the freebooters, and their chief; and if other clans should commit depredations on lands they had engaged to protect, they would recover the booty, or an equivalent, by force if necessary.

ring their horses in good order, and distinguished by the tidiness of their trappings. They seldom use any reins to guide them, either in the plough or cart; but have their animals so completely trained, that they obey their voice, and perform all their evolutions by word of command. Though the horses sometimes run off, and fatal accidents occasionally happen to the ploughmen themselves, they cannot be persuaded to use reins in order to command them in such cases. It is observed, that horses work with more docility and zeal, under the direction of a person to whom they are accustomed, than under a stranger. A considerable proportion of this class of labourers are married, whom many farmers prefer as being more steady; not apt to roam about in quest of their bethearts; nor much disposed to leave their service for other situations. Others, however, dislike married servants, because they think them apt to be troublesome about their allowances; and excepting one, perhaps, who acts as foreman, they prefer young lads, who are engaged by the year, or half year, as can be agreed upon.

Their hours of working upon the farm, in winter, are by a single yoking, which commences immediately after breakfast, and is continued until darkness approaches. In spring and summer they have two yokings, of about four or five hours each. At the times of sowing, and of gathering in the crop, they observe no regular hours of working; but in critical weather, they catch every opportunity of accomplishing their object, and sometimes work all night. Indeed farming, like sailing, cannot be conducted by regular intervals of labour and rest. As the negligence, or inactivity, of a few minutes, may occasion the wreck of a ship, so the laziness of a few hours may cause the loss of a crop. When they go to the market with grain, or to fetch home coals or lime, those in the

the

the interior generally set off very early in the morning, or soon after midnight, and sometimes do not return until the midnight following. They carry provender for their horses, and are allowed something for refreshments at their place of destination.

Day labourers are distributed in all parts of the county, in the towns, villages, and hamlets; of which the latter are commonly distinguished by the name of Cottons, that is towns composed of cottages. Some of these cottons are immediately under the proprietor, others are under the possessor of the farm, to whom the inhabitants pay rent, generally in labour upon the farm. Every family has a kail yard, and some individuals have as much land as maintains a horse or two, with one or more cows. The latter hire themselves and horses to work the small pendicles of those who have no horses, to carry materials for the roads; coals from the coast, and fuel to the tradesmen in the towns and villages. All the day labour, that can be reduced to an estimate, is performed by the piece; and the labourers generally make considerably more in this way, than when they are upon wages. But as it was stated, that the regular servants upon a farm never work except in conjunction with their horses, day labourers are always employed to assist in the filling and spreading of manures, the turning and mixing of middens, cleaning of ditches, and all parts of the weeding processes which are performed by the hand. They also assist in hay-making, in reaping and securing the crop; and there are few farms of any extent, where a certain number of labourers do not find constant employment. A few of the female labourers are kept in the farmer's house, where household occupations, and the dairy, are the principal objects of attention. But they assist in hay-making, in
planting,

planting, weeding, and gathering potatoes; in weeding and thinning of turnips; reaping, and all other out-door work for which they are adapted. Their leisure hours are employed in spinning blankets and linnen stuffs for domestic use.

The other female labourers, as well as a considerable proportion of men who follow other employments, such as weaving, &c. may be considered as only occasional labourers in agriculture. They are arranged in the cottons and villages; but they are always ready, especially the women, to turn out when their labour is needed in the fields. When not thus employed, the women are engaged in spinning yarn; though, since the spinning mills became general, and hand-spinning became a less profitable employment, a great proportion of the women have betaken themselves to weaving; but they always prefer working in the fields, when opportunities occur; and in some sorts of work, such as hand-weeding, shearing, &c. they even surpass the men.

Although varieties of character must be expected in every numerous description of people, yet, in general, it may be truly said, that the labouring class in this county are an industrious and useful class of persons. They are very expert in the different kinds of work to which they are accustomed. They are regular and decorous in their attendance on public worship, and religion seems to have a suitable influence on their morals and behaviour. They are frugal and economical in the use of food and drink; and the only article of expence in which they are perhaps disposed to run into extravagance, is, in clothing, and the ornament of their persons. The usual dress of a ploughman, is a grey felt, or straw, or glazed hat; a short drab coat, striped waistcoat, with white or blue pantaloons or trowsers. But when they appear at church,

or

or at places of festivity, they are dressed in English cloths, and can hardly be distinguished from their masters. The young women, on such occasions, are generally dressed in muslins, or printed calicoes; and each sex commonly carries from eight to ten pounds worth of clothes upon them. Many of their faces are injured with the small-pox, which the cow-pox inoculation is likely to avert from the rising generation. It is very singular that the great body of the people resisted inoculation with the natural pox, from religious scruples, which all the efforts of the clergy, joined to the authority and influence of proprietors, were unable to remove. But no sooner was the cow-pox inoculation introduced, than it was readily adopted by all classes. So much is this the case, that it is frequently performed by midwives, or by mothers upon their own children; and it is in danger of being brought into disrepute, from their not being able to distinguish between the spurious and the genuine cow-pox.

The hours of work for day-labourers in summer, are from six in the morning to six in the evening, with an hour for breakfast, and another for dinner. In winter, they work from about sunrise to sunset. When they work by the piece, they regulate their own hours, and generally begin more early, and continue later, than when they work for wages. When there is a hurry of work, in spring or harvest, or in preparing corn for the market, they never hesitate to work beyond their regular hours. In such cases their employer commonly furnishes a little beer, or spirits, in order to cheer and animate their exertions.

Wages

Wages.

has been a subject of controversy among political economists, whether the wages of labour be regulated by the price of provisions. No doubt a labourer must get a wage sufficient to maintain himself and family, or it is impossible he can labour long. But though the price of provisions may be supposed to have some influence upon the mind of the labourer, when he engages his services, it cannot be supposed to weigh much with his employer. Former times, in this country, a labourer was thought to be very well off, if he gained a peck of oatmeal, or the money price, by his day's work. Now, labourers generally gain the price of two pecks of meal, or more; we must infer that the price of provisions has not all the influence on the price of labour, which some sup-

pose we are apt to bewilder ourselves, on this, and on other subjects, from their rooted habit of estimating value by money. They do not consider that money has itself no intrinsic value; that it is merely a medium for circulating commodities which are desirable as necessary, agreeable, or ornamental; and that the effect of money to produce this effect arises entirely from a tacit compact, suggested by motives of convenience and expediency. They forget also that the power of money to produce its effect, or its value when compared with other commodities, is in proportion to its scarcity, or the smallness of its quantity in the market. When the quantity of money in circulation is greatly increased, whether it consist of the precious metals, or of paper, whatever be its species, its value, or power in pur-

chasing commodities, must be proportionally diminished.

The depreciation of the value of money must therefore be held as one cause of the great rise of the money price of labour; but this rise is more apparent than real. It is true that the meal, on which the labourer chiefly subsists, has not risen in the same proportion that the power of money has fallen, and in this particular the labourer has gained an advantage; but he needs clothes, shoes, and other articles of manufacture, as well as food, and the price of these has risen in proportion, or has even exceeded the diminution of the power of money.

But the most operative cause of the great rise of the wages of labour, has been the demand for men to the army and navy, for manufactures and trade, and for agricultural improvements, which have been progressively increasing during a considerable time past. If there be many labourers seeking employment, and few who are desirous of their services, the wages of labour must fall. But if the employers be many, and the labourers few, their wages must rise. Thus the price of labour, like that of other commodities, will be regulated by the quantity in the market, compared with the demand.

There is a general complaint among the farmers of this county, that they cannot get labourers sufficient to execute all the necessary operations on their farms; and that their extravagant wages are beyond what can be repaid by the sale of their produce, if they take into account all other expences. It is very true that the profits of agriculture are perhaps lower than those of other professions; but high wages are always a good criterion of the general prosperity of the country. They shew that capitals find profitable employment, and that the great body of the people are industrious.

A married farm-servant, or ploughman, gets a house and garden, with fuel, and a cow, well kept throughout the year. He also gets $6\frac{1}{2}$ bolls of oatmeal, 3 bolls of potatoes; and from L. 12 to L. 15 a-year of money. His whole expence may average about L. 33. If his wife and children should assist in weeding, harvesting, &c. they are either paid for their work, or get such a proportion of lintseed as can be agreed on, sown on some part of the farm, as an equivalent.

Unmarried servants frequently get their victuals in their master's house, in which case they receive nothing more than their money wages. Young lads are sometimes averse to engage longer than half a-year; partly from a roving disposition, partly from the hope of a rise of wages the next half year; but, in general, they are engaged for a whole year; and those who do not get victuals in the house, have a place called the *Booby* where they sleep and prepare their victuals, their fuel being provided for them. They get a Scotch pint of milk each day, $6\frac{1}{2}$ bolls of oatmeal, and from L. 16 to L. 21 a-year, of money wages. In some cases the milk of one cow is allotted to three servants. The whole expence of a good unmarried ploughman, may also average about L. 33 a year.

Female servants commonly receive their victuals in their master's house, and they get from L. 5 to L. 6 a year of wages, according to their age and strength; a full grown female seldom getting less than L. 6. As they are much employed in the fields during summer and harvest, they generally receive 10s. in addition, during that season, to purchase shoes.

With regard to harvest work, the system of threaving formerly described, is now become so general, that very few servants are now hired for that season alone.

A good labourer gets from 1s. 6d. to 2s. a-day, during winter ; and from 2s. 6d. to 3s. a-day during summer. In such work as is done by the piece, if he happen to make an advantageous bargain, he often gains, by persevering labour, 4s. 5s. or even 6s. a day. All labourers prefer piece-work to any other mode of employment, because they are then their own masters, and they are rewarded in proportion to their exertions. But they are sometimes out of employment ; when they do any little jobs that may be necessary about their house and garden.

SECT. III.

PROVISIONS.

FARM-SERVANTS live chiefly on oatmeal and potatoes, and milk. Their breakfast is porridge, which is made by stirring meal among boiling water, or milk, in a pot over the fire, with a little salt ; and when it cools, it is eaten with milk. Or they use *brose*, which is made by pouring warm water upon meal, in a wooden dish, with a little salt, taking care to stir it well. This also is eaten with milk, or with beer, which is furnished in place of milk, when the latter is scarce. Sometimes, when they are in a hurry, they mix the liquid with the meal, in a cold state. Their usual dinner is oat-cake, with sometimes butter or skimmed milk cheese, and milk. Their supper is the same with breakfast, except that sometimes they use sowens, or potatoes, in place of porridge or brose. Butcher-meat is only used on particular occasions ; and fish by those who are near the rivers, and the sea-coast.

Much

Much ridicule has been thrown upon the Scotch on account of their immoderate use of oat-meal. This has been represented as inflaming their blood, and producing their favourite disease called the *Scotch fiddle*, and other cutaneous eruptions. But oat-meal is as much used in some districts of England, as in any part of Scotland; and cutaneous eruptions are much more frequent in some of these districts than they are here; where they are seldom seen or heard of. The latter ought rather to be ascribed to dirty linen and clothing, than to oat-meal, or any particular species of food. Oat-meal, when it is sufficiently diluted with any sort of liquid, is known to be a laxative, aperient, wholesome, and at the same time, a strengthening food, for those engaged in hard labour. Engineers, who superintended the excavation of canals, have assured me, that those labourers who lived entirely upon oat-meal and milk, did a third more work, than those who used butcher-meat, beer, and spirits. All of the former saved money, while many of the latter involved themselves in debt. As this sort of work is done by the piece, it affords a fair comparison, not only of the wholesomeness of oat-meal in promoting health, but of its power in supporting labour.

All families, that have a house of their own, use tea, with wheaten bread. But among cottagers this is a rare, and always a ceremonious entertainment, at christenings, and other solemn occasions. Among people in better circumstances, tea is used once, and more frequently twice, every day. All classes use butcher meat, and fish, occasionally; but tradesmen in towns, and the better class of farmers, use them once, and sometimes twice, every day. In every village there is a butcher, and the towns are sufficiently provided with people of that profession. All classes drink small beer,

which is generally of good quality in this county; and spirits when they can be procured. There were formerly entered stills in the county, but now there are none. The people hold in abhorrence the whisky produced by the stills in the south country, especially that which is made from sugar. They receive a precarious supply of whisky, from small stills behind the Grampians, for which they pay a much higher price than for south country whisky. But the excisemen have become so active, as very much to diminish this supply. This has created an irresistible encouragement to the smuggling of gin and brandy, which are thrown upon the coast. The vessels which convey these liquors, are well armed, and they act as privateers, after they have discharged their cargoes. They lie off and on during the night, and make signals, which bring the people alongside with their boats, who receive their spirits, and pay down hard cash. Thus, this traffic tends to rob the country of its currency, and to encourage the industry of our enemies. It is a pity but some measure could be adopted that would enable the county to supply itself with wholesome spirits, while, at the same time, they paid a suitable revenue to government.

As a great proportion of the cattle that are fed in the county, are exported, the price of butcher meat is nearly the same with the average of other counties; and it has been gradually rising during several years. Beef varies from 7d. to 8d. per lb. Amsterdam. Best pieces are sometimes as high as 10d. Mutton and lamb are 6d. 7d. and sometimes 8d. per lb. Pork 6d. sometimes 7d. A chicken from 6d. to 8d. A hen, or duck, from 1s. 6d. to 2s. 6d. Eggs per dozen, from 6d. to 1s. A goose 5s. A turkey from 5s. to 7s. Butter from 1s. 5d. to 1s. 6d. per lb. Cheese from 6d. to 9d. per lb. These articles

articles are rather cheaper in the northern, than in the southern district; and there are hawkers who purchase them in the remote parts of the county, and convey them to the towns.

In this, as well as in other counties of Scotland, the prices of grain and meal are annually ascertained by the Sheriff of the county, with the help of a jury. The Sheriff summons a jury every month, from November until Candlemas day in the month of February, before whom dealers are examined upon oath, to ascertain the prices during each month. At Candlemas, the final jury is called, when the fiars are struck; that is, the medium prices during the three preceding months.

FIARS OF FORFARSHIRE DURING SIX YEARS.

Years.	White Wheat.		Red Wheat.		Barley.		Bear.		Oats.		Out-Meal.		Pease.		Rye.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1790.	22	0	22	0	14	3	12	6	13	0	13	6	12	0	10	6
1791.	21	0	20	6	17	0	15	0	14	0	15	6	14	0	12	0
1792.	19	10	19	3	18	6	16	6	12	0	16	6			12	0
1793.	23	0			16	0	14	8	14	3	16	3				
1794.	23	2½			20	6	18	2	15	11	16	1	16	7½		
1795.	24	9			20	10	19	6	20	7	15	0				

ANGUS FIARS, FROM 1801 TO 1811.

	1801.		1802.		1803.		1804.		1805.		1806.		1807.		1808.		1809.		1810.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Wheat,	34	0	24	8	25	2	39	3	33	3	37	6	31	6	42	11	41	2	35	0
Barley,	24	8	16	5	17	1	28	0	23	3	25	6	26	5	25	8	27	3	24	6
Beet,	21	6	13	9	14	7	23	6	19	9	21	5	22	6	22	4	22	9	22	3
Potato-Oats,	16	9	14	0	17	10	18	11	19	11	21	0	24	4	23	11	23	5	20	3
Oats,	17	6	15	8	18	8	18	2	19	6	22	0	26	2	26	11	25	10	21	7
Oatmeal,	16	11					17	10									23	2		
Pease and Beans,			14	0	15	8						28	0	26	8					
Pease,					15	3						27	6	27	7					
Beans,													23	0	23	0				
Rye,																				

SECT. IV.

FUEL.

IN the Grampian district peats are chiefly used for fuel. In the Strathmore district, and part of the Seed-lays, peats and wood are chiefly used; though all persons whose circumstances can afford the expence, prefer coals. In the maritime district coals are chiefly used. All families endeavour to lay in a few carts of peats, in order to kindle and keep in their fires, which, in summer, are never lighted, except for culinary purposes.

Among the Grampians, the mosses are situated at high elevations, on the sides and tops of the mountains, to which the people have to climb every day from the valleys, to cut and dry their peats. It is also a very laborious work to get them conveyed to their places of residence, after they are ready for use. This occasions the people to consume a great part of their most valuable time in summer, in providing fuel for the ensuing winter. After all their labour, a wet season frequently defeats their object, and the peats cannot be dried so as to be fit for use. To prevent this, it has often been recommended, and the plan is acted upon by some individuals, to provide as many peats in one summer as may serve for two years. The peats also make much better fuel when they are kept a year before they are consumed. To remedy these inconveniences, some have proposed that the cutting and drying of peats, should be made a separate business, like the manufacture of bricks and tiles. But
where

where the mosses are locked up with frost until near, or even sometimes after midsummer, and where two months is the utmost period that can be depended on for accomplishing this object, it is evident that such a project is utterly impracticable; and that every person must exert himself in this work, or it never can be executed. In the Strathmore and Seedlay districts, the mosses which yield good peats are nearly exhausted. There one and a half cubic yards of solid moss are estimated to furnish a cart-load of peats. Those who cut the peats, have the moss measured to them, and they pay to the proprietor a rate per cart, according to this measurement, which varies according to the quality of the moss, and the demand. A two-horse cart-load of these peats, being carried from three to five miles, will cost from 8s. to 10s., and it requires nearly three of such carts to equal a boll of Scotch coals, of about 11 cwt. 20 lbs.

The people of these districts also make much use of Scotch fir-wood, as fuel. This appears to be the most expensive of any they can have recourse to, though it often happens that necessity has no law. A single horse cart-load of these sticks, cut green in the wood, with their tops, costs from 7s. to 8s., beside carriage. They must be split with wedges, reduced to small fragments, and long exposed to the air, before they will burn at all. Yet they are far from being a lasting sort of fuel, and they require a person to be almost constantly at work with the bellows, to make them burn. Those who depend chiefly upon coals, only use chips of this wood for kindling their fires. The roots of these trees make a stronger, and more lasting fuel than their stems, or branches; but they are never used except by those who root them out, with a view to bring the land into cultivation.

At

At the coast, a boll of Scotch coals, from Fife, or the Frith of Forth, is 70 stones weight, of 16 lbs. to the stone, and $17\frac{1}{2}$ oz. to the pound, or about 11 cwt. 20 lbs., and this costs about 12s. Conveying them into the interior, to the distance of ten or fifteen miles, costs from 6s. to 9s. more. So that these coals, in the interior, cost from 18s. to 21s. English coals, being small, and of the caking species, are not sold by weight, but by measure. A barrel of them costs at the ship, from 20d. to 2s. Scotch coals are reckoned best for the kitchen, where the fire must be often stirred; and the most economical fire of any is esteemed to be that which is composed of a few chips of Scotch coals in front, with small English coals behind. The farmers provide themselves with coals, when their carts go down to the coast with grain. All classes prefer coals, when they can get them, and esteem them not only the best, but the cheapest fuel; though they use a proportion of wood and peats, for the reasons already stated.

In the maritime district coals are chiefly used for fuel; and wood is only applied for the purpose of kindling the fires. Owing to the scarcity, and difficulty of procuring fuel, many families have been induced to emigrate from the northern parts of the county, into the towns and villages along the coast. This shews the expediency of opening the country by canals, which would put every district nearly on a level with the sea-coast, in respect of this indispensable accommodation. The duty on coals, carried coast-wise, is now happily removed; or rather it was commuted for a much higher duty on distillation. It is wonderful that it should ever have entered into the heads of any set of politicians to propose, or how any Parliament could have sanctioned, a tax so partial and unjust in its operation, and so unproductive of revenue,
compared

compared with the mischief it produced. But the tax only began to operate, after the coals had passed the Red-head Promontory; and thus the towns of Dundee and Arbroath were exempted, while Montrose, Brechin, and all places to the northward, were liable. This tax operated as an effectual prohibition against the burning of lime in the county, and all manufactures which required much fuel.

It may be necessary to state, that the boll of Scotch coals, at Dundee, and some other places, is only 8 cwt. 96 lbs., and that the capacity of the barrel measure for English coals, varies at the different ports, and landing-places. But the prices are regulated according to the actual weights and measures; the differences between which are only known to experienced dealers, who have acquired, by laborious study, a knack of ready conversion of one measure and weight, into another, by mental calculation. We shall have occasion to enter more fully into this subject afterwards; but this shews the absurdity of having different weights and measures in the same county, which none but adepts understand; while the simple and unlearned in these matters, are perpetually exposed to imposition and fraud. They are like the people who were gulled out of their money, as well as their rationality, by the alchemists, who pretended to the secret of the philosopher's stone, which was to convert all substances into gold.

BOOK

BOOK XV.
**POLITICAL ECONOMY, AS CONNECTED WITH,
OR AFFECTING AGRICULTURE.**

THIS branch of the subject includes those measures of local police, and those legislative enactments, which have an influence on agriculture, and general improvement. It may be made appear, that, in some particular cases, government interferes too much with agriculture; and that in others they are too reserved. It may also appear that no improvement can come single, and unconnected with other circumstances that are favourable to its production. The security of property, which is the effect of a wisely ordered government, begets industry, which is the parent of wealth. This again creates a desire for a great many accommodations and conveniences, which were not thought of in the rude and simple state of society, when men lived chiefly on the spontaneous produce of the earth.

There are some objects of police, which have hitherto been left to the management of persons in the several districts of the kingdom, but which long experience has proved

proved that they cannot manage with any advantage to themselves, or to the community at large. They get enflamed with local and party animosities; and like the Lilliputians described by Swift, they are apt to engage in fierce contests, which have no higher object than to decide whether an egg should be broken at the big, or at the little end. It would seem expedient that all such subjects should be taken under the hands of government, and vested in persons who have neither local attachments, nor antipathies, to bias or to pervert their judgments.

SECT. I.

ROADS.

It appears that the first roads in this county, like those in other districts, were merely random paths, which were marked out by horses and cattle frequently following the same tract. Many vestiges of these still remain, in various parts of the county; parts of which have been hollowed out into gullies, which receive and discharge all the water from the neighbouring acclivities, and they are encumbered with rounded blocks of stone. No inconvenience was felt from this state of the roads, while the population was distributed over the country, and the produce of land was chiefly consumed on the spot where it was raised. But after commerce began to extend, and the population to be accumulated in towns, while grain and other land produce became subjects of commerce, such roads were found inadequate for the purpose of easy communication.

It

It appears that, during this period, though most of the operations upon the farm were performed by oxen, all heavy articles were carried on the backs of horses. In order to get a dry and firm footing, they often went far out of their way, to climb over the tops of hills. Two bolls of meal, or the same weight of grain, were reckoned a sufficient load for a horse, and these are distinguished by the name of *load* to this day. Now, this formidable load is only 256 lb. and, on a level and firm road, a man may easily convey more than double this weight upon a wheel-barrow. It is evident that, in such circumstances, farmers must have kept a great many horses, consuming the produce of their farms; while this mode of conveyance was not adapted for importing fossil and other extraneous manures, to increase the fertility of the land. It is hence utterly impossible, in the nature of things, that they could pay such high rents, as more favourable circumstances now enable them to afford.

The next mode of conveyance was by cars, or sledges, as they are usually named. These are similar to carts in their structure, except that the trams, or shafts, rest upon the ground, and have no wheels to diminish friction. In some districts of the Grampians, these vehicles are still employed, to convey peats from the hills, or corn from steep hanging grounds, which are inaccessible to carts. The chariots of which we have such magnificent descriptions in Homer and Ossian, were mere cars, more ornamented, and adapted for war, than those used in rural operations. Such cars could carry a considerably greater load, and they could convey a great many articles, which could not easily be placed upon the back of a horse. They also suggested the necessity of smoothing certain steep declivities over which they had to pass, to prevent the

the car, with the horse and driver, from being thrown over a precipice.

The next step in improvement was the adoption of wheel-carriages; and the first sort of wheel-carriages used in this country were called *tumbrils*. These consisted of wheels, or rollers, of solid wood, about three feet diameter, in which a large wooden axle was inserted, on which the trams or shafts of the car rested; and the axle turned round with the wheels. These have long ceased to be used in this county; but I have seen them in some of the north western counties of England. They commonly travelled in a long string, the head of each horse being tied to the rear of the tumbril before him. Their approach could be descried from a great distance, by a musical concert, resembling the braying of asses, the screeching of night owls, and the squealing of swine. So much was this the case, that if the axle was not carefully and repeatedly greased, the tumbril and its load often took fire, and burnt to the ground. But these tumbrils were a great improvement on the cars, or sledges; and their use suggested the necessity of making roads which were not only smooth, but solid below.

The last improvement was the adoption of the wheel-carriages now in use, and which have been already described. The advantage of these can be easily estimated from this circumstance, that in place of 256 lb. the usual load upon a horse's back, a horse can easily convey, upon a level and firm road, more than a ton; and even upon an indifferent road, 11 or 12 cwt. is no distressing load for a single horse.

This, however, still further demonstrates the necessity of improving the roads to the utmost. But this has not been sufficiently attended to in this county. When

the

the roads first began to be improved, proprietors generally contented themselves with metalling the old tracts, so as to render them firm and solid below. They did not consider that money and labour, laid out upon a bad line of road, was so much thrown away; but that what is bestowed on the best possible line, is so much added to the permanent stock of the nation, the fruits of which they are to share. It has hence happened that there are not a few roads in this county, which may be pronounced good as roads; though their line, or direction, is most abominable. Steep pulls occur, where a horse, with great injury to himself and vehicle, cannot draw so much by more than a half, as he can easily do upon level parts of the same road. But such pulls might easily be avoided, and the road made much shorter, by going round a hill, in place of climbing over its top. In many cases the road is turned out of its course, in order that the traveller may enjoy the luxury of ascending a hill. Where a rise is unavoidable, which is a frequent case in this county, it should be equably distributed between the lowest and highest points; which, in all cases, in this county, would render the rise almost imperceptible.

After the utility of good roads became manifest, our old Scottish parliaments in the reign of Charles II. passed acts, empowering those who held a certain valuation of property in every district, to call out the people, and to employ them during six days of summer in making and repairing the roads. Those who had carts and horses, were also bound to furnish their labour. This is what is usually known by the name of *statute labour*; which is still exacted in some of the Grampian districts of this county. But this labour was always evaded as much as possible; or it was performed in the most slovenly and indifferent manner, so that, in fact, it did not amount to

two days of efficient labour in the year. Feeble and inefficient as this labour was, it was most wretchedly misapplied, in smoothing and laying stones and gravel upon the old tracts which had been marked out by the tread of cattle. Whereas, had the best possible line been taken, between the extreme points of a road, the labour bestowed in rendering such a line firm and solid, would have been so much gained to the public. But after a road has been inclosed, and the lands cultivated on each side, altering its direction for the better, is attended with much more expence, than if the best line had been adopted at first. All future alterations of the lines of roads, are also apt to be mere partial shifts, which, though they may palliate an evil in one place, tend rather to increase, than to diminish, the faults of the road upon the whole.

At last, in the 29th year of the reign of his present Majesty, the county of Forfar procured an act of Parliament for converting the statute labour into money, to be levied upon the different classes of the inhabitants, and to be applied, under the direction of trustees, being proprietors of land, or liferenters, to the value of L. 100 Scots in the county books, to the making and repairing of the roads and bridges within the county. From the operation of this act those parishes were exempted, who chose to continue under the old system of statute labour in kind; which is still continued among most of the Grampian districts to this day. At the same time an act was passed empowering the same trustees, or such of them as chose to act, to convert certain roads within the county into toll roads, and to levy certain rates for all sorts of cattle and carriages travelling on the same. The trustees were also empowered to borrow money upon the credit of these tolls, or upon their personal security, to
put

put the roads and bridges upon the toll roads into a state of complete repair. Upon this act, from L. 40,000 to L. 50,000 have been raised and expended upon the toll roads. The engineers who were employed in lining them out, were directed, if possible, not to admit of a rise of more than one foot in 20; but except in impossible cases, no road should have more than one foot in 30 of rise. Under this act considerable progress has also been made in rendering the parochial, or bye roads passable; but of some of these there is reason to regret that they did not take a more level line, before they began to lay stones and gravel upon them. Under this act, from L. 5000 to L. 6000 a year have been levied upon the inhabitants, and applied to the improvement of roads and bridges within the county.

The principal toll-roads in the county, are

1. The coast road, which connects the sea port and trading towns, and along which the mail coach runs, one north to Aberdeen, and one towards the south each day. This road connects with the great toll road from Perth, through the Carse of Gowrie, at the boundary of the county, to the west of Dundee. It passes by Arbroath, and terminates at Montrose, where it ceases to be a toll road. The gentlemen of the Mearns have it now in contemplation to improve this road, and subject it to toll, until it reaches Stonehaven; and thus the mail-coach will run wholly upon toll roads, from London to Aberdeen.

Although there are abundance of good materials along the line of this road, it has neither been paying the interest of the money originally advanced upon it, nor affording sufficient returns to keep it in repair. This is so much the case, that it has been protested against before the Court of Session. Some proprietors complain, and

with much apparent reason, that the mail-coach does much more injury to the road than any other vehicle that travels, and yet is wholly exempted from toll. That this exemption gives it a preference over post chaises, which do much less injury to the road, and yet pay better than most other vehicles. It seems reasonable and expedient to subject the mail-coach to the payment of toll; which might either be recovered by a small rise upon the tickets of passengers, or by a trifling addition to the postage of letters. It does not seem just that individuals should be allowed to use and injure the property of others, without indemnifying the loss they have occasioned.

2. The Strathmore road, connects with the toll road from Perth, through Strathmore, at Cupar Angus. It passes by Meikle, Glammis, Forfar, Brechin; and enters the county of Mearns at the Bridge of Pert, or North Water bridge. Upon the whole, this is a very level road, and kept in excellent order. A mail cart travels north, and another south, along it every day. A post coach, drawn by four horses, also runs betwixt Perth and Aberdeen, and *vice versa*, every day. There is considerable posting, and equestrian travelling upon this road; as it is the general road of communication between the south and north of Scotland.

These two roads traverse the county nearly parallel to each other. The other toll roads only form communications with these two, or between the towns on the coast, and those in the interior. These are

3. A toll road from Dundee to Cupar Angus, which throws off a branch to Meikle.

4. Another from Dundee to Forfar, over the Seedlay Hills, which throws off a branch through a gap near the highest

highest pinnacle of these hills, to Glamis, and from thence to Kirriemuir, near the mouth of the Grampians.

5. A road from Dundee to Brechin, by Carmylie, and Pitmuies. These roads are not in good order, nor are they defraying what has been expended upon them.

6. A road from Arbroath to Forfar, by Pitmuies, and the north side of the hill of Dunichen. This road also forms a communication between Arbroath and Brechin, by joining the road last described at Pitmuies toll.

7. A road from Montrose to Brechin, by the north side of the bason, and of the North Esk. This is an excellent road, having the moderate rise very equably distributed.

Any other toll-roads in the county are merely lines of communication with other roads. The extent of toll-roads in the county is upwards of a hundred miles. Some of the latest formed private roads, are equal, or even superior to many parts of the toll-roads, in breadth, solidity of structure, and in the equable manner in which they ascend eminences which are unavoidable. But many of these roads are merely formed, by digging a ditch on each side of them, and throwing the spongy clay, here called mortar, upon the top of the road. Of course they are almost impassable, except in dry weather, or during hard frost. During wet weather, horses sink to their bellies, and carts to their axles; and it is with difficulty an animal can make his way through them without any load. Where these roads are too narrow, and are smothered with trees, they are often impassable, even where they have been metalled, or laid with stones and gravel. There are also a great many roads which still continue in their antient state, and are mere tracts, over which horses, and sometimes carts, find their way in dry weather.

weather. It would perhaps be expedient to abolish a great many of these useless roads; and to have those that are retained in the most correct lines, and suited to the conveniency of as many of those who are interested as possible.

Soon after these acts of Parliament were passed, the country came to be divided into two parties, which were distinguished by the names of the *Great Roadists*, and the *Private Roadists*. The first insisted that as the toll-roads formed communications between the different towns, and between the interior country and the sea-ports, they were the highways which were in the contemplation of the Legislature, when they appointed them to be repaired by the statute labour of the several parishes through which they passed. That as this statute labour was now converted into money, the toll-roads were entitled to a part of this money, in aid of what was levied at the tolls, to keep them in repair. The other party insisted, that those who had advanced money upon the toll-roads, had done so in contemplation of what should be levied at the toll-bars; which was their only security for payment of interest, replacing their capitals, and for keeping these roads in repair. That the money raised as a commutation for the statute labour, ought wholly to be employed in making and repairing the different roads through the several parishes, upon which no tolls were paid. That it would be unjust to make the people first pay their money for repairing these roads, and then to exact a toll for the use of such roads. That if the sums levied upon the toll roads, were found insufficient to cover all expences, the only remedy was to increase their amount. While these contests were going on, most of the old roads, for which the toll-roads were substituted, were left open, or repaired. As these generally run parallel to each other, in

most

most cases, people can travel betwixt the different towns without paying any toll. This has tended to diminish the amount levied at the tolls, and to render the funds inadequate for the payment of the interest, and for keeping the toll-roads in repair.

The powers conveyed by the former acts being nearly expired, a new act was obtained which took effect in 1811. By this act the toll-roads in the county are divided into districts, under the management of resident trustees in the several districts, none of whom can act unless they have a real property of L. 100 a-year, or L. 500 Sterling, real and personal. These are empowered, if they see it expedient, to double the former rate of tolls; and to lower them again, with consent of those who have advanced money upon the roads. In aid of the tolls, one half of the road-money levied within burghs, may be laid out, at the discretion of the trustees, in repairing the toll-roads within three miles of each burgh, whether they be within the parish to which the burgh belongs, or not. At the same time several new lines of road are marked out, on which the trustees are empowered to levy tolls, as soon as a certain proportion of the money necessary to complete these roads, is subscribed. But no interest on money advanced, in making new, or amending old roads, can be demanded, until there be a revenue arising from the tolls, sufficient to keep the roads in repair, in the first instance; and to afford a surplus to pay interest, or to replace the capital, in the second.

The road-money to be levied, seems to be changed, from its original intention, of a tax upon personal labour, or that of horses and carts; and to be converted into a tax upon property, of which certain external signs are assumed as the indication.

The

The county is divided into four districts, each under the inspection of trustees, of L. 100 Scots valued property; and the whole under the controul of the general meeting of the county.

Occupiers of land, whether proprietors or tenants, who possess what is valued in the cess books, or, who can be shewn to possess land of L. 100 Scots valuation, are to pay a rate not exceeding L. 2, 8s. Sterling for each L. 100 Scots valuation of land in their natural possession. But if the majority of trustees of a particular district, shall desire the rate to be raised to L. 3 Sterling for their whole district, or for any particular parish, or parishes, of their district, on giving due intimation, the annual general meeting is empowered to render their desire effectual.

Occupiers of burgh roads, whether proprietors or tenants, to pay a sum not exceeding 6d., for each pound Sterling of actual, or valued rent, (if the land be occupied by the proprietor) that accrues from such lands.

Where horses or oxen are kept, for working and improving lands, that are not valued in the cess books of the county, there is to be paid for each horse so kept, 3s. Sterling, and 1s. for each ox.

For each coach or chaise, having four wheels, whether kept for private use, or for hire, there is to be paid 12s.; and for each gig or vehicle with two wheels, 6s. Sterling.

Inkeepers who keep horses for hire, and carters who keep them for carrying goods, to pay 4s. 6d. for each horse.

Occupiers of houses, in towns and villages, who have no other lands but a garden, to pay 1s. for each house, whose rent is L. 1, 10, and under L. 3. If the rent be L. 3, and under L. 5, to pay 1s. 6d. For houses whose
rent

rent is L. 5 and upwards, $2\frac{1}{2}$ per cent. per annum, of the actual, or valued rent, if the house be occupied by the proprietor, to be paid.

All persons who keep carriages, or saddle horses, to pay 6s. for each horse, exclusive of what they pay for coaches, chaises, gigs, &c.

Ministers and schoolmasters exempted, unless they possess other lands or houses, than those annexed to their offices.

Trustees have power to exempt those persons from payment, who appear to them to be in indigent circumstances. They cannot increase the rates beyond what is here expressed; but they may, if they see cause, diminish the rates payable by the occupiers of land, according to the L. 100 Scots valuation in the cess books of the county. In which case, the rates which affect all the other classes must be diminished in the same proportion.

These rates, as they affect the different classes already described, are uniformly represented in the act, to be a conversion, or compensation for *statute labour*. Now, if we take into consideration what this statute-labour was, when it was first imposed, we must allow the conversion to be extremely moderate. The statute-labour was six day's labour of every man who was able to work, and of every horse and cart, or of every ox and cart, within each parish. Here those who occupy houses below 30s. of rent, are wholly exempted; and those who occupy houses below L. 5 of rent, do not pay what would hire a man for one day's labour. For working horses there is not payable half a day's labour; and even for saddle and carriage horses, there is not exacted what would hire a man, with a horse and cart, to work one day.—We offer these remarks, because, when this bill was in agitation, the whole county

county was in a flame. There were many meetings, and much *speechifying*, and much *writifying*, upon the subject; and the people in the towns were crying loudly against its injustice, and oppression. But if they had thought more coolly, they must have seen, that the whole hand of this act, was less oppressive than even the little finger of the law, in place of which it was substituted.

There is one clause of this act, which meets our highest approbation. It empowers the trustees of a parish, under certain conditions and limitations, to borrow upon the credit of the conversion-money, a sum not exceeding what the half of this fund, will repay, with interest, in the space of ten years. The money so raised to be laid out, by report of professional surveyors, in making new roads and bridges, or in altering and amending old lines of road, so as to render them more serviceable to the public.—It has long been a well-grounded subject of complaint, in all parts of Scotland, that the application of the road money has, hitherto, been mere patch-work. A piece of one road is repaired one year, and a piece of another the next, without ever amending their lines of direction. Thus the public money is scattered upon detached parcels of roads, without ever making any one road passable, from its commencement to its termination. Were the whole strength of the funds made to bear upon one road, so as to render its direction the best possible, while it was uniformly hard and solid below, the people would come to perceive the benefit and advantage of good roads. But when there is a piece of good road here, and a slough of despond there; now a steep pull, and then a rapid declivity; the people grumble, and think they derive no benefit from the money they are obliged to pay, for making and repairing roads.

Bridges.

Bridges.

The principal bridges in this county are thrown across the two streams of water, which may rank as diminutive rivers, namely, the North and South Esks. Of these, by far the most magnificent is the bridge over the North Esk, which connects the parish of Montrose with the county of Mearns; and over which the mail-coach passes. The river here was formerly crossed by a very dangerous ferry. This bridge was built by subscription, to which Government granted very liberal aid; as is very fully narrated in a large inscription, cut in stone slabs, placed on the Angus end of the bridge.

A very elegant plan has been adopted, and a subscription has been raised, for building another bridge opposite to the village of Marykirk, in the county of Mearns, so as to facilitate the communication between that county and the harbour of Montrose. But as this is a project in which the county of Mearns is chiefly interested, it requires no other notice here, than to mark its utility.

Farther up the river, the North Water, or Pert bridge, is a mean looking structure, and so narrow, that only one carriage can pass it at a time. Here the toll-road through Strathmore is carried considerably out of its line, both on the Angus and the Mearns sides, in order to get over this bridge. There is some reason to suppose that this bridge had been built by the Romans, when their armies traversed this country. At least, it very much resembles other bridges, which were unquestionably built by them.

Gonnachy bridge, consists of one arch, of a very broad span, thrown from rock to rock, over the North Esk, below the house of Burn. This bridge was widened, or rather

rather rebuilt, by the late Lord Adam Gordon. He also made several miles of excellent road, in the county of Angus, in order to open a communication between his property of Burn, and the city of Brechin. This bridge being thrown across a deep chasm cut through solid rock, below which the river, when swelled by rains, roars and maddens from fragment to fragment, joined to the picturesque scenery on its banks, with the naked or heath-clad Grampians, frowning, in surly majesty, in the background, presents such a contrast, or rather mixture of the sublime and beautiful, as never fails to arrest the attention of every passenger.—These bridges connect the county of Angus with that of Mearns.

At Invermark, near the old castle already described, where the furious mountain stream called the Mark, joins the North Esk, an arch is thrown over the former, which is only noticed here on account of its singularity. This bridge is chiefly built with rude stones taken from the torrent; and is so high, that crossing it is like walking over the roof of a house. A horse would find some difficulty in scrambling over the rounded stones with which the bridge is paved; and dragging a cart after him seems impossible. This indicates that carts were not known in that district when this bridge was built.

On the South Esk, we have already described the wooden bridge at Montrose, and suggested a probable method of superseding its use; namely, by digging a deep channel for the river along the south side of Inch Bryock, where it might be crossed by a draw-bridge, so as to admit vessels up the river; and then filling up the north channel by a broad mound of earth, supported by piles of wood. This would much facilitate the embankment, so that the water may be excluded from the basin, and much fertile land would thus be gained.

The

The bridge of Dun is thrown over the South Esk, near its junction with the bason of Montrose, and it opens a communication between Maryton and the north-eastern districts of the county. It is a handsome modern building, of red sandstone.

The bridge of Brechin is a venerable antique structure ; but too narrow, and steep on the sides. It opens a communication between Arbroath and Dundee on the south, and Brechin on the north.

Farther up the river, the Honourable William Maule has constructed an elegant wooden bridge, which rests upon stone pillars, and is adorned with statues. This bridge forms a communication between his parks and pleasure-grounds, on the north, and those on the south side of the river. It also opens an entrance to his castle from the south, without passing through the town of Brechin.

At Findhaven, in the parish of Oathlaw, there is a very handsome modern bridge, over the South Esk, of several arches, on the Strathmore toll-road. The river here was formerly crossed by a dangerous ford, and by a ferry-boat, when it was swelled. This bridge was built by subscription, and there is a toll-bar upon it, where the same rates are levied as at other toll-bars on the road, and the proceeds are allotted to pay interest, and to replace the capital expended in building the bridge. When these are accomplished, the bridge will become free.

Farther up the river there is a wooden bridge for foot-passengers, which connects a part of the parish of Tannadice, situated on the south side of the river, with the parish church on the north side.

There are only two other stone bridges over the South Esk, each consisting of one arch, thrown from rock to
rock,

trict to take charge of the roads of a contiguous district, where they have no personal interest; and *vice versa*.

Haud interest nobis, tantas componere lites.

SECT. II.

CANALS.

IN the year 1788, George Dempster of Dunichen, Esq; employed a skilful engineer to make a plan and estimate of a canal, from the harbour of Aberbrothwick, to Forfar. The distance was found to be fourteen miles, and the highest elevation 196 feet above the level of the sea. This canal was estimated to cost L. 17,788; a very small sum compared with the great benefit that would result from it. The scheme was vigorously opposed, chiefly on account of the mills, from which, it was alleged, the canal would take off the water. But this objection might have been obviated by considering, that there are too many mills in this tract; and for those which it was found necessary to retain, the canal might have been converted into a mill-pond.

It has also been proposed to open a canal from the head of the bason of Montrose, to the town of Brechin. The length necessary to be cut, from where the South Esk ceases to be navigable, to this town, is only about four miles; and it is thought the whole expence would not exceed L. 10,000.

These canals would put the towns in the interior, nearly on a level with those on the sea-coast, by the
cheap

cheap conveyance of coals and lime. They would encourage agriculture, by rendering extraneous manures accessible, and conveying land produce to market. The interior would be put on a footing with the towns on the coast, as coals and raw materials would be cheaply conveyed, while the manufactured goods would easily reach a market.

Others are of opinion, that these proposed canals ought only to be formed as branches projected from a main trunk, which should be carried through the whole of Strathmore, and the How of the Mearns, being locked down into the Tay at Perth, on the one hand, and into the sea at Stonehaven, on the other. This would lay open the whole interior of this country to water carriage; while branches might be thrown off from this main trunk, almost into every farm, on the one hand towards the Grampians, and on the other towards the Seedlay Hills. The branches which were sent down to Arbroath and Montrose might also have lateral communications, thrown off into every district, on either side, where they might be found useful or necessary.

Although this tract has never been surveyed by professional men, nor the levels ascertained, there are some circumstances which lead us to infer that it is nowhere of great elevation above the level of the sea, and hence, that no great expence of lockage would be necessary, in order to open a navigable communication. Thus, Forfar, which seems to be the highest point, near which the waters divide towards the east and west, was stated to be only 196 feet above the level of the sea. The house of Burn, which is situated on the north-western side of the How of the Mearns, and towards the rise of the Grampians, as we learn from the ingenious and accurate Colo-

nel Imrie *, is still lower than this, being only 126 feet above the level of the sea, and 12 miles from it. At all events, it would be extremely easy to form a navigable communication between the loch of Forfar, and the navigable Tay at Perth. The author has been credibly informed, that a gentleman, not many years ago, in consequence of a wager, took a boat in the loch of Forfar, from which he sailed down the Dean into the Isla; through this river he passed into the Tay, and continued his voyage by Perth, until he landed at Dundee. About forty years ago, a merchant in Cupar Angus caused a survey and plan to be made of a canal from Forfar to Perth. But his plan was on too large a scale to afford a prospect of its defraying the expence.

Others have taken a more enlarged view of the subject, and insist upon the practicability of opening a navigable communication from the Clyde at Dunbarton Castle, to Stonehaven in the Mearns. This canal might be made to connect with the three great navigable rivers of Scotland, namely, the Clyde, the Forth, and the Tay; and it might connect with the Ardrossan and Glasgow canal, through the navigable Carte at Paisley. Through the Clyde it would also connect with the Grand Forth and Clyde Junction Canal, and with the Monkland Canal. Thus it would receive all the products of the southern districts of Scotland, and convey them to the north, while the products of the north were conveyed by the shortest passage in return. The coarse linens, and other fabrics which are the staple manufactures of the north of Scotland, would find a ready passage to Greenock, or to the harbour

* Description and Section of the Strata of the Grampian Mountains, &c.

harbour of Ardrossan in Ayrshire, from which they might be conveyed to the West Indies; and the sugars and other produce of the West Indies, which are consumed in the north, might be received in return. This canal would run parallel to the Grampians, from their origin to their termination, through a country that is either cultivated, or is susceptible of the highest cultivation. It would form the shortest road for travellers, between the populous manufacturing towns in Dunbarton, Lanark, Renfrew and Ayrshires, and Aberdeen, with those situated in the intermediate space. In fact, it would form the shortest and easiest communication between a long range of towns and villages, where manufactures are already established; where new manufactures would soon be introduced, and those which already exist would be increased more than an hundred fold. With regard to land, it would circulate both fossil and putrescent manures through the most extensive, and what is capable of being rendered the most fertile district of Scotland; while every article of produce might be cheaply and speedily conveyed to all those manufacturing and commercial towns in Scotland, where their price is always higher than in other places. The conveyance of minerals would also form a great source of traffic upon such a canal.

The illustrious Lord Napier of Merchiston, the inventor of logarithms, was the first person in Scotland, perhaps in Europe, that perceived the advantage of navigable canals. After the colonization of America had considerably advanced, he thought it expedient that a navigable canal should be opened between the east coast of Scotland, where the greatest part of the trade and population were then situated, and the Western Ocean. With this view he executed a survey, and framed a plan and

estimate of a canal for small boats, from the Forth near Alloa to Lochlomond. From Lochlomond the river Leven is navigable by boats to the Clyde at Dunbarton Castle. But in order to get to the Western Ocean by the shortest route, he proposed to cut the narrow isthmus between Lochlomond and Arroquhar, at the head of Loch Long, which communicates with the Frith of Clyde. The whole expence of these operations he estimated at L. 10,000, according to the power of money in those days. He presented his plan to Charles II., soon after his restoration. But that monarch, though he had a clear enough intellect to comprehend what might promote the good of his subjects, was too dissipated, needy, and indolent, to give himself any trouble in carrying such projects into effect. The Forth and Clyde were joined, in our own days, by the Grand Canal, which, next to the Caledonian, is the greatest canal in Britain. But a very obvious mistake was committed in the construction of this canal, that it is too large for small boats, and too small for sea-rigged vessels. A canal of less than half its dimensions can be made to carry a greater load than can be carried upon it. Thus the Monkland Canal, which is locked down into it, is only about five feet in depth; but by having the locks of sufficient length, boats every day convey upon it from 60 to 80 tons of coals, to Glasgow, and through the Grand Canal to the Frith of Clyde, and the towns upon it, as Dunbarton, Greenock, &c., which is nearly as much as can be carried on the Grand Canal. These boats are managed by two men; and when the wind is favourable they erect a mast, let down a moveable Dutch keel, and hoist a square-sail.—As this proposed canal, should it ever be carried into execution, will form the shortest communication between the Clyde and the Baltic, and the north seas, the locks should be made sufficiently

sufficiently long to admit floats of the largest logs of wood; and much wood will be conveyed upon it from the country through which it passes. They should also take in boats, which compensate by their length, what they want in depth; so that each boat may carry as much as a single horse can draw. It is well known, that the shallower the draught of water, the less resistance a boat finds in passing through it.

My ingenious friend, Captain Frazer, was lately employed in making a plan and estimate of a navigable canal, from Loch Earn, to the Tay at Perth, being a distance of forty miles. He found the Crieff level to be 120 feet above the tideway at Perth; and that on this level, his proposed canal might be carried from Crieff, to within about two miles of Dunkeld, a distance of nearly thirty miles.

It was proposed that this canal should throw off a branch to pass down Strathallan to the Forth, in the neighbourhood of which it might be conducted to the mouths of coal-pits. The only obstacle to this is a ridge of hill, between Muthil and Blackford, which separates Strathearn from Strathallan; and indeed this is the only obstacle in the way of completing a navigable communication between the Clyde at Dunbarton, and the northern ocean at Stonehive. But this ridge might be crossed by a waggon rail-way, or by a tunnel.

Mr Macgibbon has lately published the result of a survey executed by him, wherein he proposes two navigable communications from the Forth at Stirling; the links of which he proposes to cut, so as to admit large vessels to that town. One of these he proposes to extend to Thornhill, or Gartmore, on the southern extremity of the plain of the Forth; the other to Callender, on its northern extremity, and near the foot of the Grampians. Were these

these executed, they might easily be joined to the main trunk here proposed; and thus form a communication between the whole extent of Strathmore, and the navigable Forth.

With regard to the ridge between the plain of the Forth, and Lochlomond, no difficulty seems to arise from it, as it is of low elevation. The only question is, whether, in executing a navigation of such vast extent, it would be better to lock it down into every river it must pass, and then raise it again by locks on the opposite side? Or, whether it would be best to raise the canal at its two extremities, to the summit level, and then cross the Forth, the Teath, the Tay, and other rivers which intersect its course, by aqueduct bridges?—It is probable the latter may be found the cheapest mode; and thus there would be an uninterrupted navigation upon the summit level, of 150 miles or upwards. Excepting the ridge between Muthil and Blackford, it does not appear that the summit level, through this extensive tract, can exceed 200 feet above the level of the sea.

We have thus thrown together the views that occurred upon this interesting subject; and it may be remarked, that it is no objection to such undertakings, that there is not, at present, a sufficient degree of traffic to warrant the expence. Canals never fail to create an immense traffic, which did not previously exist; and though they should be losing speculations at first, they seldom fail to yield great profits in the end. As this is a great national undertaking, there can be no doubt but Government will be disposed to afford it all possible encouragement.

SECT. III.

FAIRS, AND WEEKLY MARKETS.

THE most noted fair in the county, for horses and cattle, is held at Brechin, on the second Wednesday of June, annually; and it is called Tarnty, or Trinity fair, from the name of the ground on which it is held. There are about fourteen other fairs held in different parts of the county, the dates of which are inserted in the usual calendar, or Edinburgh Almanacks.

Every town, and several of the villages, have their weekly markets; and butcher meat may be bought in each of the three sea-port towns, every day of the week, Sunday excepted. But as we mentioned the principal fairs and weekly markets, when treating of the towns and villages where they are held, it does not seem necessary to say more of them here.

SECT. IV.

COMMERCE.

As this county is bounded by the Frith of Tay on the south, and by the British ocean on the east, it is very favourably situated for commerce. But as we gave a general sketch of the commerce, when treating of the sea-port towns, it seems only necessary here to state a few

particulars which were there omitted, or were imperfectly described.

There are two customhouses in the county, one at Dundee, and another at Montrose. The latter has under its jurisdiction the port of Arbroath, and the small harbours called Johnshaven and Gourdon, in the Mearns. To the port of Dundee belong 147 vessels, amounting to 18,080 tons, which are navigated by 1077 seamen. To the port of Montrose there belong 67 vessels, and to Arbroath 56, being in all 123. These vessels amount to 8779 tons. If we add 7 vessels belonging to Johnshaven and Gourdon, amounting to 341 tons, the whole tonnage under the Customhouse of Montrose, will amount to 9120 tons, which are navigated by 597 men, including boys. This is according to the most authentic information that could be procured, at the commencement of the year 1812.

Thus the whole tonnage of the county amounts to 21,859 tons. Of these, seven ships, each exceeding 300 tons, and whose united tonnage amounts to 2223 tons, are employed in the whale fishery, in Davis Straits, and on the coast of Greenland. The other vessels are engaged in the foreign and coasting trade; and there is a sufficient provision of smacks and packets, which regularly convey passengers, and all sorts of goods, to London and the other ports. At the proper season, fresh salmon from the Tay, packed in ice, is regularly conveyed to London several times a week.

An extensive commerce tends much to encourage agriculture; for while those engaged in it consume a great proportion of the produce of land, they also export to places where it may be in demand, the surplus which would otherwise remain with the farmer, and induce him to contract his exertions, in future, so as to raise no

more

more than he found to be saleable. Notwithstanding the progress of manufactures, and the increase of population, this has always been an exporting county. This must be ascribed to its favourable situation for commerce, which renders the farmer always certain of finding a market, for any quantity he can raise. In former times, this county exported much grain to Norway and the north of Europe. In late years, it is chiefly sent to London, to Leith, and to Glasgow by the grand canal.

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The following TABLE exhibits the Quantity, and supposed Value, of Grain exported in one Year, from 11th October 1794, to 10th October 1795.

	Wheat. Qrs.	Wheat Flour. Qrs.	Barley. Qrs.	Malt. Qrs.	Oats. Qrs.	Oat- Meal. Qrs.	Pease and Beans. Qrs.
Dundee,	7724	93	33,229	1693	6383	3714	2695
Arbroath,	548	132	1942	240	88	390	755
Montrose,	981	427	21,354	3328	10,410	597	3867
Total,	9253	652	56,525	5261	18,881	4701	7317
Supposed Value,	L. 30,585	L. 2565	L. 90,440	L. 8367	L. 32,657	L. 5014	L. 12,439
Tot. supposed Value, L. 183,017							

It may be observed, that a considerable proportion of what was exported from Dundee, was produced in the neighbouring county of Perth; and that a small part of what was exported from Montrose, was grown in the neighbouring county of Mearns. All the remainder was the growth and produce of this county; and though there are no means of separating its amount from that of the neighbouring counties, it may be safely affirmed that its value considerably exceeded the whole rent paid for farms in this county, in the year alluded to.

SECT. V.

MANUFACTURES.

It appears that linen was the antient staple manufacture of Scotland, as woollen cloths were of England. It is probable that the linen manufacture was first introduced into Scotland by the Flemings, or people from the Netherlands, whom our antient kings encouraged to settle in our towns. Fine linens were the original fabric for exportation, while the coarser articles were used in home consumption. Fine linens were chiefly manufactured in the west of Scotland, where the cotton manufacture now prevails. The folly of the Stewarts, in persecuting people for their religious opinions, drove many of the weavers of fine linens to the north of Ireland; and to them the linen manufacture, which has long been the staple of Ireland, owed its first commencement. The diaper and damask manufactory of table-cloths and similar fabrics, seems to have been an invention of the Scotch, and it is confined to particular places; its chief seat being Dunfermline.

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The coarser kinds of linen fabrics, seem to have long been the staple manufacture of this county. Fine linen for shirts and sheets is chiefly made from home grown flax, and is manufactured principally for domestic use, or for home sale. The other sorts of fabrics, such as osnaburgs, huckabacks, ducks for sailors and soldiers trousers and knapsacks, cotton bagging, &c. are chiefly made for exportation. The following particulars respecting the manufactures of this county, are chiefly extracted from the Statistical Account of Scotland, and it presents a general view of them as they existed from the year 1792 to 1795. Though some branches have fallen off since that time, others have very much increased.

In Dundee the principal manufacture is linen of various kinds, of which upwards of 4,000,000 yards are annually manufactured, and valued at L. 119,000. 135,000 lbs. cotton are spun into yarn, valued at L. 20,250. The quantity of coloured thread annually made, is computed at 269,558 lbs., estimated at L. 33,696. The value of leather tanned is L. 14,200; and of boots and shoes exported, L. 6923. Cordage for shipping, and ropes for all the various uses of the country, are manufactured by two companies. There are also manufactures of soap, sugar, glass, and cast iron. The revenue to Government, arising from the trade and manufactures of Dundee, may be estimated at L. 57,000.

Aberbrothwick, or Arbroath, in 1736, was a mean fishing town. It had no manufactures; and cloth made there was carried to Montrose, where it was sold. Nothing was imported, except now and then a small cargo of wood from Norway. Flax, iron, and other commodities, were purchased from the merchants of Dundee and Montrose. About the year 1738, osnaburgs were introduced by the following accident. A weaver in the town

town or neighbourhood, having got a small quantity of flax, unfit for the kind of cloth then usually brought to market, made it into a web, and offered it to one of the inhabitants, as a piece by which he was willing to be a loser. The merchant, who had been in Germany, remarked the similarity between this piece of cloth, and the fabric of osnaburg, and prevailed on the weaver to attempt other pieces of the same kind. The experiment succeeded. A company was established, and other parts of the county soon profited by the discovery.—The principal manufactures of this place are sail-cloth, osnaburgs, and other brown linens. From November 1790, to November 1791, there were stamped of the two last, 1,055,303 yards, manufactured in the town and stamp-office district, and valued at L. 39,660. Sail-cloth to the same amount is annually sent to market. There is a tannery, where hides are dressed, to the amount of L. 2500. A manufactory of cotton is in its infancy, and one of thread is on the decline.

At Montrose were manufactured in 1791, sail-cloth to the amount of 300,000 yards, valued at L. 21,125: Os-naburgs, 360,000 yards, valued at L. 9000: Sheeting, 57,600 yards, worth L. 3480: and thread, 11,000 dozens of pounds, estimated at L. 20,000. There is a tan-work, and manufactories of soap, candles, and hats, the product of all which may be L. 8,000.—We have already expressed an opinion, that it would much improve the trade of this place, as well as render the navigation of the north seas more safe, were a pier thrown out at the mouth of the South Esk, so as to blow away the bar of moving sand with which it is annoyed.

Of the manufactures of Brechin, no specific account is given in the Statistical Account, but in the town and district of Forfar, we are informed, that osnaburgs, sheetings.

ings, and shirtings, form the principal manufactures, of which there were stamped, from November 1794 to November 1795, 1,592,745 yards, valued at L. 45,088. This place is noted for a coarse sort of shoes, of which, 10,192 pairs are annually manufactured for exportation, and estimated at L. 2,293.

In Kirriemuir, osnaburgs, and other brown linens, are manufactured annually, to the amount of L. 38,000. About 12,000 pairs of shoes are made for exportation. The value of the leather prepared in three tan-yards, does not exceed L. 1000.

In the parish of Logie, on the banks of the North Esk, there is a bleachfield for thread, of which 60,000 or 70,000 spindles are annually whitened, and sent to the London market. There are also bleachfields, both for yarn and linen-cloth, on the Dighty, near Dundee, and in other places. The osnaburgs, which are chiefly exported to the West Indies, receive a partial cleaning in the yarn, by fermenting it in vats, and subjecting it to the plash-mill; of which there is commonly one near every spinning-mill. Where greater whiteness is requisite, the oxymuriate of lime is now much employed, which is chiefly applied to the yarn.

Since the publication of the Statistical Account, mills for spinning yarn from lint and tow, have made a very great progress in the county, and are established in all the towns along the coast, where they are chiefly moved by steam; and in various places in the interior, where they are moved chiefly by water, and sometimes occasionally by steam. These were mentioned when describing the different towns and villages. In the year 1871, there were 15,200 spindles in constant work, moved by water or steam; with all the necessary machinery, for carding, roving, and preparing the flax. These operations

tions have been contracted of late, partly owing to Bonaparte's outrageous decrees, partly to the markets being overglutted. Since spinning was taken out of the hands of the women, many of them have betaken themselves to the loom; so that, upon the whole, there are more hands employed in this manufacture, than before the introduction of these machines. The spinning-mills have undergone very great improvements since their first introduction, when they were solely employed in spinning yarn for osnaburgs, cotton-bagging, sail-cloth, and other coarse fabrics. Those of latest construction, and some old ones whose machinery has been improved, can be made to spin yarn of any degree of fineness, that is commonly spun by the hand. Hence private families often employ them to spin yarn, which is to be made into fine linen, for domestic uses.

Though it has often been proposed to erect weaving-mills in the county, we have heard of none that are yet constructed. Some are of opinion, that these machines are better adapted for the fine muslins of Glasgow, and Paisley, than for the fabrics which are the staple of this county. This is contrary to what one who has no practical experience in these matters, would be led to expect. Sail-cloth, for example, requires very great strength and exertion to weave it properly; and one would naturally think it might be best weaved by a machine; especially as there would be little interruption from the breaking of threads.

Some are of opinion, that Government should leave manufactures and trade to find their own level, and that no particular encouragement should be held out to any branch, except what arises from the demand for the produce. They say, that wherever there is a demand for any particular articles, either merchants will import them

them from countries where they can be had cheaper than at home, or manufactures will be established to supply the demand. Were all nations to act upon liberal principles, this argument might have some weight. But as this never has been the case hitherto, and is not likely soon to take place, it behoves a nation, like Britain, to secure to herself every branch of industry, for which her climate and local situation, together with the habits of her people, render her peculiarly adapted. Besides, it is insisted, that nations like Russia and America, who have not sufficient hands to stock and cultivate their land, should confine themselves to the production of raw materials, and leave them to be wrought up, and prepared for use, by a nation like Britain, which possesses a superabundant population adapted for the purpose, and which employs machinery to abridge and facilitate labour. Some Spanish gentlemen informed me, that they had tried to manufacture their fine wool in Spain; but soon found, that though they should send the wool necessary for the cloth they wanted to England for nothing, and then purchase the cloth made from it at a fair market price, they would have their cloth cheaper, and of better quality, than they could make it for themselves. This shews it to be the true interest of Spain, and of all nations in similar circumstances, to exert their industry in the production of such raw materials as are adapted for their soil and climate, and leave their manufacture to those who are possessed of capital, skill and machinery sufficient for the purpose.

The great rivals with which the manufactures of this county had to contend, were German linens, where labour, and the rough flax, being much cheaper than they are here, they were enabled to undersell us in our own market. To turn the balance in favour of our own manufactures, Parliament first imposed a tax upon foreign

Linens

linens imported, of so much a yard, according to their value. Our manufacturers still complained that this tax was often evaded by entering linens of a higher under a lower denomination; and that this tax did not enable our fabrics to meet the German linens in a foreign market; because, when the latter were re-exported, the tax was wholly withdrawn.

This induced Parliament to grant a bounty of so much a-yard, *ad valorem*, on British linens exported; and the tax upon foreign linens consumed at home, was assigned as the fund from which this bounty should be paid. This operated as a very powerful stimulus upon the linen manufacture of this county. In progress of time, our own fabrics secured the home market; and there being few or no foreign linens imported, there was no fund from which the bounty on our linens exported, could be defrayed. This induced Parliament to transfer this bounty to another fund; and under these regulations, this manufacture has advanced with unexampled rapidity.

It is the general opinion of manufacturers here, that this branch would not be able to keep its ground, amidst such formidable competition, without these encouragements on the part of Government. They also insist, that the public revenue, so far from losing, is a great gainer, in consequence of the bounty on home linens exported. In proof of this, they refer to the great rise in the produce of the customs and excise, and other branches of the revenue, since this bounty was granted. They also allege, that the encouragement given to this great branch of industry, has tended to improve agriculture; and to extend all other productive lines of industry. But for farther illustration of these particulars, we must refer to the excellent communications by the Messrs Gillies of Brechin, which are added in Appendix G.

ACCOUNT, shewing the Quantity and Value of LINEN CLOTH returned by the different Stamp-masters in Forfarshire, as stamped by them for Sale, in each of the ten years, from 1st November 1798, to 1st November 1808.

Years ending 1st November.	Total Quantity. Yards.	Total Value.
1799.	12,620,309	L. 463,406 11 1 $\frac{1}{4}$
1800.	11,623,297 $\frac{1}{4}$	390,752 0 6 $\frac{1}{4}$
1801.	13,366,773 $\frac{1}{4}$	431,849 11 3
1802.	14,249,384	425,798 19 11 $\frac{1}{4}$
1803.	8,955,272 $\frac{1}{4}$	288,640 7 10 $\frac{1}{4}$
1804.	7,710,728 $\frac{1}{2}$	316,799 8 5
1805.	10,551,249 $\frac{1}{2}$	418,061 13 9
1806.	12,188,297	440,159 15 0
1807.	11,870,372 $\frac{1}{4}$	427,756 17 8
1808.	11,269,867 $\frac{1}{2}$	496,944 7 2 $\frac{1}{2}$

Extracted from the Official Book, by desire of Sir John Sinclair, Baronet, M. P.

(Signed) W. A., *Secretary.*

It is supposed that the whole, or greatest part, of the cloth that is stamped, is exported. The stamp merely assures the foreign merchant, that the web has been carefully examined by a person of skill, and that it is all of the same quality with what he sees. It also ascertains the number of yards in the piece, without giving him the trouble of measuring it; and is the test upon which the bounty on exportation is paid. But great quantities of linen cloths are manufactured for domestic uses, and for private

ivate sale, which are not stamped at all. What the amount of these may be, there are no means of judging; but some think, that though not in quantity, yet in value, they may be nearly a half of what are stamped for exportation. Nor are there any means of judging of the amount, or value, of sailcloth, and other fabrics, which are never stamped. The sailcloth manufactory has been carried to a great extent, on account of the demand for the navy, during the war. In time of peace, this branch diminishes; but the demand for the other fabrics creases.

Much controversy has taken place among political economists, concerning the effect of manufactures upon agriculture. One sect maintains, that were the labour employed in manufactures exerted wholly in the cultivation of the soil, a much greater, and a more permanent amount of national wealth would be produced, than what arises from manufactures. They insist, that manufactures raise the wages of labour to an exorbitant pitch, and thus put it out of the farmer's power to improve his land, be he ever so much inclined.—It is true, that every wise nation will study, in the first place, to acquire without itself an abundance of food, and of the necessaries of life. But those engaged in agriculture need clothing, comfortable houses, and even implements of agriculture, as well as food; accommodations which they cannot enjoy without manufactures of some kind or other. At no very remote period, it is said, that carts, wheel-barrow, sledges, and even ploughs and harrows, were imported to this country from Holland; there being no artists in the country who were capable of making these instruments in a proper manner. Where a great proportion of the population is engaged in manufactures, though the wages of labour should be raised upon the farmer, this

is more than compensated by the ready sale he finds for every article of his produce. High wages also stimulate him to adopt more correct modes of culture, and more efficient implements, by which manual labour may be facilitated, or abridged; and thus he is enabled to raise a greater proportion of disposeable produce, than could exist in the former confused state of agriculture, when the greatest part of the produce of land was consumed by the people, and bestial employed upon it; excepting the portion that was exported in name of rent.—In this county, the question is supposed to be decided by fact and experience. Since the introduction of manufactures, much waste land has been brought into cultivation; and what was formerly cultivated, has been rendered much more productive. The rents of land have been tripled, and in many cases, quadrupled; and yet the farmers are in a much more flourishing state than ever they were before. Although the population has very much increased, and there is a more liberal consumption of all articles of land produce among all classes of the people; yet the exportation of grain and other provisions, instead of being diminished, has been very much increased.—There can be no doubt, but that the prosperity of manufactures and commerce, operates as a powerful stimulus to the improvement of agriculture; and that they reflect mutual aid upon each other.

SECT. VI.

POOR.

IN treating of poors rates, of which there are none established in this county, we entered so largely into this subject, as to render any additional observations almost unnecessary. The poor are supported by private charity; by collections at the church doors, and other funds which are managed by the ministers and elders of each parish; and where these funds are insufficient, they go about begging, sometimes with a certificate of their necessity from the minister and elders of their parish, but oftener without any certificate. It may be truly said, that the poor are chiefly supported by the middling class of people; because, as few of the gentry attend the established church, though some of them give occasional donations for the use of the poor, there are many who contribute nothing for their support. There seems also to be a defect in the police, as it respects dissenting congregations. It is very far from our intention to insinuate any thing disrespectful against any denomination of professing Christians; and still further from our wish that any class of persons should be hindered from worshipping God in the way they think most acceptable to him. But such congregations should either be bound to relieve their own poor, or to allot a suitable proportion of their collections to the parochial funds. It seems contrary to natural justice, that persons who have contribut-

ed what they could afford, while they enjoyed health and strength, to dissenting congregations, should come upon the parochial funds, to which they contributed nothing, after they fall into poverty and old age. The parochial collections should be considered as a sort of joint stock, to which none have a right, except those who contributed what they could afford, while they enjoyed health and prosperity.

Many schemes have been proposed for the total suppression of begging, which have hitherto proved abortive. Even the poor rates of England, with all their complicated laws and regulations about the management of the poor, have not produced this effect; for in several districts of that country, I observed a much greater proportion of beggars, than in any part of this.—In a country such as this, where the following maxims are familiar in people's mouths:—"Blessed are the merciful, for they shall obtain mercy;"—"It is more blessed to give than to receive;"—and where the great body of the people are impressed with the obligations of charity, and giving of alms, as sacred duties, enjoined by the highest authority; there will always be persons disposed to give, and others who will go about and receive what they are willing to bestow. In such a situation, though the total suppression of begging be utterly impracticable; yet we conceive that some salutary regulations might be introduced, to prevent this practice from being a cover, under which the worthless and abandoned carry on their depredations, on the property of individuals.

In this county, the country parishes are much annoyed by swarms of beggars from the manufacturing towns; many of whom are very able to earn a livelihood by honest industry. Along with these, gangs of sturdy beggars frequently prowl through the county, from remote districts;

districts; many of whom their speech betrays to be of Irish extraction. Those that are known to the country people, are generally reputed to be very honest, and they thankfully receive whatever is offered to them. But this is not the case with sturdy beggars, whether from the manufacturing towns, or from remote districts. They often get beastly intoxicated; kick up riots in private houses; and when they see no other persons there but women, they extort from their timidity, whatever they chuse to demand. Such beggars also pilfer and steal, whatever they can carry off without being detected. For all such a bridewell is imperiously called for, in a central part of the county, where they should be compelled to work, or starve. To this, all beggars whatever should be committed, unless they be furnished with a badge, or certificate, from the ministers and elders of their respective parishes, attesting their necessities and good characters.—Some such measures as these, we conceive to be absolutely necessary, to prevent begging, as it is too much the case at present, from being a cloak to theft and depredation; and to prevent the worthless and undeserving from imposing on the charitable and humane, and thereby intercepting that benevolence which should be reserved for its proper objects.

There are several Friendly or Benefit Societies, as they are usually called, in the county, which are productive of the best effects. Each member pays a certain sum at entry, and a quarterly subscription, while his health and ability continue. The money thus collected is vested in the management of persons chosen by the society, who lay it out at interest on good security. If any member falls into sickness, on producing a certificate from his parish minister, with an attestation from a medical man, he receives a weekly allowance, according to the

rules of the society, until he be in a condition to resume his labours. If he be disabled through old age and infirmity, he receives an allowance, according to the nature of his case, during life. If he dies, there is an allowance for funeral expences; and if he leaves a widow, and children under ten years of age, they receive a similar allowance until the children be able to do for themselves.— This is, unquestionably, the most beneficial of all the modes of providing for the poor that ever were invented. It operates as a powerful stimulus upon the industrious, to lay up a little during their years of health and strength, in order to form a provision for sickness and old age. From the great decrease in the value of money, and many of the gentry and their families declining to contribute to the parochial funds, joined to the increase of the poor from the extension of trade and manufactures, it does not seem possible to avert legal assessments for their subsistence much longer, in several districts of this county. But were proprietors to take such steps as would procure the establishment of a society of this sort, in every parish, to which every individual should be called to contribute, a legal assessment, or poors rate, never would be necessary.

The industry and frugality of the labouring class in this country, render them much less burdensome to the community, than the same class in the sister kingdom. A labourer, though he may rear a numerous family, has seldom more than three of them on hand at the same time; and these his industry is sufficient to support, and even to keep at school. When a boy or girl arrive at eight or ten years of age, they are able to do as much as procures their maintenance. A girl from thirteen to fourteen years of age, can earn 1s. 6d. or 2s. a-week by spinning, and much more if employed in the fields, or in some o-

ther

ther kinds of work. After children are able to do for themselves, they attend evening schools in order to complete their education; and they acquire the same industrious and frugal habits which distinguished their parents. The only persons who come upon the parochial funds are infants whose parents have died, or for whom no father can be found; and these receive no allowances after they are ten years of age. Or they are aged persons, who only receive what is judged to be absolutely necessary to supply the defect of their ability to do for themselves. Poor persons, who are visited with sickness, and other disasters, also receive occasional supplies.

In the first table of the population, there is exhibited what could be collected from the Statistical Account of Scotland, respecting the parochial funds for the maintenance of the poor. It may be observed that in several parishes, since that estimable work was published, the kirk-sessions have been reduced to the necessity of encroaching upon their accumulated stocks; and in some these have been wholly annihilated. In others these stocks have been rather augmented, partly from the surplus of collections at the church doors, partly from donations of charitable individuals. Thus these funds, upon the whole, are nearly in the same state as when the Statistical Account was published. But the general conclusion that follows from these premises is, that as in some parishes there is no occasion for a legal assessment; in others it seems to be unavoidable, unless proper steps be taken in order to obviate its necessity.

SECT.

SECT. VII.

POPULATION.

The first table that is annexed, exhibits the population of each parish, and other particulars as they are contained in the Statistical Account. From this it will be seen that the whole population of the county, as collected by Dr Webster, in 1755, amounted to 68,297; and that the population in 1790—1798, amounted to 91,001. Thus there was an increase, in about 40 years, of 22,704 persons. The second table exhibits the population in 1800, by act of Parliament, which has obtained the name of Abbot's act, because it was proposed by that gentleman. From this it appears that the population at that time, was 99,127; there being an increase since 1790, 1798, of 8126. The last table exhibits the population as it was ascertained by act of Parliament in 1811, amounting to 107,578; there being an increase, in about ten years, of 8451. Total increase since 1755—39,281.

It seems doubtful, however, whether the population had actually increased so much, as it is there stated to have done, during the intervals between these different enumerations. Several respectable clergymen have assured me, that when the enumerations were made for the Statistical Account, and by act of Parliament in 1800, many of the people were much prejudiced against these operations, and studiously endeavoured to conceal the numbers of their families; but the more they have been accustomed to such things, the more ready they have
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hewn themselves to divulge the whole truth. It is possible, then, that a part of what is stated as increase, between the different enumerations, may consist of persons who had been concealed, or who had escaped notice, during the preceding enumeration. At all events it must appear that the population of this county has increased very rapidly, especially since agriculture and manufactures began to be improved. For the increase during the last sixteen years, is very little short of the increase during the preceding forty years.

In the table for 1800 there are 8627 persons stated to be chiefly employed in agriculture, 14,827 persons to be chiefly employed in manufactures, trades, &c. and 74,450 who are classed under the denomination of *all other persons*. Now this classification of persons, appears to have arisen from some want of precision in the questions that were put to the schoolmasters, who were employed in taking up the lists; and they have been led to throw into the class of *all other persons*, many who derived their subsistence from agriculture or manufactures. We shall only advert to the numbers stated to be employed in agriculture. It was formerly stated that there are 3222 farms in the county. Though some of the smaller farms are wrought chiefly by the farmers and their children; yet on all the larger ones, there is a suitable establishment of hired servants, many of whom have families, who subsist wholly by agriculture. Hence it can hardly exceed the truth, although we should allow five persons to each farm, including the farmers' families, who are wholly subsisted by agriculture. This will bring the number to 16,110. If to these we add day-labourers, and their families, who are constantly employed in rural operations, the numbers chiefly employed in agriculture will considerably exceed 20,000 persons;
without

without taking into account the great numbers who are occasionally employed in seed-time and harvest, and in weeding, and hay-making, during summer.

We may now advert to the question which has been so long, and so keenly agitated among political economists, Whether large or small farms be most favourable to population? On this question we formerly arrived at this general conclusion, that that arrangement, with regard to the size of farms, which rendered the land most productive, is most favourable to population. In a great part of Wales; of the Highlands of Scotland; and of the Grampian district of this county, small farms are indispensably necessary. Where the arable land consists of small patches, on the sides of rivers, or on the acclivities of the mountains, these patches must either be cultivated by small farmers, or they will not be cultivated at all. But where there are extensive tracts of level land, through which the plough can travel without interruption, the size of farms seems to be limited by the following circumstances. 1. The capital of the farmer to stock the farm sufficiently, and his skill to manage it properly. 2. It is a loss both to the proprietor and farmer, if an arable farm be so far enlarged, that too much time and labour are exhausted in conveying dung and manures from the homestead, and in bringing back the crop; or even if too much time is wasted by servants and cattle, in travelling between the centre and extremities, in order to do the necessary work. Within these limits, we see no bounds that ought to be prescribed to the size of farms; and these limits will, ultimately, regulate themselves. If the effect of enlarging a farm, be to put it into the hands of a man of sufficient capital and skill, who renders it much more productive than it was before, this enlargement must be favourable to population.

tion, because, to produce the effect, more hands must be employed, and more efficiently employed, than when the land was parcelled out among small farmers. If, on the contrary, diminishing the extent of farms, have the effect of rendering the land more productive, this will be favourable to population. Accordingly, it was stated, that farms in this county are of all dimensions, from one to many hundred acres; but that those which are in greatest request, among practical farmers, are from 50 to 150 acres. These things are best, when they are left to regulate themselves. There is only one species of small farms, which are kept up by some proprietors in this county, from an erroneous notion of encouraging population, which we cannot help reprobating, as evidently adverse to the effect intended. We mean farms that are held in runrig, or mixed occupancy. In these, a great number of ridges, or patches of arable land, with intervening stripes of land that never has been tilled, are possessed by families, who are arranged in a sordid, straggling, village; while a large tract of waste land is allotted for their cattle, not to feed, but to starve upon it. As such a mode of occupying land, renders it utterly impossible to increase its fertility, it is evident that it must operate against population. In order to increase population, such farms should be divided into separate possessions, with a portion of the waste land annexed to each farm. Though a man should have no more land assigned him, than will accommodate him with a grave, let him have his grave, without disturbance or annoyance.

Another point deserves consideration, and that is, the density of the population of the county.—From the tables it will be seen, that the most crowded population is in the sea-port towns, and in the maritime district.

Next

Next to these, the most crowded population is in Stridmore, and the towns it includes.

The population of the county, in the year 1811, being 107,578, and its extent being 831½ square miles, there are 129.87823 persons to the square mile.

As the county contains 435,144 Scotch acres, there are 4.04401 Scotch acres to each person.

There being 532,243 English acres in the county, there are 4.94740 English acres to each person.

Farther, there being in the county;

20,764	English acres under woods and plantations;
20,000	Ditto ——— cultivable wastes;
150,836	Ditto ——— hills and mountains, unarable;
340,643	Ditto ——— cultivated and improved.

532,243

Hence, there are 3.16647 cultivated English acres to each person.

From the Tables it will be seen, that the females in the county considerably exceed the males. Yet where accurate registers of births are kept, it appears that there are more males born in this county than females. These registers, however, are seldom correct, as many parents neglect to insert their children, and few of the dissenters ever do so. However, it may be assumed, that this remark is well founded, upon the whole. Among the Asiatic nations, where polygamy prevails, the number of females born, is said considerably to exceed the number of males. In this county, the excess of females over males, may be accounted for, from numbers of our young men going abroad to push their fortunes; and from the numbers that were absent in the army and navy, and other branches of the public service, when the enumerations

merations were made. Many of these never return; and thus there is always a greater proportion of females, than of males, in the county.

Another question has much engaged the attention of political economists, namely, the causes which occasion an increase, or diminution, in the numbers of the human race.—There can be no doubt but the human race, like all other animated beings, will always multiply or diminish, in proportion to the quantity of food, and other necessaries of life, that are within their reach. A country such as Holland was, before it sank under the despotism of France, may sustain a very dense population, which all that the country produced was insufficient to sustain during three or four months. But by the Rhine, and other rivers, they communicated with the most fertile provinces of Germany, and not only became a great granary for supplying themselves, but for exporting provisions to other nations; and they enjoyed a great naval commerce, by which every production of the sea, and land, was open to them. Countries, such as China and Japan, support an immense population, without any foreign commerce, because the land is subjected to a more correct cultivation than the finest gardens of Europe. By navigable rivers, and canals, a very great internal commerce is also carried on in China, and the products of one district are exchanged for those of another.—Some political economists wish to throw discouragements in the way of the multiplication of the human race, lest their numbers should exceed the means of subsistence, and they should die of starvation. This project is only applicable to the inferior animals, who never increase the means of their subsistence, and when these are exhausted, if left to themselves, they must starve. But human skill and labour increases the productiveness of the earth
and

and seas, and provide an addition of food, more than sufficient to sustain the increase of numbers. Of this we have an example in this county, whose population has increased more than a half since the year 1755, and yet the ranks of the people are more affluently fed; are better clothed and lodged, than they were at that period. There is a greater surplus of provisions exported, than at former times. This shews, that instead of checking the natural tendency of mankind to increase and multiply, it would be much sounder policy, to use suitable exertions in order to render every acre of land as productive as possible; and to occupy those extensive fisheries which have been abandoned by the Dutch. Britain never can be secure while she depends upon the caprice of foreign nations, or of their rulers, for the means of subsistence.

SECT. VIII.

OBSTACLES TO IMPROVEMENT.

Tithes in kind, cannot be stated as any obstacle to improvement in this county, because there are no tithes levied in Scotland. The clergy, as was formerly served, receive a certain proportion of the rent of land, which cannot be increased except by a decree of the Supreme Court. Nor is that Court empowered to grant augmentations beyond the extent of teinds that have been valued, or which remain unappropriated.

Nor can *poors' rates* be stated as an obstacle to improvement, as none have yet been introduced; the poor having hitherto been supported by voluntary charity.

1. *Land*

by Parishes.

lars.	Schoolmas- ters' Emo- luments.			NO. of Poor.	Capital of Poors Funds.			Collections.			Income of Poor.				
	£	s.	d.		£	s.	d.	£	s.	d.	£	s.	d.		
20				120									130	0	0
40				16									25	0	0
	17	0	0	7	150	0	0						16	10	0
40	20	0	0	13	222	2	2						35	0	0
68				5	300	0	0	12	10	0			25	0	0
40				11									30	0	0
				60	330	0	0	38	0	0			55	0	0

1

II. PCo. III.—1800.

STATISTICS.			TOTAL of PERSONS.
	tures, or Handi- crafts.	All other persons not comprised in the two preceding Classes.	
Amno,	09	681	945
-	48	743	1041
ot,	60	440	1050
ath,	39	3057	4943
, Logie, and sion of Inver	89	1558	2194
ee,	18	284	541
-Pert,	26	514	918
t,	00	28	318
e,	43	251	345
,	23	617	939
on,	50	449	596
uir,	67	710	949
ieith,	32	574	1407
ikie,	07	512	1236
rose,	22	6170	7974
ouse,	64	378	591
yle,	04	618	781
aw,	30	264	384
ride,	-	-	1583
obie,	77	648	870
ven,	21	165	211
hmartin,	89	372	503
kathro,	39	442	593
adice,	54	1186	1373
ing,	114	544	755
an's, St	152	1546	4243
ar Jail,	-	-	2
trorse ditto,	-	-	1
Summ	27	47,450	99,127

_____ |

-1811.

	Males.	Females.	TOTAL.
	181	199	380
	515	596	1111
	198	275	475
	409	506	915
	776	952	1728
	620	673	1292
	3837	5118	8975
	304	348	652
	347	433	780
	168	187	355
	630	782	1412
	452	468	920
	107	133	240
	292	335	627
	265	315	580
	705	805	1510
	363	416	779
	2234	2719	4958
			107,578
801, - - - -			99,127
- - - - -			8,451

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1. *Leases.*—In general, the shortness, or want of leases, cannot be quoted as obstacles to improvement. In many cases, as was stated when treating of this branch of the subject, leases are of too long endurance, and they have induced farmers to stop short in the race of improvement, after they had gone so far as to secure a genteel income. But in the western Grampians, and places adjacent, it was stated, that there are either no leases, or leases of seven or nine years endurance. It is obvious, that in such circumstances, no improvement can be expected; and that proprietors who suffer their property to continue in this state, are very blind to their own interest. With regard to the absurd covenants, or restrictions in many leases, we have already pointed out their hostility to improvement; and have shewn, that had they been rigorously insisted on, agriculture could not have advanced beyond the state it was in half a century ago. Happily, all enlightened landlords, wink at the violation of their own restrictions; and those who continue to harass their tenants with prosecutions, to enforce these restrictions, would do well first to consider, whether the system adopted by the tenants, or that prescribed in their leases, be most for their mutual advantage.

2. *Townships, and runrig.*—These still continue in several parts of the county, and they are completely hostile to improvement. A *township* is a farm occupied by two or more farmers, in common, or in separate lots, who reside in a straggling hamlet, or village; and they have generally a labourer for each plough, who occupies a cottage in the same town. *Runrig*, is when the farm is lotted out into separate ridges, with stripes of unploughed land betwixt them; which ridges are parcelled out among different farmers, and in some cases the occupan-

cy is changed in the course of a certain number of years. Such farms have commonly a piece of waste ground annexed to them, where the cattle of the occupants are sent, not to feed, but to starve. After the crop is removed, the whole farm becomes common to all the cattle. It is needless to point out the inconsistency of this mode of occupancy, with any thing like improvement. It was universal in former times; and it behoves landlords to remove, what still remains, of feudal barbarism.

3. *Servitudes*.—We formerly stated, that servitudes, which were formerly so inconsistent with improvement, are now generally abolished. We stated, as the only exception to this, that some proprietors, in the interior parts of the county, have their tenants bound to carry their fuel, for which they pay them a stipulated price. This degree of servitude can hardly be quoted as hostile to improvement; unless the farmers be called out at times, when it is most important for them to be occupied upon their own farms. Perhaps it would be as well to render these services entirely voluntary, on the part of the tenants; because those proprietors who have entirely abolished all services, never fail to get as much help as is necessary, to carry their fuel, or to perform any operations for which their own working stock may be insufficient.

4. *Thirlage*.—This great obstacle to improvement has been generally abolished, by the voluntary agreement of the people themselves. The only exceptions to this are the occupants of some old leases, who refused to compound for this servitude. Upon the whole, thirlage can hardly be now stated as an obstacle to improvement.

With these slight exceptions, we know of no obstacles to improvement in this county, but what are interposed
by

by Nature herself; and many of these have been, or may be surmounted, by the persevering industry of the people.—Among these natural obstacles, may be mentioned steep and boggy roads, which are an insurmountable obstruction to improvement in every country. Roads are bad when they are too steep, or not sufficiently firm to support horses and loaded carts. Much has been done in the way of improving the roads, and they are still in a progressive state of melioration.

MISCELLANEOUS OBSERVATIONS.**SECT. I.****AGRICULTURAL SOCIETIES.**

WE have already stated, that there are benefit, or charitable societies in the several sea-port towns, to which all classes of persons are admitted, who choose to conform to their rules, and to pay the quarterly subscriptions.

The first agricultural society in this county, has the venerable George Dempster of Dunichen, Esq; for its preses, and founder. It is called the *Lunan and Vinney Water Society*, being chiefly composed of proprietors, farmers, and clergymen, who reside in the district through which these streams flow. The society meets annually, at the village of Dunichen, in the month of July, where they partake of a social dinner, followed by a glass of whisky toddy; and it is a rule, that excepting the sugar used to sweeten the latter, no other article is consumed except the produce of the country. The preses makes an opening speech, wherein he details the progress made in improvement during the preceding year, and the result of those experiments that had been proposed for trial at the former meeting. After which each member proposes any thing he may think conducive to improvement, and states the result of any new experiments he may have been induced to try. In the fore-
noon.

noon, they have an annual exhibition of the several kinds of live stock, and judges are appointed to decide which are the best of each species. But as farmers have shewn a backwardness to bring forward their animals, the Preses has announced his intention of conferring, in future, gold and silver medals, on those who produce the best of each species of stock, according to the opinion of the judges*.

The next agricultural society, in point of antiquity, is called the *Strathmore Society*. They meet occasionally at Cupar, and sometimes at Glammis, and have a fund subscribed for conferring premiums on the best ploughmen, at an annual ploughing match; upon the best of each species of live stock; upon improvers of agricultural machinery, and other persons whom the society may judge to be worthy of reward. They are also establishing a fund for the relief of decayed brethren, and of their widows and orphan children.

Another society, entitled the *Angus and Mearns Agricultural Society*, is in progress towards formation at Brechin and Laurencekirk; and a third, entitled the *Angus and Perthshire Agricultural Society*, is nearly completed at Dundee. The two latter societies embrace the same objects with the Strathmore Society; and there can be no doubt but they will be productive of much public good.

It would perhaps be an improvement were the various societies that are formed in the several districts of the kingdom, to correspond with the Board of Agriculture; and that a short annual abstract of the state of agricul-

* At the meeting in July 1812, gold medals, with suitable inscriptions, were distributed by the Preses, to the successful candidates at the exhibition of the former year.

ture, and the improvements that are going on in the several districts should be drawn up, from this correspondence, and published for general information.

SECT. II.

Weights and Measures.

In this branch of police the county of Forfar is very deficient, though perhaps, not more so than several other counties of the kingdom. The weights and measures vary, not only in the different towns, but in the different districts into which we have divided the county. In many cases, dealers use no other weights but rounded stones, one of which is called a *stone*, another a *pound*, *half-pound*, and *quarter*. The smaller weights are formed from bits of lead. The balances, where the beam terminates in a bend at each end, are apt to be bent inwards, or extended outwards, and to become fraudulent, even without the knowledge of the persons that use them. The scales should therefore be hung upon pivots, fixed in each end of the beam, and exactly at equal distances from the centre of motion. The measures of length commonly used for cloths of all sorts, are the English foot and yard; but for certain kinds of cloth, ditches, &c., sometimes the Scotch *ellwand* is used, which is an inch longer than the English yard. For liquids, the Scotch mutchkin, choppin, and pint, are commonly used; though in many places, the English pint, quart, and gallon are preferred. The dry measures are subject to similar variations; and such is the confusion on this point, that none but experienced dealers know what

what they are doing, when they are buying and selling.

The late Lord Swinton, one of the Senators of the College of Justice, published a pamphlet, the object of which was to prove, that were the old acts of our Scottish Parliaments carried into execution, the kingdom would enjoy uniformity of weights and measures. It appears very easy, in theory, to establish this uniformity; but nothing has been found more difficult in practice.

Soon after the French Revolution broke out, scientific men were employed, to bring about an uniformity of weights and measures, in that country. A system has accordingly been adopted which is used in all the transactions of the government; but it is thought too refined, and remote from common observation, to prevail in general practice.

Some have proposed to assume drops of pure distilled water, of a medium temperature, as a standard which might easily be appealed to, for regulating weights. But it has been observed that these drops, either evaporate, or acquire more water, according to the state of the atmosphere. Pure distilled mercury, or quicksilver, does not seem liable to these objections. For all measures a decimal division into parts, seems easier in calculation than the divisions now in use. The metallic rods that are now used as standards of measures of length, expand or contract by heat or cold; and they are apt to rust, or to wear by long use. Rods of glass are not so liable to these objections, and they can easily be replaced should they be broken. Wood expands by moisture, and contracts by dryness; and it is apt to warp or bend. It is hence an unfit standard for a measure of length. We throw out these hints, because we conceive it would be highly expedient, to have an inspector of weights, mea-

asures and balances, established in every town, who should be furnished with proper standards, to ascertain the correctness of all the instruments of this sort, that are used in the district over which he presides. It seems also expedient to prohibit, under severe penalties, all instruments that have not his mark affixed to them. Such an officer need not cost the public much, because he might be entitled to a fee from those whose instruments he regulated; and to all the penalties arising from the conviction of offenders. Perhaps a hollow cylinder of gilded copper, immersed in a vessel of pure distilled water, which is kept at a medium temperature, might prove the most correct of all instruments for weighing articles that are not of too large a bulk. The cylinder should be so adjusted as to sink perpendicular in the water. A rod being fastened to the upper end of the cylinder, might pass up through a tube in the lid of the vessel, and have a cup, or bason, on its top, to receive the article to be weighed. In proportion as the cylinder was pressed down, by the weight of the body weighed, the water would rise on the sides of the vessel, until its pressure counterbalanced the weight of the body weighed; while the weight would be ascertained by divisions on the upright rod.

It appears expedient that grain, and all sorts of provisions, should be sold by weight. This would enable dealers to distinguish good grain from bad; for though husks fill the bushel, they do not add much to the weight. It was stated that potatoes are always sold by weight in this county; and when grain is sold in large quantities, there is always as much of it weighed as enables the purchaser to calculate its weight per boll. It appears also expedient to sell all liquids both by weight and measure. As the specific gravity of all liquids, when pure, is accurately

rately ascertained; this would enable the purchaser to detect adulterations from extraneous mixtures.

The gentlemen in the neighbouring county of Mearns, have set a laudable example, which well deserves to be followed by all the counties and towns in the kingdom, by their endeavours to effect an uniformity of weights and measures. Were some plain and practicable, but efficient plan adopted, and vigorously executed, this very desirable object, which has baffled all former endeavours, would at last be attained. Were a plain and obvious principle to be discovered, there is no occasion to pay any regard to former standards, as these are founded in whim and accident; and the old can easily be converted into the new.

Here follows a view of the different measures and weights used in this county, for which we are indebted to the learned and accurate Dr Playfair. It will be seen that they not only differ from the standards established by law, but from each other.

The Linlithgow wheat firloot contains $21\frac{1}{4}$ Scotch pints, or 2199 cubic inches; and the barley firloot 31 pints, or 3208 cubic inches; whereas,

The wheat firloot at	{	Montrose contains 22 pints.
		Aberbrothwick, $22\frac{1}{4}$
		Forfar, - 22
		Dundee, - $22\frac{1}{2}$

Medium of the county, 2274.888 cub. in.

The barley firloot at	{	Brechin contains $32\frac{1}{2}$ pints.
		Forfar, 32
		Dundee, $31\frac{1}{2}$
		Aberbrothwick, $31\frac{1}{2}$
		Kirriemuir, 32

Medium of the county, 3221.853 cub. in.

The

The weights in common use are as various as the measures.—Dutch or Amsterdam weight, contains $17\frac{1}{2}$ ozs. nearly, in the pound, and 16 pounds in the stone. By this weight, meal, coal, potatoes, butcher-meat, and goods from Holland and the Baltic, are sold. A boll of meal is 8 stones; of potatoes, 32 stones; of coals, 70 at Aberbrothwick, and 56 at Dundee.

Trone weight, by which home flax, wool, butter and cheese are sold, contains $21\frac{7}{8}$ ozs. avoirdupois, in the pound, and 16 pounds in the stone. But the pound of this stone is different in different parts of the county. Thus,

At Montrose, Brechin and Forfar, each pound contains,	24 ozs. avoirdupois.
At Dundee and Aberbrothwick,	22
At Kirriemuir,	27
At Glamis,	26

SECT. III.

INCOME TAX ON FARMERS.

THIS tax falls with great severity upon all farmers who had recently taken farms before it was imposed. In many such cases, the farmer, instead of having any income, is obliged to lay out money, during several years, according to the condition of his farm, before he can bring it into a productive state. On all such farmers the tax operates in withdrawing part of the capital, by which the land ought to be improved; and hence must prove detrimental to agriculture. The criterion assumed

ed as the test of the farmers income, seems also to be extremely fallacious. It assumes that the half of the farmers rent is his income. This may be a very moderate way of estimating a farmer's income in England, where, it is well known, that the rent to the landlord is generally the smallest part of what a farmer is legally bound to pay for his farm. Where a tenth of the produce is paid to the tithe-holder, and from 20s. to 30s. in the pound on the landlord's rent, are often paid as poors rates, and other public burdens, it is evident that the landlord's rent will be depressed even below what it would be were these rival payments rendered fixed and certain; or made a part of the rent, which could not be increased. But in Scotland where a farmer pays nothing but rent, the whole amount of which is stipulated before he enters into possession, it is evident that estimating his income by the half of his rent, is putting him in a much worse situation than the English farmer, whose rent seldom amounts to a half of what he actually pays, or is legally bound to pay for his farm.

If the tax fall much more heavily on farmers situated on the north, than on those situated towards the south of the Tweed; it also falls very unequally on the farmers of this country themselves. There are some whose clear income is three or four times the amount of their rent; and there are others whose income does not amount to a fifth or sixth part of their rent. If, indeed, any income can be calculated, where great outlays are necessary before any returns can be expected. It seems therefore to be highly expedient so to modify this tax, that it may bear equally upon the farmers of this country. How this should be done, we cannot pretend to say; but it seems reasonable that farmers should be put on the same footing with persons engaged in commerce. If the tax charged

charged upon them should exceed ten per cent. on their clear income, after paying interest of borrowed money, and all annuities that may affect them, let them have an appeal to the commissioners, to whom they may disclose their circumstances, and obtain redress. This tax also falls with great severity upon the clergy, from whose stipends it is deducted by the proprietors; and they seem entitled to relief in similar cases.

But, in progress of time, this tax will come to fall entirely upon proprietors, and to be wholly paid by them; while the farmer, be his income what it may, will not be at all affected by it. If the farmer be bound to pay one or two shillings of tax, for every 20s. he pays to his landlord, he will offer only 19s. or 18s. to his landlord, when he bargains for a farm, for every 20s. he would have offered, had this tax not been imposed. Thus the income tax, as far as it affects farmers, will come, in fact, to be a land tax; or rather a tax or deduction from the landlord's rent. In this county the farmers have begun to reduce these matters to calculation, and for some farms that have been lately let, no such rents have been obtained, as would have been offered before the tax was imposed. Indeed a tax of this sort, like tithes in kind in England, has a tendency to diminish the landlord's rent, much more than the actual amount of the tax. It is well known that when Lord North, during the American war, laid a penny upon the bottle of wine, the dealers laid sixpence upon their customers. The same effects will always ensue with all payments which a tenant is obliged to make, independent of his stipulated rent to his landlord. They will depreciate the rent much more than their actual amount. If this tax is to be continued, in its present form, it would be advantageous

tageous to proprietors, when granting new leases to take the tenants tax upon themselves.

SECT. IV.

DISTILLATION FROM GRAIN.

THE distillery affords a great market for barley, which is the only sort of grain used for distillation in this country. This manufacture not only stimulates the production of as much barley as supplies the demand; but as this crop requires the land to be well cleaned, wrought, and manured, it excites the production of much greater quantities of other sorts of grain, than would otherwise be raised. Thus the distillery operates as a premium on the production not only of barley, but of all other sorts of grain, and causes a much greater surplus to be raised than is necessary for feeding the people. The same thing may be said of the manufacture of starch, and of all the other modes by which grain is consumed, that is not used for food. Were these manufactures abolished, the farmers would soon come to limit their exertions, and would raise no more grain than could be disposed of as food. In such circumstances should a deficient crop occur, unless the deficiency could be made up by importation, the consequences might be fatal. But in extreme cases such as we have supposed, government can stop these manufactures, and apply the surplus which they had occasioned to be raised, for feeding the people.

There is one point, however, we wish earnestly to press upon the attention of those in authority; and that

is the danger of rash and hasty interference, with the usual course of agricultural relations. We admit that seasons have occurred, when it was not only expedient, but even absolutely necessary, to stop distillation from grain; but if this should become a permanent measure, the very evils will ensue, which it was intended to avert. The quantity of farinaceous food raised, will suffer a lamentable diminution.

The grain consumed in distillation is not wholly lost as human food. It has been ascertained, that as much milk, beef, pork, or other animal food, can be raised from the draff and dreg, after the spirit is extracted, as could have been produced upon the land on which the barley grew, had it been sown with grass, and thrown into pasture. From the dreg of sugar, after distillation, no food of any kind is procured. The beef and pork, fed in the distilleries, always supplied the markets, during the interval between the failure of the turnip-beef, and the preparation of the grass-beef of the ensuing summer. In this way, animal food was always in regular supply, and never rose so high as it has done since the distilleries were prohibited from using grain, during several successive years. The consequence of this has been, that many farmers have thrown a greater proportion of their land into pasture, or have extended the cultivation of turnips, in order to supply that portion of animal food, which used to be furnished by the distilleries. Many also sow wheat, where they were wont to sow barley. The latter agrees best with light friable soils, and used generally to succeed turnips or potatoes; whereas wheat thrives best on strong clays, or what are here esteemed to be well adapted for drilled beans. It is obvious, that if wheat, or any other grain, be too often repeated on soils that are ill adapted for them, the productive powers of the land must

must suffer a rapid diminution. There is another circumstance attending distillation from grain, that has no place in that from sugar. The straw on which the barley grew, was all consumed in the farmer's yard, and returned to the land in the shape of putrescent manure, to raise wheat, potatoes, or other crops for feeding the people. The animals too, that were fed on the draff and dreg, yielded great quantities of rich manure, in addition to what was produced from the straw. Thus, distillation from grain, not only produced a large supply of animal food for the use of the people, but the great addition it made to the stock of manure, enabled it to replace the whole, or greatest part of the grain that was thus consumed. Distillation from sugar can have no more effect upon the land of this country, than if the process were carried on in the West Indies.

From these facts it seems evident, that if the prohibition of grain-distillation be continued, the operations of the plough will soon be very much curtailed. There will be no occasion to prohibit this mode of distillation, because there will be no surplus of grain on which to operate. Nay, it follows from the above data, that even the portion which was consumed as food by the people, will be very much diminished.

With regard to the interest of the West India planters, it is acknowledged on all hands, that they have long been in the habit of urging on the cultivation of sugar, and of other disposeable produce, to a greater extent than all the markets of the world can take off their hands. All other cultivation but theirs, feeds the people employed in it, in the first instance; and it is only the surplus that is sold. But they export sugar, &c., and import provisions. Now that the slave-trade is abolished, it behoves them to consider seriously, whether it would

not

not be more for their advantage to substitute bananas and other plants in place of part of their sugar canes, that so they may raise sufficient food among themselves, for feeding the negroes engaged in the cultivation of these colonies. This may diminish the amount of sugar raised, which is by far too great at present; but it will make their negroes more comfortable, and enable them not only to keep up, but to increase their numbers. At least, Government should be very cautious, lest, by holding out premiums for the excessive production of sugar, they may, unintentionally, occasion the destruction of the negro-race in the West Indies; and by suppressing a manufacture, so obviously beneficial, they should inflict upon the agriculture of their country a mortal wound. Here, we do not take into the account the damaged grain, which the distillers always took off the farmers' hands, at a price equivalent to its value to them. When grain distillation is suppressed, damaged grain is wholly unsaleable.

With regard to the experiments that have been tried, of feeding oxen and hogs upon sugar and molasses, these had best be practised in the West Indies, to raise animal food for the people there. If the supply of animal food be taken out of the hands of our farmers, this will operate as an additional discouragement to agriculture.

The late stopping of grain distillation was wise and necessary; and we only suggest the danger of rendering it permanent.

SECT.

SECT. V.

IMPORTATION OF CORN.

THE bounties on the exportation of grain have long remained a dead letter in the statute-book; and in place of exporting, this country has been advancing enormous premiums, and paying excessive prices for grain imported. This has drained the country of its metallic currency; has stimulated the agriculture of hostile nations; and has swelled the financial resources of our enemies, for our destruction.

On the first blush of the subject, when we have so much land that does not yield the half of what it might do, if subjected to a more perfect cultivation, and so much that has never been cultivated at all, an indifferent spectator may be led to conclude that there must be some radical error in our policy, since our agricultural exertions have not kept pace with other improvements, so as to supply the wants of our increasing population, or even to go beyond these wants, and to render this an *exporting* nation, as it formerly was, instead of an *importing* nation, as it has been during a long period of years. It is true, indeed, that different districts, such as this county, continue to raise more than is consumed by the inhabitants; but the surplus has long ceased to be exported to foreign nations, and is only sent coast-wise to other districts, where the supply is deficient. What is here stated, is not applicable to particular districts, but to the island at large.

It seems now to be a matter, not merely of expediency, but even of irresistible necessity, that Parliament should inquire into, and remove all those legal restraints which fetter agriculture, and prevent it from keeping pace with the demand for its produce. We conceive they should not stop short at mere negative measures; but that they are called upon to do something positive, and efficient, in forwarding this great national object.

For example, Suppose only a small portion of those almost countless millions, which have been lately sent out of the country to purchase corn, had been laid out in premiums to encourage the reduction of waste land into cultivation, will any man say that the produce of this country would have been so far short of the consumption, as it now is?—The probability is, that instead of being deficient, the produce would have considerably surpassed the home consumption, and that there would have been a surplus to export. It would at least be worth while to try the experiment, with a view to ascertain the effect that would result, from granting a premium, during a limited period, say of L. 2 for every acre, that was brought from a waste or barren condition, and so far improved as to carry a medium crop of any species of grain, grass, or roots, which the farmer thought proper to insert. It is probable this would cause half a million of acres to be annually added to the cultivated surface of the island, at an expence to the public of one million; which is much less than the interest of the money sent abroad for corn within a few years.—Such would be the cheapest, and at the same time the most productive conquest that Britain could achieve. If by such means the produce of the island could be increased a half, or even a third, it is manifest, that this would be more advantageous than adding

ing another island to the empire, by fire and sword. Money laid out in this way, would soon be returned to the Exchequer, with compound interest, by the additional taxes the subjects would be enabled to pay. It is meant, that fossil manures should be chiefly applied, in the first instance, that so the land already cultivated may not be deprived of its usual supply, of putrescent manures.

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CONCLUSION.

IN the preceding parts of this work, it was stated, that the county contains 532,243 English acres: That of these, there are about

20,764 Acres under woods and plantations;
 20,000 Do. cultivable wastes;
 150,836 Do. hills and mountains, unarable;
 340,643 Do. cultivated and improved.

532,243 Total.

1. With respect to the 20,764 acres under woods and plantations, we may observe, that portions of these, which had been originally planted with Scotch firs, have had the trees rooted out, and the land has been converted into tillage, or pasture. But more than an equivalent has been added in new plantations. We remarked the general preference now given to larches, and what is called hard wood, to Scotch firs, as a favourable symptom of the progress of improvement, in this branch of rural economy. Many parts of the older plantations do not thrive, because no pains had been taken to draw off

springs, or to discharge water from hollow places, where it collects during rains, and can only escape by evaporation. This improvement is generally attended to, in the later plantations, and in those which are now going on.

2. The 20,000 acres stated to be cultivable wastes, consist of lands that are of a sufficiently low elevation, above the level of the sea, to admit of their ripening corn, and all sorts of crops. Indeed a considerable part of them consist of hollow marshy grounds, embosomed among hills, which are cultivated to their summits; and are not so much encumbered with rocks or stones, as to render their reduction into tillage too expensive. Parts of these may be improved by planting, as the proprietors may incline.

The 150,836 acres, which are stated to be unarable, consist of hills and mountains, which are elevated above the level adapted for ripening corn; or whose lower acclivities are so much encumbered with rocks and stones, that their removal would be too expensive. A small proportion also consists of lakes, whose drainage would cost much more than the land they occupy is worth. Rivers and roads are also included; though the latter, when properly made, are the most valuable land in the county.

With regard to the stony places on the rise of some of the Seedlay Hills, and of many more of the Grampians, there is, generally, a sufficient quantity of earth interposed between these rocks and stones, to nourish trees. From the very thriving condition of such plantations as have been made in similar places, especially of the patches that have been tried among the Grampians, with a southern exposure, we are led to wish that all these stony acclivities, together with many gravelly knolls, and stony parts

parts of the valleys, were planted with trees. There are abundance of stones to fence off such places; trees would gradually improve the pasture; and in a few years, these plantations would be an excellent resource for wintering sheep and cattle. We formerly observed, that most of the Grampian glens are traversed by streams of water, which, at least when swelled with rains, would be sufficient to float the largest logs to the sea. In this way, from forty to fifty thousand acres might be rendered highly productive; while the stunted herbage they now yield, would be increased in quantity, and meliorated in quality. In the Grampian glens, there are many large heaps of stones, which have been gathered from the cultivated land. As they still obstruct cultivation, they would better have been arranged in fences, to separate the cultivated from the waste land. But where land is held in mixed occupancy, with no leases, or those of very short endurance, neither this, nor any other improvement, can be expected.

We have already detailed the means that seem expedient to be adopted, with a view to increase the quantity, and improve the quality, of the mountain pastures; which it is unnecessary to recapitulate.

The lakes of this county, which do not easily admit of being drained, are of too small consequence to deserve much notice. But we may state a few facts, tending to shew, that many of the more extensive lakes, which abound in the Highlands, as well as some in this county, might be turned to good account, as internal fisheries. Lochleven in Kinross-shire, so famed for its trouts, yields a very good rent, as well as profit to the tacksmen, by its fishery. The char, and other trouts, which abound in the lakes of Cumberland, are also a great source of profit. Char is known to abound in many of the Highland lakes; but the people

have never found the way of catching these trouts, nor of turning any of the fishes in their lakes to account. The Chinese are said to convey the spawn of their more valuable fishes, from the rivers and lakes where they abound, to those where they are wanting, and to derive as much food from their waters, as from an equal extent of cultivated land.

From the 340,643 acres, stated to be cultivated and improved, we may deduct the parks around the mansion-houses of noblemen and gentlemen, which are not occupied by trees, and may be reckoned permanent pasture. At least, they have not been subjected to the plough for twenty years and upwards; and as some of these yield a higher rent in pasture than they would do in crop, they are not likely to be soon broken up. What the extent of these may be, there are no means of calculating; but we should suppose they may amount to about 6000 acres. To these we may add about 1000 acres, of gardens and orchards; making 7000 acres of cultivated land, not subjected to the plough. The remaining 333,643 acres, are subjected to the alternate system of husbandry, according to the various rotations we have stated to prevail in the different districts of the county.

To estimate the proportion of these acres occupied by sown grass and pasture; by naked fallow and drilled crops; and by the various species of grain crops, would be a very difficult, as well as an unnecessary task. These proportions are varied exceedingly, both by the local position of the land, and by the quality of the soil. We have already observed, that the proportion of barley is annually diminishing; while that of wheat is increasing, together with turnips, sown grass, and pasture. The proportion of acres occupied by lint has also begun to in-

crease

crease of late, and would increase still more, were not linseed so costly, and so difficult to be procured.

It would also be a very difficult task to assign the annual money value of the various species of crops, which the cultivated land produces. This varies with the seasons; and money, whose value is very fluctuating, appears to be an improper standard by which to compare the value of the farmer's disposeable produce. A more perfect standard seems to be the quantity of labour, of clothing, harness, and other manufactured articles, this produce may enable him to command. In fact, labour, if not the standard, seems to be the only source of value; and this is enhanced according to the skill and ingenuity necessary to its exertion. As a small error in the data of such calculation would be very much increased in the result, we shall not attempt it.

The *capital* employed in the agriculture of this county, it is also no easy matter to estimate exactly, as this depends upon such a variety of circumstances. It is evident, that when an arable farm is in bad order at entry, a much greater capital is necessary to render it productive, than for another farm, of the same extent, which it is only necessary to keep in the state in which it was found.

Premising, that the data on which all calculations of this sort are founded, must be in a great measure hypothetical, and that this quality must predominate in the results, all that can be expected is to make as near an approximation to the truth as circumstances will admit. From the present high prices of live stock, implements, and all the items which enter into the composition of a farmer's stock, we are led to think, that, on a general average, it may require a capital of about L.600, to
stock

stock a farm of a hundred English acres sufficiently ; or L.6 per acre. And as there are 340,643 English acres cultivated, this brings the capital employed to L.2,043,858. But we have already stated, that we do not pretend to accuracy in the data assumed.

The profits, upon agricultural capital, it seems utterly impossible to calculate. There are some *data* on which to calculate the capital ; but none on which to calculate the profits. The latter depend so much upon the seasons, and upon such a variety of local circumstances, that we might as well attempt to calculate the figure and dimensions of the clouds, or of the waves of the ocean, as to reduce to exact calculation, a farmer's profits. In general we shall only observe, that there are some farmers, in favourable positions, especially if they occupy under old leases, who make from 20 to 50, or more per cent. on the capital they have embarked in agriculture. But there are many other farmers who do not make even legal interest from their capitals ; and there are not a few who make nothing at all ; or if they make any thing, it does not exceed the income tax, most absurdly charged upon their rent.

Taking a general view of the subject, after all our endeavours to arrive at truth, though we cannot pretend to certainty, we are inclined to think, that the profits upon agricultural capital in this county do not exceed 10 per cent. on a general average. We are inclined to think this average overrated, rather than underrated ; and this falls very far short of the profits arising when trade is flourishing, from manufactures and commerce. One circumstance tends much to reduce the profits arising from agriculture : That is, the irresistible instinct implanted in man, by the Author of our being, to cultivate
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the earth; and to derive his chief enjoyment, from such occupations. This strong instinct induces persons who have realised fortunes in manufactures and trade, or who have acquired a competency in the service of their country, to purchase estates, or to take farms, and to improve them. This occasions a greater competition of capitals in agriculture than, perhaps, in any other line of employment; and the effect of this competition is to reduce the profits.

In bad seasons, when there is a deficient crop, mechanics in towns are apt to exclaim against the exorbitant profits of the farmers, and to form combinations in order to bring down the prices. The effect of such operations is uniformly to increase the evil they were meant to remedy. When provisions are cheap, such persons never think of reducing the prices of their manufactured goods. The farmer must first feed himself, his family and servants, together with the live stock employed upon the farm; and it is only the surplus that he can bring to market. If a season occurs when he has only three bolls to dispose of, in place of four, his usual quantity; as the raising of three bolls cost the farmer as much, or more, than four bolls, he is entitled to the same price for three as for four, or he will be a loser. In such a case, raising the price is more beneficial to the consumers themselves, than it is to the farmer, because it forces them to be more economical in the use of land produce. Thus a crop, which at the ordinary rate of consumption, would be all consumed in nine months, may be made to last a whole year. All intelligent manufacturers deprecate cheap provisions, when they come in contact with high wages; and it is chiefly in such cases as we have supposed, that the labouring classes of
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the community are distinguished by superior industry, sobriety and economy.

We have had frequent occasion to allude to the depreciation in the value of money, as a circumstance which renders the apparent rise in the prices of commodities, in some degree, nominal, instead of being real. Money is a medium, agreed upon by tacit compact, by which commodities that are wanted for use or ornament, are conveyed from hand to hand. What are called the precious metals, though they be the most useless of any, from their scarcity and indestructibility, have been adopted as the circulating medium of all civilized nations. We learn from the late lamented Mr Park, that as iron is the most valuable of all the metals, in the estimation of the African negroes, it is used by them as a circulating medium; and that commodities are rated by bars of iron, half bars, quarter bars, &c. and this standard they refer to, in making their bargains, just as we refer to Sterling or Easterling money, when there is no such money in circulation. But the value of the precious metals, like that of all other commodities, depends upon the quantity in circulation, balanced by the demand. Since the discovery of Spanish America, there can be no doubt but there is much more gold and silver in circulation than took place before that event. Their value or power of purchasing other commodities, has therefore suffered a proportional depreciation. But these metals cannot be accumulated, so as to suffer an excessive depreciation in any particular country. Should this take place, for a short period, they soon find their way to some other country, where their power of purchasing other commodities is greater. Thus the depreciation of the precious metals, arising from the increased quantities extracted from the mines, is progressive, and is nearly equal in all parts of the world.

With

With regard to paper currency, there can be no doubt but, when under proper regulations, it is a more convenient instrument in commercial transactions, than the precious metals. But neither paper, nor indeed any other species of circulating medium, can be forced; and their currency must always be voluntary, or optional, on the part of the people. Assignats are said to have been sold by the stone weight on the streets of Paris, while Robespierre had the guillotine at work to keep their value at par. If bank notes be issued only on value actually existing, and that value in a state of transition from hand to hand, they have many advantages over the precious metals as a circulating medium. But if they be not convertible into specie at the option of the holder, there is a strong temptation to issue them on what are called *wind bills*, where there is no corresponding value of commodities in existence, nor that value *in transitu*, passing from hand to hand. In the first case the notes represent the value of the goods which have been purchased by one person from another; and they may be considered as circulating these goods, from the producer to the consumer, under a different shape. In the second case, the notes represent nothing; and by throwing more of them into circulation than commercial transactions require, their value is of course depreciated. Should this happen, paper currency is found to labour under one disadvantage, that it cannot be circulated beyond the country where it is authorised, and cannot, like the precious metals, find its way to other countries, so as to bring its value to an equilibrium.

From these causes, namely the increase of the quantity of the precious metals, and from the excessive issue of paper currency, money is of much less value, or does not possess the same power in purchasing other commodities,

dities, that it had in former times. Hence money is an uncertain standard by which to compare the value of commodities.

We have thus detailed the present state of the Agriculture of the county of Angus, together with that of Manufactures and Commerce, as far as we were able to obtain information concerning them. Though we cannot charge ourselves with any want of care and attention in the investigation of facts, we are duly sensible that many errors have been committed, which require the indulgence of the candid reader.

APPEN.

APPENDIX.

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THE UNIVERSITY OF CHICAGO

PH.D. THESIS

BY [Name]

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APPENDIX A.

ABSTRACT of Colonel IMRIE's Description of the Strata from the plains of Kincardineshire to the summit of Mount Battock.

THE ingenious Colonel IMRIE having reviewed the scene of his former observations, and favoured the public with a more correct account of the result than that which appeared in the Transactions of the Royal Society of Edinburgh; and as the section of the Grampians which he describes with so much accuracy, lies chiefly in the County of Forfar, we are induced, with his permission, to present a short abstract of his description.

The Colonel's Description comprehends a section of the rocks which occupy a space of about ten miles, from the plain of Strathmore to the summit of Mount Battock, where the three counties of Kincardine, Aberdeen and Forfar meet. These consist of a regular series, from what is reckoned the latest formed sandstone, to granite, which some geologists esteem the oldest rock in existence. These strata are farther interesting, from the first being horizontal, and the others gradually rising until they assume a vertical position; which latter also exposes the series more fully to view.

Forfarshire Report.]

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The Colonel, taking his departure from the plains of Kincardineshire, or of Strathmore, and following up the channel of the North Esk, which is here the boundary of the counties, the first native rock that occurs is "a reddish-brown argillaceous sandstone, stratified in layers, of various thicknesses, from one inch to four feet of solid stone. The granulations of this sandstone are small, but in some parts of it gravel is found imbedded in its composition, and where this occurs, it is generally to be seen in the lower parts of the layers of its strata. Besides the general reddish tint of this rock, it also, in some places, shows narrow stripes, and small circular forms of a pearl-grey colour. The component parts of this sandstone consist of small particles of quartz, and still more minute particles of silvery-lustred mica, with a very small admixture of calcareous matter. These particles owe their cohesion in mass to a martial argillaceous cement, to which this rock also owes its general colour."

In the plain, this rock is perfectly horizontal in its position; but when it approaches the undulated grounds which skirt the lowest basis of the Grampians, it begins to rise from its horizontal bed. For the first quarter of a mile after its first deviation from its horizontal position, its rise is very gradual, but afterwards its acclivity is more rapid, and in a mile it becomes perfectly vertical.

"Where this sandstone is in its most solid state, and where its position is perfectly vertical, between two layers of it, there occurs a bed of trap * forty feet thick." The sandstone on each side of the trap is in close contact with it, and the river has worn both trap and sandstone so, that a perpendicular section of these rocks may be examined to a height of 60 feet. Upon the east side of the river, two branches spring from the trap, nearly where the river washes the base of the section, one on the south, the other on the north side of the main trunk. These branches intersect

* The Germans apply the word *Trap* to all sorts of stones of which stairs are usually built. Mineralogists seem now to restrict the word to denote Scottish whinstone

Intersect some of the sandstone strata in a zig-zag direction, and at last, between two layers of sandstone, they ascend to the surface soil. Their diameters decrease from about a foot, where they branch off, to about two inches, when they terminate in the upper part of the rock. Their whole length, from their origin at the trunk, to their termination, is about sixty feet.

By exposure to the weather, this trap throws off scales in rounded patches, and when the surface of the rock is decomposed to a considerable depth, it then displays a structure largely granulated, which consists of nodules of circular and oval shapes, of a foot, and sometimes of a foot and a half in diameter.

To the north of this bed of trap, the sandstone layers, continue the same vertical position as on its south side; but soon the gravel, hitherto only occasionally imbedded in the sandstone, becomes rapidly augmented in quantity. At last the sandstone almost entirely disappears, and is seen to pass into a conglomerate or gravel rock.

This gravel rock is composed of rounded water-worn stones, from the size of a pigeon's egg to a bullet of a foot in diameter. These mostly consist of quartz, granites, porphyries, jaspers, &c. all productions of the interior mountains; but the quartz and small-grained granites predominate in the composition. These stones are cemented together by means of a highly ferruginated clay, of a reddish-brown colour, mixed with very small particles of quartz, and very minute fragments of silver-lustred mica. This cement fills up the interstices between the rounded stones, and is so binding, that the hardest stones in the composition may be more easily broken than removed from their sockets.

In this conglomerate, narrow lines and thin beds of fine-grained sandstone occur at various distances from each other, and are from the third of an inch to a foot in thickness. They are stratified, are not bent in their course, and they stretch in the longitudinal direction of the conglomerate, dividing its mass into separate beds. These stratulae of sandstone indicate that

this mass had been deposited at various periods, and they shew that it stretches from west to east, and that its position is nearly vertical. This sort of rock stretches along the whole face of the Grampians, through an extent of more than an hundred miles. At Stonehaven it is some miles in thickness. In the middle district it occupies less space; but towards the western district, it again swells out, and forms high mural precipices of immense thickness. In this long stretch, its position is uniformly vertical*. The whole thickness of the stratum of this conglomerate, where the section was taken, is only four hundred yards.

This gravelstone rests upon a very fine-grained sandstone, of a dark ferruginous brown colour. This sandstone is arranged in thin layers, none of them exceeding a foot in thickness. It stretches nearly from west to east; and the whole thickness of its strata is two hundred and sixty yards. It inclines somewhat from a vertical position towards the south.

This sandstone rests upon a clay-porphry, the base or principal mass of which consists of indurated argil, of considerable hardness. Its fresh fracture is of a pale purplish or lilac-brown colour. The concretions imbedded in it are small particles of quartz, felspar, blackish-brown mica, and specks of iron-ochre, which are but thinly scattered in the mass. This rock is not stratified, and it is two hundred and twenty yards in thickness.

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* In all parts of Scotland, and of the Isles which I have examined, the gravelstone rock uniformly occurs between the rocks which are reckoned primary and those which are reckoned secondary. It is sometimes only a few feet, but more often of enormous thickness. Its strata are generally, but not always, vertical. Thus, the Scridan rocks in Arran consist of very thick beds of gravelstone, which lean upon the primary schistus at an angle of about 45°. The primary mountains which occupy the summit of Renfrewshire, south from Greenock, and part of the north of Ayrshire, have enormous beds of gravelstone projected from them in some directions. These, in different places, near Largs and Kilbride, and in some of the glens which open from these mountains to the sea, are seen to consist of very thick beds, nearly in a horizontal position. The same occurs in some parts of the island of Lewis, and several other places.

The clay-porphry rests upon a stratification of transition-slate, which is variable in its composition, irregular in its stratification, and contorted in some of its members. Where it is near the porphyry, it is in some places composed of quartz and clay; so that it sometimes takes the appearance of a compact sandstone, sometimes of hornstone, and even sometimes of quartz in mass. As the argillaceous matter augments, it assumes a slaty texture, and passes into transition-slate. This rock is of a whitish-yellow colour, and by exposure to the weather, it assumes an ochry-red colour, owing to iron in its composition. It inclines somewhat to the south, and its whole mass is three hundred yards in thickness.

This transition-slate rests upon a narrow bed of slate, arranged in thin lamellæ, of a greenish-grey colour, with some tints of yellow and some of bluish-grey.

This slate rests upon a bed of trap, of a black colour, with a small admixture of brown. It is more compact than the trap already described, though composed of nearly the same materials. It stretches nearly from west to east; but in this stretch, where the river has laid the trap open for inspection, a curvature in the bed is observable, the convexity of which is presented towards the mountains. This trap is eleven yards in thickness, and it rests upon a narrow bed of slate, perfectly similar to that last described.

To this last slate succeeds a narrow bed of limestone in a vertical position. It is six feet thick, of a black colour, and much traversed by small veins of quartz, and of calcareous spar. On the north side of the limestone there is another narrow bed of slate, similar to that last described.

This narrow bed of slate is succeeded by another bed of trap, seventy feet in thickness. It is of a bluish-black colour, and is more compact than any of the traps formerly described. Its fracture is also more smooth, and approaches the conchoidal form. Its position is vertical, and its vertical cracks and fissures, shew a tendency towards prismatic forms.

On the north side of this trap there occurs a slaty-clay, three feet thick, whose fracture is uneven, and its texture contorted.

This slaty-clay rests upon a bed of transition-slate, six feet in thickness, and this is succeeded by a considerable extent of rock, consisting of a mixture of calcareous and argillaceous matter, of various colours; such as whitish-yellow, purplish, and reddish-brown. From the decay of its surface, its stratification can hardly be discerned, and it rests upon an argillaceous rock of a dark-green colour, whose texture is coarsely slaty, and somewhat contorted; its fracture rough, in some parts intersected with narrow veins of quartz, and exhibiting small nests of slate-spar. Towards the north, the lamellæ of this rock become very thin, and more regular.

After the rock has assumed this texture, large masses of jasper are found imbedded in it. These are either amorphous, or of an elliptic form, of various size. One elliptic mass has been cut by the river, and is about thirty feet in length, its greatest breadth about ten feet. One amorphous mass is about thirty yards in extent. The colour of this jasper, is generally dark-red, varying from brownish-red to blood-red, and to sealing-wax red. It is of great induration, and takes a high polish. It is much intersected by small veins of bluish-white quartz, and is dotted with specks of pyrites.

Soon after the occurrence of these masses of jasper, the argillaceous rock becomes more coarsely slaty in its texture, with flakes of quartz in its laminæ, and a few scattered nests of slate-spar imbedded in it. This argillaceous slaty rock is continued to a considerable distance towards the north, its prevailing colours being greyish-blue, greenish-grey, and purplish-brown.

The next rock in order is a bed of limestone twelve feet thick, which has upon each of its flanks a narrow bed of shale, of a black colour, which soils the fingers in handling. The bed of limestone is of a dark blue colour, and is much intersected by small narrow veins of calcareous spar. The texture of this limestone is small granulated.

Upon

Upon the north side of the northern bed of shale, a vein of quartz, some feet in thickness, occurs. After this, the transition-slate again appears, which seems to pass into old clay-slate. To the north of this an aggregate rock occurs, whose cementing base consists of highly indurated clay, including particles of quartz, felspar and mica. It is thickly slaty in its texture. In the progress northward, this rock seems to alternate with clay-slate. In mass, it has a greyish-blue colour, and is of great induration. Its concretions are small angular, and in some places are seen to be arranged in lines. The particles of felspar have frequently a compressed appearance, and an eye-like form. The river cuts these alternating rocks to a considerable extent.

In one place a bed of compact felspar ten feet thick occurs in these rocks. Its position is vertical, between two layers of blue clay-slate. Its colour reddish-brown, with a small admixture of purple. Its fracture conchoidal.

After passing a considerable extent of alternate clay-slate and aggregate rock, a bed of trap is cut by the river at right angles. Upon the left bank this trap is seen to split into three branches, and these three take an eastern direction, between the strata of the clay-slate and aggregate. The breadth of the entire bed of trap is thirteen feet; and the three branches into which it splits at its eastern extremity are six, four, and three feet in diameter. Its position is vertical; its colour black, with a small admixture of brown.

Where the river changes its course from east to south, nearly at right angles, and its channel and the plain in which it flows are covered with gravel, so as not to expose the section of the rocks, the Colonel left the bed of the river, and pursued his northern direction, along the deep-cut bed of a torrent that led towards the summit of Mount Battock. On entering the bed of this torrent, he found the basis of the hills entirely composed of mica-slate, much veined with quartz, and much twisted in its texture. This rock stretches from west to east, and dips towards the south at an angle of about 45° . No garnets were

Myosotis	Veronica
• repens.	alpina.
Alchemilla	humifusa.
alpina.	Eriophorum
Juncus	• gracile.
trifidus.	Arbutus
trigynus.	Uva ursi.
alpinus.	Pyrola
spicatus.	rotundifolia.
• gracilis.	uniflora; but rare.
Gochlearia	Thalictrum
officinalis, var. γ , the Cochlearia Groenlandica of our British authors, but not of Linnæus.	alpinum.
Epilobium	Tofieldia
alpinum.	palustris.
alsinifolium.	Hedypnois
Rumex	taraxaci.
digynus.	Salix
Spergula	herbacea.
saginoides.	Vaccinium
Hieracium	uliginosum.
denticulatum.	Vitis-Idææ.
alpinum.	Trisetis
Aspidium	europæa.
Oreopteris.	Rubus
• Ranunculus	Chamaemorus.
alpestris; but rare.	Silene
Asaia	acaulis.
procumbens.	Cerastium
Gnaphalium	alpinum.
supinum; and a variety.	latifolium.
sylvaticum; but rare.	• nivale, nova species.
Betula	Malaxis
nana.	paludosa.
	Lycopodium
	annotinum.

On mountains to the eastward of Clova, I discovered the beautiful *Festuca tridentata*, new to our British Flora.

On the rocks among the Clova mountains, are to be found the following interesting plants:

Pteris	Salix
<i>crispa.</i>	• <i>rupestris.</i>
Aspidium	<i>prunifolia.</i>
<i>Lonchitis.</i>	<i>Andersoniana.</i>
Epilobium	<i>arenaria.</i>
<i>angustifolium.</i>	<i>incubacea.</i>
Hier	<i>glauca.</i>
<i>Aquifolium.</i>	Hieracium
Sonchus	• <i>diversifolium.</i>
<i>cœruleus</i> of Fl. Brit.; truly a	<i>cerinthoides.</i>
rare plant. The <i>Sonchus</i>	• <i>amplexicaule</i> ; besides several
<i>Canadensis</i> of Linnæus, al-	non-descript species.
though given by Dr Smith	Tussilago
as a synonym, is a very diffe-	• <i>alpina.</i>
rent plant. <i>S. cœruleus</i> is	Cochlearia
now lost at Howden Pans,	• <i>grœnlandica</i> of Linn.
in England; and at present	• <i>alpina</i> , <i>nov. sp.</i>
we know of no other habitat	Lychnis
for it but the Clova moun-	• <i>alpina.</i>
tains, and their vicinity.	Potentilla
Braba	• <i>opaca.</i>
<i>incana</i> ; and likewise	Arenaria
<i>var. β.</i>	• <i>fasciculata</i> of Jacquin; the
Poa	<i>fastigiata</i> of English Botany.
<i>flexuosa.</i>	Serratula
<i>glauca.</i>	<i>alpina.</i>
Melica	Carex
<i>nutans.</i>	• <i>laxa</i> of Whalenberg.
Pyrola	<i>atrata.</i>
<i>secunda.</i>	<i>palescens</i> ; and several non-
Potentilla	descripts of that genus.
<i>aurea.</i>	Cyathea
	<i>dentata.</i>

On the upland pastures grow the *Satyrion albidum* and *Satyrion viride*.

Among the rarer Mosses to be found among these mountains, may be mentioned the following:

Hypnum	Hypnum
<i>pulchellum.</i>	<i>undulatum.</i>
<i>denticulatum.</i>	<i>alpinum.</i>
	Hypnum

Hypnum

plumosum.
 myosuroides.
 implexum.
 molle.
 Schreberi.
 rufescens.
 Saitana.
 stellatum.
 rugosum.
 revolvens; and some non-descripts of this genus.

Psotrum

gracile.
 arcuata.
 Merchiana.
 Halleriana.
 crispum.
 ithyphyllum.

Tortula

brevifolia.
 tortuosa.

Trichostomum

fontinaloides; and var. β .
 lineare.
 glabrescens.
 microcarpon.
 rigidulum.
 capillaceum.
 trifarium.
 ericoidea.

Cinclidium

cirratum.
 striatum.
 conostoma.
 nigritum.
 Schistum.
 Donniana.
 heteromalla.
 recurvatum.
 pectus.
 rivularis.

Polytrichum

hercynicum.
 strictum.
 alpinum.
 attenuatum.

Bryum

compactum.
 bimum.
 crudum.
 Zierii.
 julaceum.
 alpinum.
 trichodes.
 decalbatum.
 elongatum.

Neckera

curtipendulum.
 crispum.
 plumum.

Gymnostomum

niferostomum.
 lapponicum.
 fasciculare.
 stelligerum.
 curvirostrum.

Buxbaumia

foliosa.

Splachnum

rugosum.
 gracile.
 tenue.
 angustatum.
 mnioides.
 fastigiatum.
 ovatum.

Dicranum

fuscescens.
 flagellatum.
 uncinatum.
 falcatum.
 fulvellum.
 rufescens.

Dicranum

Dicranum

- ovale.
- patens.
- montanum, rare.
- squarrosum.
- flexuosum.
- polyphyllum.
- strumiferum.
- virens.
- crispum.
- osmundioides.
- pygmæum.

Jungermannia

- bilida.
- ciliaris.
- divaricata.
- setiformis.
- emarginata.
- reptans.
- adunca.
- julacea.
- cochleariformis.
- trilobata.
- curvifolia.
- resupinata.

Besides many others of the foliaceous mosses.

The species of the genus Lichen are, as might be expected, very numerous in these mountains. This extensive Linnæan genus has lately undergone a change in arrangement, and a subdivision into several genera, by the eminent Dr Acharius. In mentioning the most remarkable, I shall adopt the new nomenclature.

Lecidea

- Muscorum.
- petraea.
- miscella.
- rivulosa.
- confluens.
- fumosa.
- fusco-ater.
- dendritica.
- atro-alba.
- silacea.
- Æderi.
- niveo-ater.
- pruinosa.
- cupularis.
- Dicksonii.
- tricolor.
- icmadophila.
- luteola.
- atrata.
- granulosa.

Lecidea

- cinereo-fusca.
- calva.
- casio-rufa.
- orosthea.
- polytropa.
- atro-rufa.
- lurida.
- canescens.
- vesicularis.
- pustulata.

Gyrophora

- glabra.
- erosa.
- proboscidea.
- cylindrica.
- pellita.

Verrucaria

- nitida.
- stigmatella.
- epidermidia.
- umbrina.

Endocarpon

Endocarpon

amaragdulum.
 miniatum.
 complicatum.
 Weberi.

Thelotrema

hymenium.
 pertusum.

Sphaerophoron

coralloides.
 compressum.

Isidium

corallinum.
 Westringii.

Urceolaria

calcaria.
 cinerea.
 fimbriata.
 Hoffmanni.
 scruposa.
 Acharii.
 cirtaspys.
 ostracadermis.
 • diamarta of Acharius.

Parmelia

ventosa.
 perella, var. 3. Upsaliensis.
 tartarea, var. 2. frigida.
 dispersa.
 cerina.
 vitellina.
 hypnorum.
 brunnea.
 candelaria.
 gelida.
 circinata.
 epigea.
 miniata.
 caesia.
 recurva.
 fahlunensis.
 conspersa.
 haematomma.

Parmelia

pulverulenta.
 stygia.
 affinis.
 plumbea.
 caperata.
 herbacea.
 glomulifera.
 scrobiculata.
 pulmonacea.
 saturnina.
 lacera.
 nigrescens.
 crispa.
 fascicularis.
 furfuracea.
 jubata, var. 4. chalybeiformis.

Sticta

limbata.
 sylvatica.

Peltidea

aphthosa.
 resupinata.
 crocea.
 saccata.

Cetraria

nivalis.
 islandica.

Cornicularia

aculeata.
 tristis.
 spadicea.
 lanata.
 pubescens.

Stereocaulon

paschale.

Baeromyces

roseus.
 rupestris.
 Papillaria.
 bellidiflorus.
 cenoteus.
 spinosus.

The plants, natives of the Clova mountains, which have the chief claim to the farmer's notice, are the Gramina. Of the rarer grasses, the first is the *Alopecurus alpinus*, a new species which I discovered many years ago. This grass I have cultivated for several seasons, and I am convinced it is but little inferior to the *A. pratensis*, so much taken notice of by agricultural writers. It has the advantage of the latter, in so far as it increases more freely in the roots, and readily produces perfect seeds, the want of which is sometimes complained of in the *A. pratensis*. The next is *Phleum alpinum*, which forms a considerable part of the pasture on the mountains of some of the northernmost parts of Europe, and seems a grass well calculated for pasture in alpine districts. *Poa nemoralis*, *Poa glauca*, and *Poa alpina*, and the variety *vivipara*, are all good grasses; the *P. alpina* is one of our best pasture grasses on poor soil, with a bad climate. Lately I discovered three other grasses, new to Britain, viz. the *Avena plano-culmis* of Schræder, Fl. Germanica, producing a great quantity of foliage; the *Aira levigata*; and the *Phleum Meichelii*, the *Phalaris alpina* of the German authors: these grasses grow on the very summit of the highest mountains.

The pasture on the mountains, particularly on the summits, is composed of the following grasses:

Eriophorum	Poa
<i>vaginatum.</i>	<i>humilis.</i>
<i>angustifolium.</i>	<i>decumbens.</i>
Scirpus	Carex
<i>cæspitosus.</i>	<i>binervis.</i>
<i>pauciflorus.</i>	<i>rigida.</i>
Melica	<i>fulva.</i>
<i>corulea.</i>	<i>Oederi.</i>
Nardus	<i>dioca.</i>
<i>stricta.</i>	<i>cæspitosa.</i>
Aira	<i>recurva.</i>
<i>flexuosa.</i>	<i>ampullacea.</i>
<i>cæspitosa</i> ; together with	<i>Micheliana.</i>
var. <i>vivipara.</i>	<i>limosa</i> ; but rare.
Agrostis	<i>panicca.</i>
<i>vulgaris</i> , several varieties.	<i>pilulifera.</i>
Festuca	<i>præcox.</i>
<i>vivipara.</i>	<i>flava.</i>
<i>ovina.</i>	<i>teretiuscula</i> ; but rare.
<i>duriuscula</i> ; and also	<i>curta.</i>
var. <i>dumetorum.</i>	<i>stellulata.</i>
<i>cæsia.</i>	

Carex

Forfarshire Report.]

b

<i>Carex</i>	<i>Juncus</i>
<i>pauciflora</i> ; but sparingly.	<i>articulatus</i> .
<i>pulicaris</i> .	<i>uliginosus</i> .
<i>Juncus</i>	<i>spicatus</i> .
<i>trifidus</i> .	<i>campestris</i> .
<i>squarrosus</i> .	

The pasture in the valleys in the high lands is the same as in the low lands, only with the addition of the *Meum athamanticum*.

Angusshire has some of the best grasses growing native by the sides of the rivers and rivulets: such as the *Alopecurus pratensis*, *Festuca elatior*, *Festuca pratensis*, *Festuca triflora*; the latter but rare. I have observed, although sparingly, the *Festuca loliacea*. I have of late discovered a non-descript species of *Festuca*, which seems to be equal, if not superior, to almost all the known species. We have also a number of the genus *Poa*, and some non-descript species of that genus. The *poa* furnishes some of the best grasses we are acquainted with, viz.

<i>Poa</i>	<i>Poa</i>
<i>trivialis</i> .	<i>pratensis</i> .
<i>glauca</i> .	<i>nemoralis</i> .
<i>alpina</i> .	<i>humilis</i> .

The *P. alpina* and *P. humilis* form excellent pasture in alpine or barren districts.

As we descend from the high lands, the vegetables are, with few exceptions, the same as in the neighbouring counties: some, however, are rather of rare occurrence. In several of the woods are to be found the *Ophrys cordata* and *ovata*, *Tridentalis europæa*, *Hieracium molle*, *preanthoides*, *sabaudum*, and *paludosum*; and in the fir woods near Forfar grow the *Hieracium paniculatum*, var. *maculatum*, not yet found in any other part of Britain; together with the beautiful *Trollius europæus*, *Pyrola minor* and *rotundifolia*; and also *Juncus Forsteri*, *Melica uniflora*, *Carex pallascens*, *remota*, *sylvatica*, *lævigata* and *pendula*, *Triticum caninum*, and *Festuca gigantea*. *Milium effusum* likewise occurs: this grass, although never noticed by agricultural writers, promises to be useful, producing abundance of foliage, which is grateful to cattle. By the side of the Isla grow the beautiful *Orobanchis sylvaticus*; and *Ribes petreum*, which may prove equal, if not superior to the *R. rubrum*: also *Ribes Grossularia*; *Vicia sylvatica*, one of the most beautiful of all the British plants; *Lonicera periclymenum*, var. *quercifolium*, and *Viburnum Opulus*, and *Paris quadrifolia*. Likewise the uncommon *Allium carinatum*; this is also found among the rocks; it is of rare occurrence in other parts of Britain. Besides these occur the *Allium ursinum*, *Adoxa Moschatellina*, *Melanopyrum sylvaticum* and *pratense*, *Chrysosplenium alternifolium*,
Lysimachia

Lydimachia nemorum, *Campanula latifolia*, *Satyrium repens*, and *Equisetum hyemale*. This last is the plant brought from Holland for polishing wood, and sold to cabinet-makers under the name of *rushen*. There are, further, some rare cryptogamous plants, among which are the following: In the fir woods near Forfar, is the *Dicranum undulatum* and *Hypnum crista-castrensis*, not found any where else in Britain. And in the order Fungi, is *Hydnum auriscalpium*, *repandum*, *sublamellosum* and *imbricatum*, *Helvella caryophyllaea*, *Agaricus cinnamomeus*, *elephantinus*, and *deliciosus*; together with the very poisonous one called by Linnæus *A. muscarius*, and its var. *verrucosus*, with many others. As cattle sometimes eat these, it is possible that they may bring on disease. The singular fungus called *Phallus impudicus*, occasionally appears. *Helvella spathulata* and *Clavaria militaris* are to be found in General Hunter's woods at Burnside, besides a great many others. I may also add the *Boletus perennis*, *versicolor*, *abietinus*, *suberosus*, and *igniarius*: the latter is called *touch-wood*, being used for tinder. Also the *Riccia fruticulosa*, with *Jungermannia scalaris*, *albicans*, *ovata trichomanes*, and *excisa*.

When the botanist traverses the marshes, and examines the lakes, he will find his trouble amply repaid. In the lakes of Forfar, Rescobie and Balgavies, he will meet with the *Typha latifolia*; this is also in a rivulet not far from Pitmues, by the side of the turnpike-road that leads from Forfar to Arbroath. In the lakes of Rescobie and Balgavies, are likewise to be found *Nymphæa lutea* and *alba*, and *Ceratophyllum demersum*; and on their margins *Lysimachia thysiflora*: the latter plant, though rare in other parts of Britain, is not uncommon in Angushire. *Potamogeton perfoliatum*, *lucens*, *crispum*, *pectinatum*, *compressum*, *gramineum*, *pusillum*, likewise occur in these lakes. *Cicuta virosa*, which is one of the most virulent of all the vegetable poisons, grows on their margins. Cattle, when allowed to browse by the sides of the lakes in the winter months, are sometimes deceived, by its smell being very weak at that season; and when once they have eaten it, it generally proves fatal in two or three hours. The late Mr Dickson of Cloak's-bridge lost three cows in one afternoon by this plant. When the summer is a little advanced, the odour of the plant warns the cattle, and then they carefully avoid it. The *Scirpus lacustris*, the well known rush, so much used for making rush-bottomed chairs, is common; and in the lake called Loch Feithie, is to be found the *Isoetes lacustris*, generally supposed only to be found in alpine lakes. In the lake at Forfar is the *Stratiotes aloides*, which I brought from a great distance, and introduced there about the year 1792: it is now (1811) in great abundance. *Lemma trisulca* is frequent. *Hippuris vulgaris* is also very common; the latter being somewhat interesting to the botanist, as it belongs to the Monandria, or first class of the Linnæan system, there being only four other plants indi-

genous to Britain that belong to that class. At the east end of the Lake of Forfar, in small pools, is to be found the *Utricularia vulgaris* and *minor*, both beautiful plants, and rather of rare occurrence: likewise *Sparganium natans* and *simplex*, *Veronica anagallis*, *Chara hispida* and var. β , and *Ranunculus Lingua*.

In the lake called the Loch of Lintrathen, the beautiful *Lobelia Dortmanna* is in abundance; and the rare *Potamogeton lanceolatum*, only of late known to be indigenous to Britain.

In the marshes are to be found the *Scirpus pauciflorus*, *acicularis*, *syvaticus*, and *fluitans*; with the beautiful *Parnassia palustris*, so much taken notice of by botanists, on account of its singular nectary, which is figured in every elementary book. The following also occur:

<i>Poa</i>	<i>Galium</i>
<i>aquatica</i> ; but not common.	<i>uliginosum</i> .
<i>Carex</i>	<i>Littorella</i>
<i>stricta</i> .	<i>lacustris</i> .
<i>paludosa</i> .	<i>Centunculus</i>
<i>Micheliana</i>	<i>minimus</i> occurs, but is rare.
<i>Oederi</i> .	<i>Radiola</i>
<i>limosa</i> .	<i>millegrana</i> .
<i>paniculata</i> .	<i>Viola</i>
<i>teretiuscula</i> .	<i>palustris</i> .
<i>intermedia</i> .	<i>Drosera</i>
<i>curta</i> .	<i>rotundifolia</i> .
<i>Scutellaria</i>	<i>Alisma</i>
<i>galericulata</i> .	<i>ranunculoides</i> .
<i>Eriophorum</i>	<i>Peplis</i>
<i>vaginatum</i> .	<i>portula</i> .
<i>Pilularia</i>	<i>Vaccinium</i>
<i>globulifera</i> .	<i>oxycoccus</i> , or cranberry, the
<i>Hydrocotyle</i>	fruit of which is brought in
<i>vulgare</i> .	quantity from the north of
<i>inundata</i> .	Europe, and used for mak-
<i>Galium</i>	ing tarts.
<i>Witheringii</i> .	

In the Moss of Restennet formerly grew the *Schoenus mariscus*, the only place I have seen it in Angushire; but it is now entirely lost there. The *Chara hispida* grows in pools in the same moss; and there I discovered, in 1791, that truly rare and beautiful grass, the *Eriophorum alpinum*, the first and only time it has been found in Great Britain. I am sorry, therefore, to say, it has been extinct there for these several years past, and that at present

sent we know of no British habitat for it: it is found on the mountainous heaths of Germany, Denmark, Sweden and Norway.

In the marsh called the White Mire, near Forfar, I discovered in 1807 the *Arundo stricta* of Schrader's F. Germ., and the *Arundo neglecta* of Ehrhart, being the only place where it has been found in Britain: but I am sorry to say it will be soon entirely lost, by the draining of the marsh. This reed produces a great quantity of foliage, and might prove a grass of considerable utility to the farmer in marshy grounds; it is much more promising in its appearance than the rest of the reed family. There is also the *Eriophorum polystachion*, the only place I have seen it in Angusshire; and the *Carex filiformis* and *Galium Witheringii*. In the ditches are the *Potamogeton fluitans* and *heterophyllum*, both only of late years known to be natives of Britain; and in the marshes grows also the *Saxifraga aizoides*.

Some rare mosses also occur, among which are the following:

Polytrichum	Dicranum
aloides.	flexuosum, var. fragile.
gracile.	osmundioides.
attenuatum.	Hypnum
nanum.	stellatum.
Bryum	revolvens.
dealbatum.	cuspidatum.
ventricosum.	cordifolium.
turbinatum.	dendroides. This is every year
sericeum.	to be found with fruit near
hornum.	Forfar, though the fruit is
bimum.	accounted rare.
compactum.	scorpioides.
Dicranum	molluscum.
heteromallum.	commutatum.
strictum.	rugosum.
glaucum.	Splachnum
pellucidum.	ampullaceum.
adiantoides.	ovatum.
	fastigiatum.

In a marsh, near Colonel Kinloch's of Logic, I discovered in 1810 the *Iris xiphioides*, new to Britain: it was growing among *Carices* and *Juncus effusus* and *articulatus*, in a situation where it had never been cultivated.

In the Moss of Cassens is the *Polytrichum strictum* of the Banksian Herbarium, the same as Sir Joseph Banks had from Iceland: it is not the species described by British authors, which is probably no more than a variety of *P. commune* or *juniperinum*, as Dr Smith informs me, who is in the possession of the Linnean Herbarium, and has access to the Banksian also.

The following is a list of the more remarkable plants to be found in the low parts of Angusshire.

Ligustrum	vulgare; near Tannadice.	Lolium	temulentum.
Circæa	alpina; and var. β intermedia. lutetiana; near Finhaven.		arvense.
Veronica	officinalis, var. β of Linnæus; perhaps the allionii of Smith. montana; on the banks of the Esk.	Galium	erectum. mollugo. boreale. verrucosum of Smith's Prodro- mus Floræ Græcæ; new to Britain. spurium; near Forfar: it has been found in no other place in Scotland.
Salvia	verbenaca; near Dundee.		I have also found another spe- cies of Galium near Kin- naird, which seems a non- descript, coming near the Galium Austriacum of Jac- quin's Flora Austriaca.
Valeriana	locusta.	Cuscuta	Europæa; generally on flax, and seems a very destructive weed; it mats it altogether like a parcel of matted hair.
Aira	scabro-setacea of Knapp's Gramina Britannica.	Sagina	apetala; but rare in Angus- shire, though common in some other parts of Scot- land.
Poa	alpina; by the side of the rivers Esk and Isla. glauca. compressa.	Lithospermum	officinale. arvense, seems to be brought along with the seed of wheat, as it is become very common of late years, since the cul- ture of wheat became more general.
Briza	media, var. with a white pa- nicle.	Anchusa	sempervirens.
Festuca	myurus.		
Bromus	multiflorus. secalinus. pratensis. arvensis; but rare. tectorium.		
Avena	strigosa. flavescens. pubescens. pratensis.		

- Cynoglossum**
 officinale; but chiefly near to the sea.
 sylvaticum; west from Dundee, rare.
- Symphytum**
 officinale; and var. fl. rubro-tuberosum.
- Primula**
 elatior; near Glamis.
- Anagallis**
 arvensis.
- Convolvulus**
 arvensis; common near Dundee.
 sepium.
- Campanula**
 glomerata.
- Viola**
 hirta.
 odorata.
 lutea.
- Verbascum**
 Thapsus; and var. flore albo; the latter near Airly Castle.
- Atropa**
 belladonna; this is to be found in the Den of Bonnetown, near Montrose: it is one of our strongest vegetable poisons. Its beautiful shining black berries, about the size of a small cherry, and not disagreeable to the taste, often allure children and unwary people to eat them, and they sometimes prove fatal. Dr Smith assures us, that when it has been for any length of time in the stomach, it is impossible to save the unhappy patient from falling a victim, as no antidote is yet known: he adds, that all acids and alkalies, milk and oils, are alike ineffectual, as it makes its principal attack on the nervous system.
- Solanum**
 Dulcamara.
- Chironia**
 centaurium; to the west of Dundee.
- Chenopodium**
 murale; rare.
 Bonus-Henricus.
 polyspermum; rare.
- Ulmus**
 montana.
 campestris.
- Gentiana**
 anarella.
 campestris.
- Daucus**
 Carota.
- Oenanthe**
 fistulosa; to the west of Dundee.
- Scandix**
 odorata; but always near houses.
 pecten Veneris.
 anthriscus; but rare.
- Cherophyllum**
 temulum; but rare.
 aureum. I discovered this plant some years ago by the side of corn fields between Arbroath and Montrose; it was till then unknown to be a native of Great Britain.
 aromaticum. I discovered this plant in summer 1810, by the side of the river called Lunan and Vennis, not far from Guthrie, in a truly wild state; new to Britain.

Carum

Carul. The most common umbelliferous plant near Arbroath: there is no doubt of the plant being indigenous there.

Pimpinella

saxifraga; and also
var. β dissecta.

Viburnum

Opulus.

Sambucus

Ebulus.

Allium

arenarium.
vineale; near Dundee, hard by the sea side.

Tulipa

sylvestris; not far from Brechin.

Convallaria

majalis; near Inchewen, parish of Tannadice.

Juncus

glaucus.

Rumex

sanguineus.
palustris.
acutus.

Trientalis

europæa.

Epilobium

angustifolium.
hirsutum; but rare.

Vaccinium

Vitis-Idæa.

Polygonum

Bistorta.
viviparum.
minus.

Adoxa

Moschatellina.

Dianthus

Armeria; on fields near the seat of Charles Gray, Esq; of Carse, the only place I have seen it in Scotland: I believe, indeed, it has been found nowhere else.

Dianthus

deltoides. This beautiful plant grows on the north bank of the Lake of Forfar, as also on dry ground near the north-west corner of the Lake; and on banks by the sea, to the east of Arbroath.

Silene

anglica; but rare.
noctiflora; in sandy corn fields near the Havens or Hains, by the sea side, the only known habitat in Scotland, where it can be reckoned truly indigenous.

Stellaria

nemorum.

Sedum

Telephium.
villosum.
album; and
reflexum; both on roofs of houses in Forfar.
anglicum; on rocks near Dundee.

Lychnis

Flos-Cuculi, flore albo.
Viscaria, and var. flore albo: on dry banks near Airy Castle.

Cerastium

tetrandrum; on roofs of houses in Forfar; common on the sea coast.

Cerastium

- Cerastium**
arvense.
aquaticum; near Dundee, but rare.
- Spargula**
maxima; *nova species*.
subulata.
- Sempervivum**
tectorum; on house-tops.
- Prunus**
Padus.
domestica; hedges.
insititia.
- Pyrus**
communis.
Malus; both in hedges near Glamis.
- Spiraea**
salicifolia.
- Rosa**
tomentosa.
scabriuscula.
collina.
cæsia.
- Rubus**
saxatilis.
corylifolius.
 And a new species. It grows near the waterfall called the Recky Linn, on the water of Isla.
- Potentilla**
argentea. I observed this plant on rocks not far from the Loups of Kenny, near Airly Castle, but very rare; but common on rocks on Seedlay Hills.
reptans; near Arbroath, rare.
verna; on rocks near Dundee.
- Geum**
rivale, var. β of Flora Brit. the *Geum intermedium* of Wi-
- thering; certainly a distinct species.
- Comarum**
palustre var. β .
- Aquilegia**
vulgaris.
- Thalictrum**
minus; in sandy stony places in the high lands, and by the sea side.
- Ranunculus**
auricomus.
bulbosus, flore pleno. I found this on the south bank of the Lake of Forfar.
acris, flore pleno; in meadows; this variety rare.
- Caltha**
radicans. I found this about the year 1790, in a ditch that runs from the farmhouse called Haltoun, on the estate of Charles Gray, Esq; of Carse. Considering it as a var. of *C. palustre*, I sent it afterwards to London, where it was ascertained to be a distinct species.
- Teucrium**
Chamædrys; but always near houses.
- Lamium**
nova species, which I propose to call *intermedium*: it is perfectly distinct from all the known species: in cultivated fields.
- Galeopsis**
versicolor.
- Origanum**
vulgare, and likewise var. *flore albo*.

Thymus

Thymus

Acinos; near the village called Welltown, about one mile south of Forfar.

Scrophularia

vernalis; near Lower.

Myagrum

sativum; by some botanists called *Alyssum sativum*.

orientale; in corn fields, and along with the other among flax. These two plants belong to the genus *Alyssum*, on account of their inflated and many-seeded silicles. New to Britain.

paniculatum; near the village of Crichtie: I discovered it there several years ago; it has never been met with any where else in Britain. This is a true *myagrum*, and not an *alyssum*.

Thlaspi

arvense; in corn fields, but rare, as near Brechin and Arbroath.

campestre.

hirtum, var. with smooth silicles, according to Dr Smith. See *Flora Britannica*. There is little doubt, however, of this being a distinct species, and not a mere variety; it is very distinct in its appearance and in its silicles, which are of a different form. I have cultivated both varieties for several years past, and am convinced they are permanently distinct. Grows

opposite to a mill on the south side of the river Esk, near Kinnaird.

Iberis

nudicaulis. This beautiful little plant grows on the estate of Pittruchie, about one mile south of Forfar; it is of rare occurrence in Scotland.

Cardamine

amara; in dens by the sides of rivulets.

Sisymbrium

terrestre.

Sophia; near the confines of Angusshire, on the Perth road.

Cheiranthus

fruticulosus adorns the ruins of several antient buildings; such as the Abbey of Arbroath, and one near the Baikie; also on rocks by the sea shore.

Hesperis

inodora; on banks near Airy Castle.

Turritis

glabra; near Kinnaird.

hirsuta; on rocks and dry banks.

- * *nov. sp.*; near Lochlee, in Glen Esk, growing on rocks. I observed it in 1801. Having shewn specimens to Mr J. T. Mackay of Dublin, when he paid me a visit at Forfar in 1811, he recognised it as the same which he had found in Ireland, and which Dr Smith has considered as *T. alpina*, Lin.

Brassica

- Brassica**
campestris; corn fields near Forfar.
- Geranium**
sylvaticum, var. *flore albo-pusillum*.
sanguineum.
- Fumaria**
capreolata.
claviculata.
- Genista**
anglica.
- Ulex**
nanus.
- Orobus**
tenuifolius of Roth; near Kinnaird.
- Ornithopus**
perpusillus; near Newtyle, but rare.
- Astragalus**
glycyphylus.
hypoglottia.
- Trifolium**
scabrum.
striatum.
medium. This last species produces a number of leaves, and as it thrives well on cold tilly pastures, unfavourable to most other vegetables, it deserves a trial, as its appearance is very flattering, and cattle and horses are fond of it.
- Lotus**
corniculatus.
major.
lathyroides; near Forfar, but rare in other places. All these three thrive well on poor soils, and in cold till,
- and if they were properly attended to, they would make a valuable addition to our pasture grasses. I named this latter species some years ago.
- Medicago**
sativa; near Dundee.
- Leontodon**
palustre.
- Hyoseris**
minima. There is a remarkable circumstance occurring with regard to this plant: when any muir ground is broken up, although there is no symptom of its having been ever ploughed, this plant never fails to make its appearance the first year; but after the field has been cultivated for some time, it begins to disappear.
- Crepis**
pulchra; among the debris of the rocks of the hills of Turin and Pitsandly, but very rare.
- Hypochaeris**
glabra.
- Carduus**
heterophyllus.
marianus.
tenuiflorus.
- Tanacetum**
vulgare.
- Senecio**
saracenicus; but always near houses.
- Doronicum**
Pardalianches; near Kinnaird.
- Pyrethrum**

Pyrethrum	Salix
Parthenium.	pentandra.
Anthemis	† nigricans.
Cotula.	bicolor.
tinctoria.	petioloris. This forms a fine
arvensis.	tree, and one of our best
Centaurea	hoop willows.
Scabiosa, and	vitellina. A good basket wil-
var. flore albo.	low.
nigra, var. flore albo.	fragilis. The bark is sometimes
jacea; found by Mr Young	used for tanning.
near New-Tyle.	malifolia.
Orchis	argentea.
conopsea.	fusca.
mascula, var. flore albo.	† cinerea.
bifolia.	aurita.
latifolia, var. flore incarnato.	† aquatica.
Satyrion	† oleifolia.
albidum.	hirta.
viride.	† caprea.
Ophrys	† stipularis.
ovata.	† alba.
cordata.	viminalis. This is the one most
Malaxis	used for hoops in this coun-
paludosa.	try.
Littorella	mollissima.
lacustris.	Those marked thus †, form
Salix	good trees.
purpurea.	Myrica
helix.	gale.
Lambertiana.	Populus
rubra.	nigra.
triandra.	tremula.
lanceolata.—All these are good	Osmunda
basket willows.	lunaria.
† Russelliana, or Bedford willow.	Anethum
The bark of this species is	feniculum; on rocks on the
the best adapted for tanning	foreside of Seedlay Hills, the
of any of the willows.	only habitat I know for it is
	Scotland.

Among

Among the pastures in wet soils, and by the sides of rivers, a considerable number of the different species of Equisetum, or horse-tail, are to be met with, particularly,

Equisetum

arvense.

palustre.

sylvaticum.—These plants are known to be hurt-

ful to cattle that browse upon them, probably from the rough angle of their stems acting upon the intestines and injuring them. May not this help to account for some of the diseases which prove fatal to cattle, hitherto not satisfactorily explained?

The genus *Agrostis*, or Bent-grass, is abundant. A Dr Richardson of Ireland, has written strongly in favour of this family of grasses; but from his publications, which I have of late fallen in with, it pretty evidently appears, that this writer knows not one family of grasses from another, far less is able to distinguish the different species of each family; for his *florin grass*, as is evident from his own words, palpably includes every species and variety of British *agrostis*, with couchy roots, or trailing shoots; for he says that it grows in every bog or marsh, and in every soil and situation, from marishes to the tops of hills, and on heaths. How any one could suppose the florin grass to be exclusively the *Agrostis stolonifera*, I am at a loss to understand; for I had three specimens sent me from gentlemen, who had their plants from Dr Richardson himself: one of them proved to be the *Agrostis stolonifera*, another the *Agrostis vulgaris*, and a third the *Agrostis canina*. Still more lately, I have received a dried specimen of the Fiorin grass, procured from Dr Richardson's own hands, and sent me from Ireland; and this proves to be another species, viz. *Agrostis alba*. This was nothing else than I would have expected, after reading the Doctor's books. I may here observe, that I have never seen the *Agrostis stolonifera* on dry elevated pastures. Now, what is this celebrated *florin grass* of Dr Richardson? It seems to be a mixture of all the tribe of couchy grasses, held equally in detestation by the farmers and their cattle; and we in Angleshire are apt to judge of the industry of the farmer, in proportion as he has eradicated these grasses, the abundance of which tends so much to depreciate the value of the ground he possesses. In the west of England, the *Agrostis stolonifera* is held in equal detestation by the farmers, and stigmatized by the name of *Black squitch*.

The *agrostides* are the worst to eradicate of any grasses I am acquainted with. Indeed, when they get possession of wettish clay soils, it is the next thing to impossible to get clear of them.

I am bold to say, that if these grasses, so strongly recommended by Dr Richardson, come really to be introduced among farmers, it will prove the
neither

greatest barrier in the way of improvement to agriculture that has ever yet taken place. But when a man like Dr Richardson, who is plainly neither a botanist nor an agriculturist, comes forward with confidence, recommends to intelligent Scots farmers to lay down their arable fields with a grass which it has been their constant study through life to eradicate, the absurdity is so great, that there is reason to hope that little harm will ensue. The agrostides are grasses that totally destroy rye-grass about the third year after sowing: the fields then become overrun with these grasses, and nothing but necessity ever compels the cattle to eat them. Dr Richardson adds, that he supposes that the fiorin grass possesses an antiseptic quality, which prevents it from running into putrefaction so soon as other grasses. But I can assure that gentleman, that the agrostides on this side of the Irish Channel possess no such quality; they being here as ready to run into putrefaction as any grass whatever. He likewise adds, that Irish cattle give fiorin the preference to all other grasses: Our cattle, on the contrary, give every other grass the preference to the agrostides.

In digging in dry banks, about two or two and a half feet below the surface, if the soil is good, will be found the *Lycoperdon tuberosum*, the truffle, or solid puff-ball, so much esteemed by people of rank in England. In trenching up my garden lately, I found several of them. In England, dogs are trained for the purpose of finding them.

Plants to be found on the Sea Shore.

If the botanist, in taking his tour, begins at the North Water Bridge, the first thing that will arrest his attention is the beautiful grass called *Elymus arenarius*, and along with it he will find the *Festuca rubra*, one of our best grasses; also *Triticum junceum*, *Carex arenaria*, and the *Arundo arenaria*, commonly called Sea-bent: this grass, although much neglected, is not destitute of utility; it is the grass which of all others possesses in an eminent degree the advantage of being furnished with strong running roots, and of growing in loose dry sand, and, by means of these roots, arresting the blowing sands so destructive in some parts of the kingdom. In some counties in England, accordingly, which have a considerable quantity of sandy sea coast, the pulling or destroying of this grass is prohibited. The botanist will also find, though sparingly, the *Phalaris arenaria*. There is also what I take to be a non-descript species of *Aira*, or else the *Aira cristata* of Linnaeus. The sandy beach is here adorned with the delicate flowers of the *Bunais cakile*, the *Cakile maritima* of Willdenow's *Species Plantarum*.

As the collector comes nearer to Montrose, he meets with the *Thalictrum minus*; and also the *Eryngium maritimum*, whose singular foliage seldom

falls to attract the notice of every man of curiosity. In cultivated fields near Montrose, he will find the *Carduus tenuiflorus* and *Lamium incisum*, rather of rare occurrence in Angusshire. By the road side, in coming from the North Water Bridge, he will find the *Carex divisa*, one of the rarest carices. Near what are called the Back Sands, he will at ebb-tide find plants of the *Zostera marina*; and on those sands, and in salt-marshes among them, *Chenopodium maritimum*, *Triglochin maritimum*, *Scirpus maritimus*, and a variety of *Scirpus lacustris*, *Carex distans* and *vulpina*, *Salicornia herbacea*, and two varieties, which may possibly prove distinct species; also *Arenaria marina* and *peploides*, *Poa maritima* and *Poa distans*, and *Juncus bulbosus*. I have there observed likewise the *Aster tripolium*, which had a magnificent appearance, the flower-stems being eighteen inches high, and strongly resembling some of the beautiful species of that genus from North America.

As the botanical inquirer proceeds along the coast towards Arbroath, he will find the rare moss called *Grimmia maritima*, and among the rocks, he will observe the *Artemisia Gallica* and *maritima*, *Silene nutans*, *Vicia lutea*, and *Reseda lutea*; and in marshes *Schoenus rufus*; and in dens near the shore, is the rare *Allium ampeloprasum*, the only place where it is known to grow in Scotland. Near the promontory called the Red Head, on rocks, is the *Lathyrus sylvestris*, which is a rare plant; *Carlina vulgaris*; *Asplenium marinum*, and *Scelopendrum vulgare*. Near to the town called Achmithie, is the *Asperugo procumbens*, which grows also at the village called Westhaven. Near the village called Torens-haven, is that truly beautiful plant, the *Pulmonaria maritima*, whose elegant glaucous leaves, and bright blue and purple flowers, form a fine contrast among the stones of the beach. Here also grows *Mentha hirsuta* of Linnaeus, and the *Gymnostomum obtusum*, which is a rare moss in Scotland. On the beach in several places occurs the *Salsola kali*, one of the plants employed to produce barilla. The elegant *Glaux maritima* is common in many places.

To the eastward of Arbroath, plenty of the *Allium carinatum*, and *Eryngium maritimum* are found; and the *Parietaria officinalis* is in plenty about the rocks and old buildings. The *Eupatorium cannabinum* is not uncommon. Near to Wormiehills, *Poa procumbens* appears, and also a non-descript species of *Festuca*. On the tops of houses at Wormiehills I observed plenty of the *Saxifraga tridactylites*. The *Carum carui*, known by the name of Caraway, is common, but is generally considered as a doubtful native: the botanist will, however, be fully satisfied of its being truly indigenous to this coast; it is indeed by far the most common umbelliferous plant in the neighbourhood of Arbroath; its seeds are often put into loaf-bread and also among the oatmeal baked into cakes by the peasants; they are also sometimes used for giving a flavour to cheeses. The *Scabiosa columbaria* is plentiful; and the beautiful *Convolvulus soldanella*, whose large rose-colour-

ed flowers makes a fine appearance among the arid sand, will not fail to attract the botanist's notice : this is the only place I have observed these two plants in Scotland. That elegant plant, the *Gentiana amarella*, is common; and *Erigeron acer*, *Phalaris arenaria*, *Pyrethrum maritimum*, *Cheespodium maritimum*, are not unfrequent. The beach is covered everywhere with the *Atriplex laciniata*; and around Arbroath as well as Dundee, grows plenty of the *Hordeum murinum*.

In proceeding a little further to the westward, the tourist arrives at the Sands of Barrie, which offer an ample field for botanical pursuits. There he will find most of the coast-plants already taken notice of. The *Phalaris arenaria*, and *Erigeron acer*, are there in the greatest abundance. Some years ago I observed there the *Equisetum variegatum*, new to Britain; and about the same time, I discovered a rare moss, which I take to be the *Meesia longeseta* of Hedwig, hitherto unnoticed in Britain: this moss is easily distinguished, from the great length of its pedicles. I have likewise observed on the downs the *Grimmia nigrita* and *Grimmia inclinata*, both rare mosses. *Carex incurva*, and *Ophioglossum vulgatum*, occur here; and this is the only place where I have observed them in Angushire. A very singular variety of the *Gentiana campestre*, without any flower-stem, is found here. *Sagina maritima* may also be added to the list of Barry rarities; it is a rare species, which I first observed in the Isle of Skye, and on the summit of Bennevis, in 1794.

As the botanist approaches to Broughty Castle, he will observe the *Sedum villosum* and *Sedum anglicum*, the former by no means common in Angushire; and the *Trifolium ornithopodioides*, a rare plant in Scotland; and between Broughty Castle and Dundee, on the rocks, he will notice the *Spiraea filipendula*, and *Potentilla verna*, being the only place I have observed them in Angushire; together with the *Carduus Marianus*, and a variety with green leaves: *Grimmia maritima*, and *Asplenium ruta muraria*, occur on the same rocks. By the sea side, in marshes, he will find, though sparingly, *Oenanthe crocata*, or hemlock dropwort: this is a strong vegetable poison; several instances are on record of its fatal effects; its roots consist of small round tubers, in bundles, like skirrets, and children and the unwary sometimes take them for the roots of the *Bunium flexuosum*, the earth nuts or earth chestnuts, in Scotland called by the name of *Arnots*.

In the fields by the shore, in several places, is found the *Centaurea intybacea* of Willdenow's *Species Plantarum*. I first distinguished this beautiful and rare plant some years ago: it is new to Britain, and must have been confounded with the *Centaurea scabiosa*, which it very much resembles, and often grows intermixed with. On walls about Dundee is found a variety of *Poa compressa*. On the walls of the old Tower of Dundee, is plenty of the *Asplenium ruta-muraria*, the only place where this little plant is to be found in plenty in Angushire.

Along the side of the Tay, to the westward of Dundee, may be seen the *Sagina maritima*, *Allium vineale*, *Triglochin maritimum*, *Aster tripolium*, *Poa maritima*, and a new species, which I propose to call *Poa depauperata*, from its starved-like appearance. There likewise grows on the banks of the Tay an uncommon species of *Aira*, which may perhaps prove to be a non-descript. In the woods, *Paris quadrifolia* occurs; and on rocks we find *Asplenium septentrionale*. *Saxifraga nivalis* grows on the higher hills, and should have been formerly mentioned.

The larger plants contained in this List are to be seen in a growing state in my Botanic Garden at Forfar, where I have now the most extensive collection of hardy plants in Scotland.

Sea Productions.

The first to be noticed is the genus *Fucus*, not only on account of the great number of species, but because they are the most conspicuous marine plants, and those generally understood by the term Sea-weeds. The following is a list of such as I have observed in the course of my botanical excursions along the shore :

<i>Fucus</i>	<i>Fucus</i>
<i>sinuosus.</i>	<i>rubens.</i>
<i>sanguineus.</i>	<i>crispus.</i>
<i>ruscifolius.</i>	<i>mamillosus.</i>
<i>membranifolius.</i>	<i>canaliculatus.</i>
<i>ovalis.</i>	<i>loreus.</i>
<i>stiliquosus.</i>	<i>nodosus.</i>
<i>ligulatus.</i>	<i>pygmaeus.</i>
<i>esculentus</i> ; <i>hen-ware</i> of Angusshire.	<i>aculeatus.</i>
<i>serratus.</i>	<i>coccineus.</i>
<i>vesiculosus</i> ; and var.	<i>plumosus.</i>
<i>spiralis.</i>	<i>rotundus.</i>
<i>cerinoidea.</i>	<i>lunbricalis.</i>
<i>alatus.</i>	<i>plicatus.</i>
<i>dentatus.</i>	<i>confervoides.</i>
<i>laceratus.</i>	<i>flagelliformis.</i>
<i>laciniatus.</i>	<i>filum.</i>
<i>ciliatus.</i>	<i>lycopodioides.</i>
<i>bifidus.</i>	<i>subfuscus.</i>
<i>palmatus</i> ; the <i>dulse</i> of this country.	<i>purpurascens.</i>
<i>edulla.</i>	<i>califormis.</i>
<i>phyllitis.</i>	<i>articulatus.</i>
<i>saccharinus.</i>	<i>opuntia.</i>
<i>digitatus.</i>	<i>amphibius.</i>
<i>bulbosus.</i>	<i>hypoglossum.</i>
	<i>pinnatifidus.</i>

The following species of *Ulva* occur :

<i>Ulva</i>	<i>Ulva</i>
purpurascens.	laciniata.
latissima.	linza.
lactuca.	umbilicalis.
compressa.	fistulosa.
lanceolata.	intestinalis.

Of the genus *Conferva*, many species are found, a few of which may be named :

<i>Conferva</i>	<i>Conferva</i>
polymorpha.	verticillata.
pilosa.	capillaris.
rubra.	funicula.
comoides.	elongata.
rupestris.	nodulosa.
glomerata.	diaphana.
confervicula.	fucoides.
littoralis.	coccinea.
æruginosa.	villosa.
scoparia.	repens.
purpurea.	atro-rubescens.

The following species are also to be met with in fresh water, and on damp walls or on the ground :

<i>Conferva</i>	<i>Conferva</i>
velutina.	amphibia.
atro-virens.	ocracea.
fracta.	sordida.
gelatinosa.	lucens.
atra.	decorticans.
fluviatilis.	limosa.
purpurea.	fontinalis.
aurea.	nitida.
rubiginosa.	rivularis.
frigida.	muralis.
flexuosa.	

This latter species grows on damp walls in crowded cities, and sends forth a fragrant smell. Dr Smith thinks it may have a tendency to correct the bad air in such places ; it colours the wall of a green colour, but its filaments are so fine as hardly to be seen with the naked eye.

The marine plants, although many of them are extremely beautiful, are neglected or overlooked by the greater part of mankind ; yet they most certainly are highly useful in the economy of Nature, although we may be ignorant

ignorant of their uses. We evidently see that they give shelter to many of the smaller tribes of marine animals, and a number of others are spawned upon them, and receive from them their nourishment during the first stages of life. Others, again, seem to depend almost entirely upon them for nourishment, as they are attached to them through life: Such, for instance, is the *Lepas striata*, some of the genus *Serpula*, and some of the Zoophyta, as the *Flustra*, *Sertularia*, &c. The beautiful *Patella pellucida* I have often observed on the larger species of fuci; the animal that inhabits that shell seems to derive a great part of its nourishment from that tribe of vegetables. The following are esculent, viz. the *Fucus palmatus*, known by the name of *dulse* or *dilse*: The *crispus* and *mamillosus* are eaten among it: the *F. pinatifidus*, known by the name of *pepper-dulse*: the *F. esculentus*, which is known by the name of *ken-ware* on the Angushshire coast: *F. edulis*, which is eaten promiscuously along with *F. palmatus*; and the stems of the *F. digitatus* and *F. saccharinus*, which are sold under the name of *tang* or *tangle*. Many of the fuci are eaten by cattle; and the whole of them are known to make excellent manure.

In some parts of Scotland, where they are extremely abundant on the shores, they are manufactured into kelp. The *F. vesiculosus*, *nodosus*, and *serratus* are principally used for that purpose; and on that account, Dr Garnet, in his Tour through the Highlands, informs us, that in the Isle of Mull, some small farms which a very few years ago were let for L. 40, are now let for L. 300 *per annum*.

The *F. vesiculosus* is strongly recommended by Dr Russell in diseases of the glands. He says it is extremely serviceable in dispersing all scorbutic and serofulous swellings. He recommends rubbing these with the vesicles, bruised in the hand till the mucus has thoroughly penetrated the parts, and afterwards washing the parts with sea water. He also says that scirrhoties in the mammae have sometimes been dispelled by this treatment.

The many *Confervæ* growing in stagnated ponds and ditches, give out a great deal of oxygenous air from their extremities, and hence tend to prevent putrescency in the waters during the summer months; and it is probable that the numerous Fuci, *Confervæ* and *Ulvæ*, are placed by the hand of Providence in the deep, in order to assist in preventing that vast collection of water from becoming putrid.

I shall conclude my observations on these tribes of vegetables, with the words of the celebrated Mr Turner of Yarmouth, who has written a *Synopsis* of the British Fuci, and is publishing a more extensive work, with highly finished figures of all of them. "I can assure the philosophic naturalist, (he says), that while the more stupenduous works of the Divine Hand arrest the attention of even the most careless observer, and in a language equally understood by all ages and all nations, declare the glory of God;

these humble vegetables will, by the inquisitive mind, be found by no means wanting in affording additional proofs, both of the wisdom and beneficence of the Great Creator."

Having thus taken notice of the vegetables which are to be found in Angusshire, and such as are natives of the sea which washes it, or are thrown occasionally on the shore, (at least such of them as have fallen under my observation), I shall next take notice of the *Zoophyta*, which are the connecting link between the vegetable and animal kingdom. The chief of these are:

Sertularia

thuja.
 halecina.
 loricata.
 pumila.
 operculata.
 geniculata.
 lendigera.
 falcata.
 eburnea.
 rosacea.
 tamarisca.
 abietina.
 eupressina.
 argentea.
 rugosa.
 pluma.
 antennina.
 volubilis.
 cuscuta.
 filicula.
 muricata.
 uva.
 myriophyllum. Of this I have only found one specimen on this coast.
 dichotoma.
 setacea.
 spinosa.
 polyzonias.
 fastigiata.
 syringa.
 avicularia.

Sertularia

scruposa.
 reptans.
 frutescens.

Pennatula

phosphorea.

Corallina

officinalis.
 elongata.
 ruberis.

Tubularia

ramosa.
 indivisa.
 muscoidea.
 fistulosa.

Cellepora

pumicosa.

Millepora

foliacea.
 polymorpha.

Alcyonium

digitatum; called *dead men's toes*.
 schlosseri.
 gelatinosum. This, by some authors, is made an *Ulva*.
 ascidioides.

Spongia

tomentosa.
 stuposa.
 oculata.
 palmata.
 lacustris. This is not unfrequent near Forfar. I have observed

Mustela

erminea. This animal is rare in Angusshire: I never saw but one, which was near the Mill of Brathens, about four miles north of Brechin; this was upwards of thirty years ago.

vulgaris; common weasel, or *Whitret*; not unfrequent.

Ursus

meles; the badger, or *Brock*, is rather rare in Angusshire.

Talpa

europæa; common mole. I have seen a beautiful variety of a pure white colour, and another variety of a dun colour: both varieties may be considered as of rare occurrence.

Erinaceus

europæus; hedgehog. This animal was formerly rare in Angusshire, but of late years it has appeared in tolerable plenty.

Of the Order *Glîres*, we have the following:

Mus

rattus; the black rat. This is the only species I have seen in the town of Forfar, and it is not rare in all the inland parts of Angusshire; but it has become very rare in most parts of Britain, and is still becoming scarcer, as the brown rat has nearly extirpated it in many parts of the island.

decumanus; brown rat, or Norway rat. Common in the sea-port towns in Angusshire; a very destructive animal.

musculus; common mouse. I have seen a variety of this of a pure white colour.

Mus

sylvaticus; field mouse.
amphibius; water rat; common.
agrestis; short-tailed field mouse. I have seen this species in my garden in Forfar: the female seem very much attached to her young, and will brave every danger in order to protect them.

Lepus

variabilis; alpine or white hare. Mountains of Clova: it is not near so timid as the common hare.

cuniculus; rabbit: it is rare in Angusshire; perhaps hardly a native.

Of the Order *Pecora*, we possess but three species belonging to one genus:

Cervus

elaphus; the stag: sometimes to be found on Clova mountains, but rare; and in the wood of the Forest Muir, near Forfar.

dama; fallow deer: it is rare in a wild state in Angusshire, but is in a tamed state at Kinpaird and Panmure.

Cervus

capreolus; the roebuck: sometimes to be found in the woods near Forfar. I have seen two or three of them in these woods some years ago: I have also seen them on the Seedlay Hills, and in the woods around Glamis.

Of

Of the Order *Cete*, we occasionally find the following :

Balaena		served a skeleton of this species to the east of Dundee two years ago.
mysticetus; common whale; sometimes on the coast.		
physalus; the fin-fish. I observed		
Delphinus	Delphinus	
phocæna; the porpoise.	delphis; the dolphin.	

As to the whales that were stranded up the Frith of Tay, I cannot positively say what species they belonged to, as I had no opportunity of seeing them. From the description given of them, they appear to have been of the kind first distinguished by Mr P. Neill, (in his Tour to Orkney), by the name of *Cæling whale*, and afterwards figured and described by Dr Traill of Liverpool, (in Nicolson's Journal), under the title of *Delphinus melas*.

BIRDS.

The Ornithology of Angusshire might furnish materials for a volume. I shall, however, very much compress my remarks on the subject.

Of the Order *Accipitres*, we find a considerable number :

Falco		ing an egg, the bird contained in it had two heads.
albicilla; the erne: on the mountains of Clova, and by the head of the West water: there is a rock near the head of it called the <i>Eras skellie</i> , where these birds generally breed.	Falco	apivorus; honey buzzard.
ossifragus; the sea eagle, is to be seen sometimes on the coast.	seruginosus; moor buzzard: on heaths. I have seen this species on the hills of Turin and Pitscandy.	
chrysaëtos; golden eagle: mountains about the head of Clova.	palumbarius; the goshawk. This bird is not very common in Angusshire.	
fulvus; ring-tailed eagle. I observed one of these on Wirron Hill, about twelve miles north from Brechin in 1797.	gentilis; gentle falcon: on our high mountains.	
milvus; the kite, or <i>Gled</i> .	peregrinus; peregrine falcon. I remember of seeing one of this species in the possession of the Laird of Balhamoon's grandfather, and of his servants hunting with it about the year 1771. It is recorded of one of this species that eloped from its master in the vicinity of Forfar, on the 24th of October 1779, with four heavy bells on its feet,	
ater; black eagle: on heaths and low hills.		
buteo; the buzzard. In a nest of one of these birds in the wood at Newmill, belonging to Colonel Kinloch, on break-		

feet, that it was killed on the morning of the 26th at Mostyn in Flintshire. This shews the great rapidity of its flight.

Falco

candicans; gyr-falcon. I observed one of this species on the estate of Mr Robertson Scott of Hedderwick in September 1810; but I rather think it is rare.

cyaneus; hen-harrier. I have seen this species several times in the neighbourhood of Forfar.

pygargus; the ring-tail: not unfrequent.

tinnunculus; the kestrel. This species is called often in An-

gushire, by the country people, *Willie whip the wind*.

Falco

nisus; the sparrow-hawk: not unfrequent.

subbuteo; the hobby: it is rather rare.

Strix

otus; horned owl.

brachyotus; short-eared owl: on the mountains of Angusshire.

flammea; white owl: common. *ulula*. I saw this species in the woods at Balmamoon, where they used to hatch every season.

Lanius

rufus; wood-chat.

Of the Order *Picæ*, there occur the following:

Corvus

corax; the raven: on the mountains.

corone; carrion crow.

frugilegus; the rook: common.

cornix; the hooded crow. These birds were much more common some years ago than they are now.

monedula; the jackdaw.

glandarius; the jay. Within these few years they have frequented the woods about Forfar, but formerly they were not to be seen: they are common about the woods of Glamis, Brigtown, and Kinnettles.

pica; the magpie.

graculus; the Cornish chough: on the mountains of Clova.

Cuculus

canorus; cuckoo.

Picus

viridis; green wood-pecker.

medius; middle spotted wood-pecker.

minor; lesser spotted wood-pecker.

Sitta

europæa; nut-hatch. One of this was brought me from the woods near Tannadice in 1807.

Alcedo

ispida; the common kingfisher. This beautiful bird is sometimes seen in the wood of Glamis and in the wood of Newmill.

Certhia

familiaris; creeper. I have seen this bird among the woods by the side of the water of Esk.

Of the *Anseres*, we can boast a considerable number :

Anas

cygnus; wild swan. A few pairs of these visit the lakes in the neighbourhood of Forfar; at least I have observed them in 1809 and 1810: they are often to be seen in the lake called the Loch of the Garth, between Forfar and Kirriemuir.

olor; tame swan: they are occasionally kept by gentlemen; two of them were long kept in a lake called Loch Feithie, by George Dempster, Esq. of Dunnichen.

ladorna; shieldrake: not unfrequent in the winter season near the river Esk.

fusca; velvet duck: sometimes to be seen on our coast.

anser; wild goose.

segetum; bean goose.

hernicla; the brent goose.

mollissima; eider duck, or *Dunfer*.

clypeata; shoveler.

streptera; the gadwall, or grey. I have seen this species in the lakes of Rescobie and Balgavies.

elangula; the golden-eyed duck.

penelope; the wigeon: in the lakes of Rescobie and Balgavies.

glacialis; long-tailed duck: on the coast.

ferina; the pochard: this is rare.

querquedula; the garganey, or summer teal; in the lake of Forfar.

erecca; teal duck: lake of Forfar.

Anas

boschas; wild duck.

fuligula; tufted duck: in the lakes.

Mergus

merganser; the goosander: on the coast.

serrator; red-breasted goosander: coast.

Alca

arctica; puffin: on the shore.

torda; razor-bill: on the coast.

Procellaria

pelagica; stormy petrel, called by the sailors *Mother Carey's chicken*.

Pelecanus

carbo; the corvorant, or scart: some of these birds occasionally visit the lake of Forfar, and sometimes sit for a whole day on the stakes driven into the lake for dragging marl.

graculus; the shag: on the coast.

bassanus; the gannet, or *Solon* goose. This is sometimes to be seen on the coast.

Colymbus

grylle; the spotted guillemot.

minor; lesser ditto.

trolle; the scout, or foolish guillemot.

arcticus; black-throated diver: on the coast.

stellatus; speckled diver.

minor; little grebe. One of these was taken in my garden at Forfar in winter 1807.

Larus

rissa; kittiwake.

tridactylus; the tarrock, or three toed gull.

hybernus; winter gull.

Larus

Larus

canus; common gull.
 erythropus; brown-headed gull.
 naevius; the wagel.
 marinus; black-backed gull.
 fuscus; the herring gull. This species is easily tamed: I once kept one of them for three years.
 ridibundus; black-headed gull. In Angusshire it is called *pictarny*.

Larus

parasiticus; the arctic gull.
 crepiditatus; black-toed gull.

Sterna

hirundo; the sea swallow. In Scotland, particularly in Angusshire, it is called *Willie Fisher*: common on the water of Esk.
 minuta; the lesser sea swallow.
 fassipes; the black tern: common on the sands of Barry.

Of the Order *Grallæ*, we have the following:

Ardea

major; common heron. This bird builds on trees in the wood of Newmill.
 stellaris; the bittern. One of these was shot in the White Mire, near Forfar, in 1789: it is sometimes to be seen in the lake of Rescobie, but it is a rare bird.

Scolopax

arquata; curlew: breeds on the mountains.
 phæopus; whimbrel. Along with the curlew.
 rusticola; woodcock,
 gallinago; the snipe.
 gallinula; jack-snipe.
 glottis; greenshank: sometimes on the coast.
 calidris; redshank: breeds on heaths near Forfar.
 lapponica; red godwit; a rare bird with us.
 tægocephala; common godwit.

Tringa

vanellus; the lapwing: called in Angusshire *Teuchet*; they are not near so numerous as they were some years ago.

Tringa

interpres; the turn-stone.
 cinerea; ash-coloured sandpiper.
 hyperborea; red phalarope.
 hypoleucos; common sandpiper, or sand lark.
 cinctus; the purra.
 islandica; red sandpiper.
 squatarola; grey sandpiper.

Charadrius

hiaticula; the ringed plover.
 pluvialis; golden plover: breeds on the hills.
 himantopus; long-legged plover. I once saw one bird of this species on the mountains of Clova: I have never observed but another, which was on Ben-Lawers, in Perthshire, in August 1793: it is a rare bird, and I believe but few naturalists have seen it alive.

Hæmatopus

ostralegus; the sea-pie: frequent by the side of the Esk.

Fulica

chloropus; common water-hen.
 atra; common coot.

Fulica

Fulica

aterrima; greater coot. The above three in the lake at Forfar.

Of the *Galline* or *Crous* tribe, Forfarshire possesses,

Tetrao

tetrix; the black cock. Two of these birds were shot on Turin Hill in the winter of 1794; they occur also on Clova mountains, but rare. lagopus; the ptarmigan: on the high mountains of Clova. attagen; red grouse, or *muir-fowl*. This species is becoming very rare of late years,

Of the Order *Passeres*, a great variety occurs:

Columba

œnas; common pigeon; frequent on the rocks by the sea side. palumbus; the ring-dove, or wood pigeon. This bird is easily tamed: I have one of them which for the most part lives in my house; it is so tame as to eat out of one's hand.

Alanda

arvensis; the sky-lark. pratensis; the tit-lark. arborea; the wood-lark: in woods near Forfar.

Sturnus

vulgaris; the starling: frequent on the mountains. cinclus; water ouzel, or *Water crow*.

Turdus

viscivorus; the missel-thrush. pilaris; the fieldfare. illiacus; red-wing. musicus; the *maavis*, or thristle.

Rallus

crex; the rail, or *Corncrak*. aquaticus; water rail.

and if gentlemen do not fall upon means to prevent their destruction, they will certainly very soon become extinct. I have seen more of them about twenty years ago in walking two or three miles, than I have of late in walking sixty miles.

Tetrao

perdix; the partridge.

Turdus

merula; blackbird. torquatus; ring-ouzel: on the mountains.

Ampelis

garrulus; the Bohemian chaterer.

Loxia

curvirostra; the cross-bill; and enucleator; pine cross-beak. these two species of *Loxia* have come in great numbers to the woods of Glamis and Lindertis, and totally destroyed the whole larch, and fir cones for these two years past.

pyrrhula; the hulfinch. chloris; the greenfinch. A few years ago I observed a white variety of this species near Forfar: I observed it for two winters.

Emberiza

nivalis; snow bunting, or *snow flake*. I once tamed one of these

- these birds: it seemed to live very well in confinement, and was cheerful; it lived with me for four years.
- Emberiza**
 mustellina; the tawny bunting.
 miliaria; common bunting.
 citrinella; the yellow hammer.
 This beautiful and innocent bird is terribly persecuted by the young children in many parts of Scotland, under the name of *Yellow-yite*, or *Yald-ring*.
 schœniclus; reed bunting: common near the lake of Rescobie.
- Fringilla**
 cœlebs; chaffinch.
 montifringilla; the brambling.
 carduelis; the goldfinch. This bird has never been plentiful since the hard winter of 1795, which destroyed many.
 linota; the linnet.
 domestica; the sparrow.
 montana; mountain sparrow: on the mountains of Angussshire.
- Motacilla**
 modularis; hedge-sparrow.
 salicaria; reed sparrow: among reeds by the sides of the lakes; but not common.
- Motacilla**
 alba; the white wagtail.
 flava; the yellow ditto.
 œnanthe; the wheat-eat.
 rubetra; whin-chat.
 rubicola; stone-chatterer.
 atrocapilla; the black-cap.
 rubicula; the red-breast.
 troglodytes; the wren.
 regulus; the golden-crested wren. This is a rare bird in Angussshire.
 trochilus; yellow wren.
 baarula; grey wagtail. I have seen this near Forfar.
- Parus**
 major; great tit-mouse, or *eye*.
 cœruleus; the blue tit-mouse.
 This bird hatches in my garden every year.
 ater; the coal-mouse.
 biarmicus; the bearded tit-mouse.
- Hirundo**
 rustica; the chimney swallow.
 urbica; the martin.
 riparia; the sand martin.
 apus; the swift.
- Caprimulgus**
 europæus; the goat-sucker: woods near Forfar.

AMPHIBIA.

In Angussshire we have but few of the class *Amphibia*.

Of the Order *Reptilia*, we have:

- Rana**
 bufo; the common toad.
 temporaria; common frog. I have seen numbers of a beautiful variety of this species in the alpine rivulets on the mountains of Clora: they appeared as if trimmed with silver lace. I once observed one of this variety in my garden in Forfar some years ago.

Rana

Rana

esculenta; the eatable frog. I have seen a few of this species about the lakes, but rather rare.

gigantea; the gigantic frog of Lightfoot. I observed one of these about five miles east of Arbroath, in June 1797; it was about three times the size of the *Rana temporaria*. I suppose it is an inhabitant of salt marshes, and rare.

Of the *Serpentes*, there occur only the following, and none of them are common.

Coluber

berus; the viper, or *Adder*.

This animal is now becoming very rare: we have it near the West Water, as at the foot of Wirron Hill, twelve miles north of Brechin, and the hills of Glenugg.

prester; the black viper. I observed one of this species at the foot of the rocks at the

head of Lochlee, in Glenesk, in 1795, the only one I have seen.

Anguis

eryx; the blue-bellied snake, or adder; on the mountains, but rare.

fragilis; the blind-worm. Several of this species were found in the Moss of Restennet, near Forfar.

Of the Order *Nantes*, the sea and rivers afford the following:

Tetrodon

truncatus; the oblong sun-fish; sometimes on our coast.

mola; the short sun-fish: on the coast, but rare.

Syngnathus

ophidion; the little pipe-fish.

acus; the longer pipe-fish: on the coast, but very rare.

Cyclopterus

lumpus; the lump-fish.

liparis; the unctuous sucker.

Lophius

piscatorius; the toad fish, or fishing frog, or sea devil.

Squalus

canicula; the greater dog-fish, *catulus*; the lesser ditto.

galeus; the tope.

vulpes; the sea fox.

acanthus; the piked dog-fish.

Raja

batis; the skate.

clavata; thornback.

oxyrinchus; sharp-nosed ray.

Petromyzon

marinus; the lamprey: in the sea, and sometimes in rivers.

fluvialilis; lesser ditto: in lakes and rivers.

Petromyzon

Petromyzon

branchialis; the pride: in clear water. Lampreys were more common some years ago than at present: a number of the

common people were much afraid of them, and many a strange story was told of them. They are called *Nise-eyed eels*.

FISHES.

I now proceed to give a sketch of the *Ichthyology* of Angusshire.

Of the *Apodal* order, we find:

Muraena

anguilla; the common eel.
conger; conger eel; seemed to be much better known some years ago than at present: the name seems familiar even to the common people; they call it *Eve-eel*.

Anarichas

lupus; the sea-wolf: in Scotland called *Sea Cat*.

Ammodytes

tobianus; the sand-eel.

Of the *Jugulares*, the following occur:

Callionymus

lyra; the gemmeous dragonet.
dracunculus; sordid ditto.

Gadus

molva; the ling.
mustela; five-bearded cod.
triccirratus; three-bearded cod.
brosme; the torsk.

Gadus

æglefinus; the haddock.
morhua; the cod.
luscus; the bib.
barbatus; the whiting-pout.
minutus; the poor.
merlangus; the whiting.
carbonarius; the coal-fish.
pollachius; the pollack.
merlucius; the hake.

Blennius

galerita; the crested blenny.
One of these was lately taken at Acmithie, six miles east of Arbroath.
pholis; smooth blenny.
viviparus; the viviparous blenny.

A considerable number of *Thoracici* occur, particularly

Gobius

niger; the miller's thumb.

one of this splendid species cast ashore on the sands of Barry.

Cottus

cataphractus; the pogue.
scorpius; the fatherlasher.
gobio; the bull-head. This species is sometimes to be found in the Esk.

Pleuronectes

hippoglossus; the holibut. This species is sold in Forfar by the name of *Turbot*.
platessa; the plaise.
flesus; the flounder.
limanda; the dab.

Zeus

luna; the opah. I observed

Pleuronectes

Pleuronectes

solea; the sole.
punctatus; the whiff.
maximus; the turbot.

Sparus

auratus; the gilt-head.
pagrus; the red gilt-head. I bought a few of this species in Forfar market in the year 1798; they were taken near Westhaven.
dentatus; toothed gilt-head.

Labrus

tinca; the wrasse.
cornubicus; the goldsinny.

Perca

fluviatilis; the perch.
marina; the sea perch.

Gasterosteus

aculeatus; the banstickle.

Gasterosteus

pungitius; the lesser stickle-back.
spinachia; the greater stickle-back. I have seen several of these on the coast.

Scomber

scomber; the mackrel.
thynnus; the albicore, or tunny: by some called the *mackrel-sture*, or great mackrel.
trachurus; the scad, or horse mackrel.

Trigla

lyra; the piper.
gurnardus; the grey gurnard.
cuculus; the red gurnard. I observed one of this species cast a-shore on the Sands of Barry; and they are taken frequently off Montrose.

Of the Order *Abdominales*, we have the following:

Cobitis

barbatula; the loche: in rivers common.

Salmo

salar; the salmon.
eriox; the grey. This fish is not near so common as the salmon: it is indeed rather a rare species.
trutta; the sea trout.
fario; the common trout.
alpina; the char: in some of our alpine lakes, but rather rare.
eperlanus; the smelt: in Scotland it is known by the name of *Spirling* or *sparling*.
thymallus; grayling.

Esox

lucius; the common pike. This is often taken in the Lake of

Forfar of a large size; one was taken in spring 1812, 27 pounds in weight and 4 feet long.

Esox

belone; sea pike.
saurus; the saury pike.

Mugil

cephalus; the mullet.

Clupea

harengus; the herring.
pilchardus; the pilchard.
sprattus; the sprat.

Cyprinus

pboxinus; the minow. The roach, dace, tench, or carp, which belong to this genus, and are so common in fishponds in England, I have never seen in Angusshire.

The

INSECTS.

The following are a few of the *Insects* which I have observed in this county, but they are only a few of those to be found.

Scarabæus	Bostricus
typhæus.	piniperda; on trees near Forfar, which it often destroys.
nuchicornis.	
fimetarius.	Ptinus
scrutator.	cerevisiæ.
conspurcatus.	mollis; destructive to dried plants.
granarius.	fur; it is a most destructive insect in museums, and I have often experienced its mischievous effects.
terrestris.	
sylvaticus.	
stercorarius; the dor-beetle:	Hister
When it flies in the evening, with a loud humming noise, it is thought by the country people to presage a fine day.	unicolor.
testudinarius; very rare.	æneus.
melolontha; the cock-chaffer:	Gyrinus
flies in the evening. In flying it often strikes against persons and other objects, as if blind; and hence comes the common proverb, As blind as a beetle.	natator.
solstitialis. This species is often hurtful to the leaves of the elm.	Cistela
nobilis.	pilula.
Lucanus	Byrrhus
parallepipedus.	scrophulariæ.
caraboides. In the wood of the Forest-muir, near Forfar.	Silpha
	vespillo.
	atrata.
	thoraciæ.
	Nitidula
	bi-pustulata.
	Cassida
	viridis.
	nobilis.
Dermestes	Coccinella
lardarius.	annulata.
pellio. This insect is destructive to books.	bi-punctata.
domesticus.	5-punctata.
	6-punctata.
	7-punctata.
	9-punctata.
Bostricus	13-punctata.
polygraphus.	14-punctata.
typographus: on fir trees near Forfar.	22-punctata.
scolytus; often destructive to elms.	

Coccinella

- conglobata.
- 14-guttata.
- oblongo-guttata.
- bi-pustulata.

Chrysomela

- graminis.
- memorum.
- euphorbiae.
- tabida.
- transversa.
- cardui.
- fastuosae.
- vitellinae. This species often destroys the leaves of the willow trees in my garden.
- polygoni.
- polita.
- populi.
- marginella.
- 20-punctata.
- anglica.
- oleracea.

Limnium

- seneae of Müller.
- Voickmari.
- tuberculatus, Müller.

Cryptocephalus

- sericeus.

Auchenia

- asparagi.
- cyanea.

Curculio

- cerasi; found on the cherry and pear trees, destroying their leaves.
- granarius; a destructive insect in granaries; the weevil.
- dorsalis.
- saxorum.
- alicia.

Curculio

- pomorum; hurtful to apple trees.
- pini. This species has destroyed a large plantation belonging to Mr Meason of Lindertis, consisting of the Scots fir and larch.
- pyri. This insect is very common on the fruit trees of the garden walls, of the garden at Kinnardy, and does a considerable degree of damage.

Attelabus

- coryli.

Clerus

- formicarius.

Cerambyx

- bajulus. The larva of this insect perforates furniture made of fir.
- arcuatus.
- coriarius.

Leptura

- aquatica.
- simplex.

Lampyris

- noctiluca; the common glow-worm.

Cantharis

- viridissima.
- fusca.
- livida.
- senea.
- bi-pustulata.

Elaeter

- sputator.
- elongatus.
- pectinicornis.
- obscurus.

Cicindela

- campestris.

Cicindela

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d

Cicindela
riparia.
Buprestis
viridis.
Dytiscus
marginalis.
cinereus.
semistriatus.
Carabus
hortensis.
catenulatus.
ruficornis.
vulgaris; and several others of
 this genus.
Tenebrio
molitor.

Of the *Hemiptera*, may be mentioned the following :

Blatta
orientalis; found in some of
 the bake-houses in the sea-
 port towns.
Gryllus
bi-punctatus.
gryllotalpa.
domesticus. These are some-
 times found near bakers' o-
 vens, but rare.
campestris.
viridissimus.
varius.
cœrulescens.
stridulus.
bi-guttulus.
grossus.
Cicada
cornuta.
spumaria. The larva of this
 species is the inhabitant on
 plants of the Cuckoo spit, or
 as it is called in Angusshire
Frog's spittle.
viridis.
ulmi.

Blaps
mortisaga.
Mordella
bi-color.
Staphylinus
marginus.
maxillosus.
chrysomelinus.
hypnorum.
riparius; and some others.
Forficula
auricularis; the earwig; in An-
 gusshire called by the country
 people *Horned golliech.*
minor. This is rather rare.

Cicadia
rosæ; and some others.
Notonecta
glauca.
striata.
Nepa
cinerea.
Cimex
lectularius; the bed bug; very
 common in some of the sea-
 port towns, but happily not
 so common in the inland
 towns.
Cimex
littoralis.
clavicornis.
corticalis.
betulae.
scaraboides.
baccarum.
juniperinus.
prasinus.
bicolor.
hyoscyami.
apterus.
campestris.

Cimex

- pratensis.
- pini.
- urticæ.
- ulmi.
- lacustris.
- stagnorum.
- personatus; and some others.

Aphis; a great number of different species.

Chermes; a great number of species.

Coccus

- ulmi.

Of the Order *Lepidoptera*, we have the following:

Papilio

- napf.
- rape.
- brassicæ. The larvae of these three are very destructive to cabbage plants in gardens, and render them very unsightly.
- cardamine. This beautiful species I have sometimes seen in my garden at Forfar.
- edusa. This beautiful and rare species I have seen in my garden: I have one preserved which was taken in it.
- hyale.
- hyperanthus.
- pamphylus.
- segeria.
- jurtina.
- cardui.
- urticæ.
- atalanta.
- lucina.
- paphia. I have one of these preserved which I found on the Sands of Barry; it is rare in Angusshire.
- argus.

Coccus

- filosella.
- capree.
- salicia. These two latter very common on some of the willows in my garden, particularly on the *Salix viminalis* and *carinata*.
- abietis.—A great many other species are to be found in Angusshire.

Thrips

- physopus.
- juniperina.

Papilio

- rubi.
- phœas.
- linea; with several other species.

Sphinx

- filipendule.
- atropæ.
- ligustri.
- convolvuli.

Phalena

- bractea. This beautiful species is frequent in my garden.
- viridana.
- fagana.
- clorana.
- seabrana.
- quercana.
- obliquana.
- rosana.
- cynobana.
- memoralis.
- pallens.
- pronuba.
- segetis.
- maura. I observed this species at Westhaven in 1807.
- brassicæ.

Phalæna

- oleracea.
 citrosa.
 cerosa.
 euonymella.
 pratella.
 pascuella.
 tapezella.
 pellationella.
 fascitella. These two latter de-
 structive to woollen clothes.

Of the *Neuroptera*, we find a number, particularly,

Libellula

- quadrimaculata.
 vulgata.
 depressa.
 vulgatissima.
 juncea.
 puella.
 virgo. This beautiful species
 I have seen several times in
 Angushire.

Ephemera

- vulgata; May-fly.
 vespertina.
 marginata.
 horaria. This species is very

Of the Order *Hymenoptera*, the following are found :

Cynips

- rosa.
 glechomatis.
 quercus-folii.
 quercus-petioli.
 quercus-gemmae.
 fagi.
 viminalis.

Tenthredo

- salicis; and several others.

Sirex

- gigas.

Ichneumon. Several species of this
 genus are to be found.

Phalæna

- dodecella.
 cembrella.
 granella.
 quercus.
 caja.
 coryli.
 erminea.
 lapricipeda; and many others
 of this numerous family.

common about the Lake of
 Forfar; they live but for a
 single night.

Phryganea

- nebulosa.
 grisea.
 flavicornis.
 rhombica.
 variegata; and some others.

Hemerobius

- lutarius.
 perla.

Panorpa

- communis.

Sphex

- sabulosa.
 fusca.

Vespa

- vulgaris; wasp.
 parietum.
 muraria.
 arvensis.
 bifasciata.
 vaga; and others.

Apis

- centuncularis.
 rufa.
 mellifica; common hive bee.

Apis

conica.
annulata.
terrestris.
virginalis.
lapidaria.
muscorum.
hypnorum.

Apis

acervorum.
Formica
herculanea.
rufa.
fusca.
rubra.

Of the Order *Diptera*, many species occur :

Oestrus

bovis.
equi, &c.

Tipula

rivosa.
crocata.
oleracea.
hortorum.
triangularis.
pratensis.
regulationis.
punctata.
plumosa.
motitatrix.
littoralis.
maedica.
pusilla.
marci.
febrilis.
vernana.
phalanoides.
palustris.

Musca

chameleon.
chalybeata.
similis.
vallata.
Cæsar.
pellucens.
cadaverina.
vomitoria.
domestica.

Musca

argentata. I observed this species near Panmuir.

grossa.
tremula.
lateralis.
canicularis.
pluvialis.
cellaris.
meteorica.
putris.
pumilionis. The larva of this species is sometimes hurtful to wheat.
frit. The larva of this is hurtful to barley.

cupraria.
aurata.
angulata.
curvitans.
stercoraria.
vibrans.
hyoscyami.
germinationis.
enopordinis.
nemorum.
tenax.
fastuosa.
pipiens.
albimana; and several others of this extensive genus.

Tabanus	Stomoxys
bovinus.	irritans.
tropicus.	rostrata.
pluvialis.	Conops
cæcutiens.	flavipes.
autumnalis. These are known	Asilus
by the name of <i>Cleggs</i> in	forcipatus; and several others
Angusshire.	of this genus.
Culex	Bombylius
pipiens.	medius.
ciliaris.	Hippobosca
pulicaris.	equina.
Stomoxys	hirundinis.
calcitrans.	ovina.
Of the Order <i>Aptera</i> , likewise, a number occur :	
Lepisma	Acarus
saccharinum.	ricinus; dog-tick.
Podura	telarius; often hurtful to plants
nivalis.	kept in hot-houses.
aquatica.	scabiei. This is the insect which
finetaria; and others of this	causes itching in the disease
genus.	called the itch.
Termes	lactis.
pulsatorium; the death-watch.	muscorum.
Pediculus. Of this disgusting genus	fungorum; and several others
fifty-three or more species are	of this genus.
reckoned natives; they are	Hydrachna
named by the animals they	globator.
inhabit.	grossipes; and some others.
Pulex	Phalangium
irritans. This troublesome little	hirsutum.
insect is well known by the	grossipes.
name of <i>Flea</i> : it is reported	opilio.
by some authors that it has	Aranca
been tamed, and has lived six	diadema.
years. Its muscular strength	redimita.
is so great, that it can leap	montana.
200 times its own length,	domestica.
and drag a weight 8 times	viatica.
heavier than itself.	saccata.
Acarus	extensa.
reduvius; the tick.	latens.

Acarus	Monoculus
senoculata.	quadricornis.
holosericea.	rubens.
Cancer	pulex.
pisum.	longispinus.
longicornis.	simus; and several others of this genus.
mesops.	
depurator.	Oniscus
* pagurus, crab, or portea.	asilus.
araneus.	entomon.
horridus. This is rather a rare species.	ostrum.
bernhardus.	aquaticus.
araneiformis.	oceanicus.
corrugatus.	asimilis. This species is often to be found among the Fuci or dulce, when sold at the cross in Forfar.
* gammarus; the lobster.	asellus.
squilla; the prawn.	armadillo.
crangon; the shrimp, Norvegicus.	Scolopendra
pulex.	electrica.
locusta.	forcata.
atomos.	
stagnalis.	Julus
phalangium. This is the Can- cer scorpio of Stewart. I have found several of these near the Sands of Barrie; it is reckoned a rare species.	terrestris.
platychelas of Pennant, a rare species: I also found one of this on the Sands of Barrie.	complanatus.
	sabulosus.
	oniscoides; among stones on the hill of Finhaven.

WORMS.

* Both these species are called in Angusshire by the name of *Firy stags*, or *Meg we' the mory feet*.

WORMS.

Of the Order *Intestina*, the following occur :

- Ascaris.** There are many of this genus to be found ; they inhabit the intestines of every kind of animals. to cause a dropsical swelling of the abdomen.
- Gordius**
aquaticus ; in ditches.
- Lumbricus**
terrestris ; earth-worm.
marinus ; on the sandy shores.
- Planaria**
fusca.
lactea ; both in the Lake of Rescobie.
- Hirudo**
sanguisuga.
vulgaris.
complanata. This species is found common in a spring called the South Running Well, near Forfar.
hyalina.
bi-oculata. These two latter I observed in the Loch of Lintrathen.
muricata ; inhabits the sea.
- Scolex**
lophii. I have a specimen of this animal which was found in the fishing-frog.
- Strongylus.** Of this genus there are two species ; one of them found in the horse and the other in sheep.
- Echinorhynchus**, and likewise the genera *Cucullianus* and the *Tænia*, are found in the intestines, and other parts of many animals, and often get their names from the parts or the peculiar animals they inhabit.
- Fasciola** is a very numerous family : the *Fasciola hepatica* is found in the liver of oxen, swine, horses and sheep, and is said

Of the Order *Mollusca*, we observe the following :

- Limax**
ater ; black slug.
succineus ; red.
cinereus ; great spotted.
agrestis ; small grey.
flavus ; amber ditto.
- Doris**
verrucosa. I have seen this not unfrequent on the coast. I have a specimen of it preserved.
papillosa. I have also a specimen of this.
- Doris**
argo. I have seen this species thrown ashore at the Sands of Barrie.
Aphrodita
aculeata ; cast on the shore, not unfrequent.
squamata.
lepidota.
Amphitrite
auricoma. I have seen several of this on the shore.

- Nereis**
 noctiluca. These animals illuminate the sea, with a brighter splendor than the glow-worm's.
 pelagica; not unfrequent; I have a specimen of this preserved.
- Nais**
 serpentina; common in the small pools of water at the east end of the loch at Forfar, among the Lemna minor and trisulca.
 proboscidea; in marishes, ponds and ditches near Forfar.
- Ascidia**
 rustica; in the sea not unfrequent: I have a specimen of this preserved.
 mentula.
- Actinia**
 rufa,
 crassicornis; and some others of this genus.
- Lernæa**
 salmonæa.
 asellina.
- Of the Order Testacea, we have the following:**
Multivalves.
- Chiton**
 albus. I observed one of this species on the shore at the Sands of Barrie.
 marginatus.
- Lepas**
 balanus.
- Mya**
 truncata.
 arenaria.
- Lernæa**
 pectoralis. I have a specimen of this preserved.
- Sepia**
 media.
 loligo. I have seen this species often driven ashore near Montrose.
- Medusa**
 cruciata.
 capillata.
 aurita.
 octopus. They are not unfrequent in the sea: the greatest quantity I ever observed of them was at the village of Achmithie, six miles east of Arbroath.
- Asterias**
 papposa.
 lacertosa.
 rubens.
 seposita; rare.
 glacialis. I observed what I take to be a non-descript species at Achmithie.
- Echinus**
 spatagus.
 esculentus.
- Lepas**
 balanoides,
 anatifera.
 striata.
- Pholas**
 dactylus.
 crispata.
- Bivalves.**
Mya
 margaritifera; common in Water of Esk.

Solen		Tellina	
vagina.		ferroensis.	
siliqua.		rhomboides.	
ensis.		cornea.	
legumen.		rivalis.	
pellucidus.		caernasia.	
Tellina		rugosa.	
fragilis.		Mactra	
planata.		stultorum.	
radiata.		solida.	
donacina.		lustraria.	
		Univalves.	
Cardium		Cypræ	
aculeatum.		pediculus ; at Lunan Bay.	
echinatum.		Buccinum	
edule. This is the common		lapillus.	
cockle.		undatum.	
Venus		reticulatum.	
gallina.		minutum.	
islandica.		Strombus	
exoleta.		pes-pelecani. I observed the	
undata.		shell on the Sands of Barrie.	
Ostrea		Murex	
varia.		clathratus ; it is rare with us.	
opercularis.		Trochus	
edulis. The shells of this are		cinerarius.	
sometimes thrown on the		zizyphinus ; but rare.	
shore.		Turbo	
maxima ; but rare.		neritoides.	
Anomia		littoreus ; with, or peristoma.	
ephippium.		rudis.	
cepa.		cimex ; on the Back Sands at	
squamula.		Montrose, not unfrequent.	
Mytilus		terebra.	
rugosus.		perversus.	
barbatus.		muscorum.	
edulis ; the common muscle.		fontinalis ; White Mire, near	
pellucidus.		Forfar.	
modiolus.		Helix	
cygneus.		striatula.	
anatinus.		planorbis.	
discors ; a rare species.		lapicida.	
		arbustorum.	

Helix	Patella
<i>aspera.</i>	<i>vulgata.</i>
<i>ericetorum.</i>	<i>ungarica.</i>
<i>turturum.</i>	<i>lacustris.</i>
<i>virgata.</i>	<i>flavistifis.</i>
<i>rufescens.</i>	<i>pellucida.</i>
<i>nemoralis.</i>	Sabella
<i>stagnorum.</i>	<i>alveolata.</i>
<i>stagnalis</i> ; in Crook water, but	<i>lumbricalis.</i>
<i>rare.</i>	Dentalium
<i>palustris.</i>	<i>entalis.</i> I found this shell,
<i>putris.</i>	with the animal in it, on the
<i>limosa.</i>	sand at Lunan Bay.
<i>auricularia.</i>	Serpula
Nerita	<i>spirorbis.</i>
<i>glaucina.</i>	<i>triquetra.</i>
	<i>contortuplicata.</i>

I have observed a great number of minute shells, of different species, on the moist places on the Sands of Barrie, which would require a magnifier to distinguish them, but never had time sufficient to examine them.

APPENDIX C.

DESCRIPTION of a Turnip-Feeding Byre, built by DAVID HUNTER, Esq. of Blackness, at Eskmount, in Forfarshire, with a Plan annexed.

It is now very generally understood, "that the more cleanly and comfortably cattle are kept, and the cleaner and the better order in which their food is presented to them, the better they will thrive; and, consequently, the sooner and heavier they will fatten." With these views, and with the additional view of saving a greater proportion of the dung and urine of the cattle than is usually done, so as to increase the quantity of manure as much as possible, the present byre has been constructed; which has been found, on trial, completely to answer the ends proposed; and it is believed to be, in several respects, different from any byre hitherto erected.

The following is a plain, and, it is hoped, intelligible account of Mr H.'s byre, and of his method of feeding, &c. The byre consists of two apartments: An inner apartment, or byre, for feeding the cattle; and an outer apartment, or barn, for containing the turnips and fodder.

To begin with the barn and its uses.—At the proper season, when the turnips are completely ripened, and the turnip feeding commences, the turnips are gathered together on the field in large quantities; and two or three men, with large turnip knives, made from old scythes, &c. cut off the whole of the roots, carefully cleaning the turnips, at same time, from any earth which may be adhering to them. The turnips are then carted to the turnip-barn, the door of which is wide enough to allow the carts to back-in, and throw them down. Here the men, with their turnip-knives, are again ready immediately to cut off the whole green tops (or shaws) of the turnips; and these green tops are immediately given to cows, young winterling cattle, sheep, &c. who readily eat them when fresh. The turnips, now quite clean, are piled up in one end of the barn, like canon-balls, and will keep in excellent order for months together: Should the winter storm set in, a small quantity of clean dry straw laid over them, will effectually preserve them from

being

being injured by the frost, &c. The other end of the barn receives the straw and litter, for the use of the byre.—The advantages, proposed to be derived from this manner of treating the turnips, are,

1st, The preservation of a great many of the best turnips, which, if allowed to remain on the field during winter, are unavoidably spoiled by the effects of the weather, and the alternate operation of snow, rain and frost.

2dly, The green tops being cut off fresh and good, are immediately consumed, in place of being entirely lost, if allowed to remain on the field.

3dly, It saves much labour and trouble, both to men and horses, to lay in a stock of turnips at once, in place of going to the field every day, whether good or bad; and when, as the fields are necessarily wet and soft, the horses, carts, and harness, are severely strained, and the fields poached and cut up.

And,

Lastly, By having a couple of months supply of turnips in the barn, you are never under the necessity of using frosted turnips, which are often little better than lumps of ice. And even if you should not incline, or find it convenient, to lay in so large a stock of turnips at once, still you can take the advantage of any good fresh day, as it occurs, to add to your stock of turnips in the barn.

Next, as to the feeding byre.—At right angles to the turnip barn, stands the feeding byre, constructed as follows. At the distance of about three feet and a half from the great side-wall of the byre, there are constructed on the ground, in a straight line, ten troughs for feeding ten large cattle; these are of hewn pavement on all sides, and at the bottom; and they are divided from each other by divisions or bridges, likewise of hewn pavement. These troughs are so constructed, that there is a small and gradual declivity from the first or innermost, to the last and outermost one; and the bridges separating them being made with a small arch at bottom, a pail or bucket of water poured in at the uppermost, runs out at the undermost one, through a stone spout passing through the wall; and a sweep with a besom or broom, carries off the whole remains of the turnips, &c. rendering the whole troughs clean and sweet. The whole food of the cattle is thus kept perfectly clean at all times.

In a line with the feeding troughs, and immediately over them, runs a large strong beam of wood from one end of the byre to the other; which is strengthened by two strong upright supporters to the roof, placed at equal distances from the ends of the byre; and the main beam is again subdivided by the cattle stakes and chains, so as to keep each of the ten oxen opposite to his own feeding-trough and stall.

The three feet and a half of space betwixt the feeding-troughs and outer wall of the byre, lighted at the far end by a glazed window, is the cattle-feeder's walk; who passes along it in front of the heads of the cattle; and,

with

with a basket, deposits, before each of the cattle, the turnips into the feeding-trough of each.

To prevent any of the cattle from choking on small turnips, or pieces of large ones, as they are very apt to do, the chains at the stakes are contrived of such a length, that no ox can raise his head too high when eating; for, in this way, it is observed, cattle are generally choked. However, in case it still should happen, that an ox chokes on a turnip, the cattle-man or feeder, is provided with a ramrod, made of a piece of strong stiff rope, with a small round wooden polished head at the end of it; this he introduces into the mouth of the ox, and so gently knocks the turnip down his throat, without either difficulty or danger to the animal.

That the cattle-feeder may be always at hand to attend his cattle, a small apartment, with a window, &c. in it, and in which his bed is placed, is constructed immediately off the corner of the byre; so that he is ready, even in the night-time, in case of any accident happening, to give assistance.

At the distance of about six feet eight inches from the feeding-troughs, and parallel to them, is the dung groop and urine gutter, neatly and substantially built with hewn stone. Here, too, like the troughs, there is a gradual declivity from the inner and upper to the outer and lowest end; so that the moment the urine passes from the cattle, it runs to the lowest end of the gutter, whence it is conveyed through the outer wall of the byre in a large stone spout, and deposited in the *urinarium*, outside of the wall. At this place, as marked on the plan, is a large inclosed space occupied as a compost dung court: Here, all sorts of stuff are collected for increasing the manure; such as, fat earth, cleanings of roads, ditches, ponds, &c. rotten vegetables, &c.; and the urine from the byre being caused to run over all these collected together, which is done very easily, by a couple of coarse wooden spouts, moved backwards and forwards to the *urinarium* at pleasure, renders the whole mass, in a short time, a rich compost dunghil; and this is done by the urine alone, which in general is totally lost. The dung of the byre, again, is cleaned out several times each day, at the two front doors of the byre, opposite to the groop, and deposited in the dung court, marked on the plan; so that in this way, too, the byre is kept as clean as any stable, and the cattle as clean as race-horses. Along the edge of the dung court, a few low shades are constructed, in which young beasts, sheep, or swine, &c. are kept; and these consume the refuse and remains of the turnips from the great feeding-byre.

In the side-wall of the byre, and opposite to the heads of the cattle, there are constructed three vents, or ventilators; these are at the distance of about two feet four inches from the ground in the inside of the byre, and come out immediately under the eaving of the slates on the outside. The inside openings of these are about thirteen inches in length, seven in breadth, and nine in depth, in the wall: And they serve two good purposes, 1st, The breath of

cattle

matter being specifically lighter than atmospheric air, the consequence is, that, in most byres, the cattle are kept in a constant heat and sweat; because their breath and heat has no way to escape; whereas, by means of these vents, this noxious air is forced out at the vents, by the draught of air from the doors, &c.; and the cattle consequently kept cool, and not over-sweated. The other good consequence arising from the vents is, that the woodwork of the byre, and the roof in particular, is kept sound and fresh, in place of being rotted, by being kept constantly damp by the breath and sweat of the cattle.

In short, it is hoped that this Plan of a Byre will be found to conduce very much to the health and cleanliness, and consequently to the fattening of the cattle, to the increase of the manure, and to the ease with which both these objects may be accomplished; and there is no part of it which is either unnecessary, or in any way more than usually expensive.

1797A

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Abstract Explanation of Mr Hunter's Turnip-Feeding Byre at Esknount, and of the Plan annexed.

TEN cattle of a large size stand on one head, each having a stone trough, A, A, &c. to eat out of, which trough is made of hewn pavement, each division arched below; so that a bucket of water put into the westmost one, runs through the whole, out at a hole in the east wall, making the whole perfectly clean with a besom. The group, B B, behind the cattle, receives their dung and water, which also runs out at an opening, C, in the east wall, into a wooden spout D, which may be shifted as occasion requires, to enrich any clean or fat earth that is laid through the summer, and greatly increases the quantity of manure for next year's operations. There are three small vents, E, E, E, in the north wall, for drawing off the cattle's breath, which greatly preserves the timber of the roof, and prevents the cattle from sweating, or being too hot: their breath, being lighter than the atmospheric air, requiring ventilation to expel it.—Small door, F, in the east corner, is a place for the cattle-man's bed, so that he may be at hand, in case of need.—The two doors, G, G, to the southward, form an easy conveyance for throwing out the dung and dirty litter into the court; where are shades, H, H, for a score of winterlings or young cattle, pigs, sheep, &c.—Immediately adjoining to the west, is the shade, I I, for holding the turnips, and straw or hay that is required; the door K, wide enough to allow a cart to back-in, where the tops are cut from the turnips. By laying up the roots, and keeping a store

of

of them, in case of a storm of frost or snow, which makes it difficult to get the turnips from the field, you are not obliged to give the cattle frosted turnips, which may sometimes be little better than pieces of ice. The above are given to the cows or young stock, and first made use of. Besides, it prevents poaching the land in very wet weather, or straining your harness, by drawing off the turnips when the field is wet.—East of the byre, is a roomy dunghill-stance, L L., for laying earth, where all the water from farm-yard, stables, and byre, is received and soaked up; the moisture increasing the quantity of manure. A raised causeway, M M, ranges along the front of the byre, and west side of the dung-court.

APPEN-

APPENDIX D.

ACCOUNT of the Bell Rock Lighthouse.

THE shores of this county are the most contiguous to the reef of rocks well known by the general name of the Cape or Bell Rock, and long so much dreaded by seamen, as to have formed one of the greatest bars to the navigation of the east coast of Great Britain. The want of some distinguishing mark to shew the place of this rock, when overflowed by the tide, was most severely felt for ages; and every philanthropic mind must rejoice that this want is so happily removed, by the erection of a lighthouse, similar to that erected about fifty years since, upon the Eddystone Rocks, in Plymouth Sound, by the celebrated Mr Smeaton.

The erection of the Bell Rock Lighthouse being evidently a great improvement upon the navigation of the North Seas, and ultimately tending to the commercial advancement of the county of Forfar, in rendering more safe the approach to the harbours of Dundee, Arbroath, and Montrose, some account of the progress and completion of such an undertaking may be expected in a Report of this nature. The facts stated shall be quite authentic; but a very minute detail seems unnecessary, because there is every reason to expect the speedy publication, by Mr Robert Stevenson, engineer, of a particular account of the whole operations, illustrated by engravings. Such a work must be interesting, not only to the man of science, but to the general reader; and it is pleasant to learn, that the Commissioners for Northern Lights, have liberally encouraged such a publication.

The Cape or Bell Rock lies about eleven miles south-west from the Red Head, a remarkable promontory on this coast, which it resembles in colour and nature, being a red sandstone, of a fine grit. As seen at low water of spring-tides, it extends about 2000 feet in length, and about 230 feet in breadth. The north-east, or highest part, on which the lighthouse is built, is only partially dry at low water of neap-tides; but in spring-tides, this part of the rock appears from 4 to 6 feet above the water; while at high water of the same tides, it is about 12 feet under water. The surface of the rock is very rugged, and it is with difficulty that one can walk upon it. The lower

parts are covered with sea weeds of the larger sorts, and the higher parts with mussels and whelks, and such kinds of crustaceous and testaceous animals as are common to the shores of this county; and around the rock are caught in great plenty the red-ware cod, with other common fishes of these seas.

The most partial examination of any sea chart of this coast, will shew the central position which this most dangerous reef unluckily occupies, in relation to all vessels bound, either over seas, or coastwise to or from the Friths of Forth and Tay. Much as the want of some distinguishing mark upon this rock may have been felt during the earlier period of our history, yet while trade was in its infancy, the difficult and expensive nature of such a work may easily be imagined to have been sufficient obstacles to such an undertaking. If we may believe tradition, the pious inhabitants of the Monastery of Aberbrothwick, more than four centuries ago, caused a large bell to be placed upon the rock, so hung that the motion of the waves set it ringing, and the mariner was in this manner forewarned of his danger, which is said to have given rise to the name Bell Rock.

In the month of December 1799, the east coast of Great Britain was visited by a dreadful storm from S.S.E., when about seventy vessels, with many of their crews, were lost on these shores, between Fifeness and Aberdeenshire, which created a sensation of the deepest regret throughout the kingdom, and turned the attention of several enterprising individuals towards the Bell Rock; the shipwrecks being attributed to the fear of this fatal reef, hindering seamen from taking shelter in the Frith of Forth, for which the wind was favourable during the storm. Of these, Captain Bruden of the Royal Navy prepared several very ingenious models for the erection of a lighthouse of cast-iron; and went so far as to construct a beacon, consisting of four spars of timber, which stood for several months upon the rock. The late Mr Downie, author of the Marine Survey of the east coast of Scotland, proposed the erection of a lighthouse, to stand upon pillars of stone. Mr Roberts, a well informed sailing-master of the Navy, and a native of this county, was also at considerable pains in forwarding the inquiries into this subject. About twenty-five years since, the unprotected condition of the coast of Scotland, with regard to lighthouses, having been urged in Parliament by a gentleman of this county, George Dempster, Esq; of Dunichen, too well known for his spirited exertions in public affairs, to require any apology in this place; in 1786, a bill was brought forward, and certain Commissioners appointed for erecting lighthouses in the northern parts of Great Britain, several of which have accordingly been erected; and no sooner were the funds of that Honourable Board in a promising state, than they projected the great undertaking of a building upon the Bell Rock, to answer the purpose of a beacon by day, and a lighthouse by night. A bill was accordingly brought
into

into Parliament in the year 1803, which, however, was lost in the House of Lords. The subject was again resumed by the Commissioners in 1806, and a bill was brought forward by the Honourable H. Erskine, then Lord Advocate of Scotland, and seconded by the exertions of the Right Honourable President of the Board of Agriculture, Sir John Sinclair. By this bill, the Commissioners, the better to enable them to erect and maintain a lighthouse upon the Bell Rock, were allowed to extend the collection of the duty for the Northern Lights, to all vessels sailing to or from any port between Peterhead on the north, and Berwick-upon-Tweed on the south, being at the rate of three halfpence per ton upon British, and three pence per ton upon foreign bottoms. The same act authorised the Commissioners to borrow L. 25,000 from the 3 *per cent.* consols, which, with L. 20,000 of surplus light-duties invested in the funds, made up the disposable sum of L. 45,000 to proceed with the work.

Several plans and models had been submitted to the consideration of the Commissioners; but those of their engineer, Mr Stevenson, were ultimately approved of. This gentleman, in the year 1800, made a particular survey of the Bell Rock; and his report was afterwards published, along with a letter from the Honourable Captain, now Admiral Cochrane, who, so early as 1793, called the attention of the Commissioners to this important subject. But so various were the opinions of the public regarding even the practicability of the work, and still more concerning the construction of the building best adapted to the situation, that, where so large a sum of public money was necessarily to be expended, the Commissioners judged it proper to submit the subject to the opinion of Mr Rennie. This eminent engineer coincided with Mr Stevenson in thinking, that a building, upon the principles of the Eddystone Lighthouse, was both practicable and advisable at the Bell Rock; and to these gentlemen was committed the execution of this great undertaking.

The first object was to moor a vessel as near the Bell Rock as she could ride with any degree of safety, to answer the purpose of a floating-light, and a store-ship for lodging the workmen employed at the rock. This vessel measured 80 tons. She had three masts, on each of which a large lantern was suspended, with lights, which distinguished this light from the double and single lights on the coast. Under the deck, she was entirely fitted up for the accommodation of the seamen and artificers, with holds for provisions and necessaries. Thus furnished, she was moored about two miles from the rock, in a north-east direction, in twenty-two fathoms water, with a very heavy cast-iron anchor, resembling a mushroom, and a malleable iron chain, to which the ship was attached by a very strong cable. In this situation, the Floating-Light was moored in the month of July 1807, and remained during the whole time the house was building, and until the light was exhibited in February 1811, when she was removed.

The bill for the erection of the lighthouse passed late in the session of 1806, and during the following winter, the necessary steps were taken, to have every thing in readiness to commence the operations at the rock at the proper season. A work-yard, upon a lease of *seven years*, was provided at Arbroath, where shades for hewing the stones, and barracks for lodging the artificers, when they landed from the rock, were erected. Vessels for conveying the stones from the quarries to the work-yard, and from thence to the rock, were hired or built; and in a few months, Arbroath, always a scene of business and activity, became now the resort of the curious, as well strangers from a distance, as people from the neighbouring towns and parishes of the county, who came to see the preparations for the lighthouse.

Early in the month of August 1807, the operations at the rock commenced, but little was got done towards preparing the rock for the site of the building, till the year following, the chief object of this season's work being to get some temporary erection on the rock, to fly to in case of an accident befalling any of the attending boats. As the rock was accessible only at low water of spring tides, and as three hours was considered a good tide's work, it became necessary to embrace every opportunity of favourable weather, both under night, by the help of torch-light, and upon Sundays; for the water had no sooner begun to cover the rock, than all the men collected their tools, and went into the boats, which often, with the utmost difficulty, were rowed to the Floating-light. By such exertions, this work was only to be overcome; and by the latter end of October, the work for the season was brought to a close, after erecting a beacon, which consisted of twelve beams of wood, forming a common base of thirty feet, with fifty feet of height; the whole being strongly held to the rock by bats, and chains of iron. This beacon, or temporary house, was used as a barrack for the artificers while the work was in progress, and remained on the rock till the summer of 1812, when it was removed. To the erection of this beacon, the rapidity with which the lighthouse was got up, is chiefly to be ascribed; and it is extremely doubtful if ever it would have been accomplished, without some such expedient,—certainly not without the loss of many lives; for in a work of this nature, continued for a series of years, it is wonderful that only one life was lost on the rock, by a fall from a rope-ladder when the sea ran high, and another at the mooring-buoys, by the upsetting of a boat.

The operations of the second season were begun at as early a period as the weather would permit, when the preparation of the rock was proceeded with. The risk, and often excessive fatigue, which occurred every tide, in rowing the boats to and from the rock to the Floating-light, made it necessary to have a vessel, which, in blowing weather, could be loosened from her moorings at pleasure, and brought to the lee-side of the rock, where she might take the artificers and attending boats on board. A vessel of 80 tons was accordingly

Accordingly provided, and named The Sir Joseph Banks, in compliment to that worthy Baronet, who, ever ready in the cause of public improvement, had lent his aid in procuring the loan from Government for carrying this work into execution.

Through much perseverance and hard struggling with the elements, both during day and night tides, the site of the lighthouse was got to a level, and cut sufficiently deep into the rock. Part of the cast-iron rail-ways, for conveying the stones along the rock, were also got ready: so that on Sunday the 10th July 1808, the foundation-stone was laid; and by the latter end of September, the building operations were brought to a conclusion for the season, the first four courses of the lighthouse having been completed.

A stock of materials being procured from the granite quarries of Aberdeenshire, for an outside casing to the height of thirty feet, and from the freestone quarries of Mylnfield, near Dundee, for the inside and upper walls, a great number of masons were kept in the work-yard at Arbroath, and every preparation made during the winter months for the work at the rock against next season. The stones were wrought with great accuracy, and laid upon a platform, course by course, and there numbered and marked as they were to lie in the building, when they were laid aside as ready for shipping for the rock;—a part of the work which was performed with wonderful dexterity; for the vessels which carried them away, were generally dispatched with their cargoes on the tide following that of their arrival.

At the commencement of the operations in April 1809, the four courses built last season were found to be quite entire, not having sustained the smallest injury from the storms of winter. In the arrangements for the work, the first thing to be done was to place the moorings for the various vessels, and stone boats employed in attending the rock, and landing the materials. The machinery for receiving the stones from the praam-boats was erected, and cranes for laying the stones in their places upon the building. With an apparatus thus appointed, the lighthouse was got to the height of thirty feet by the month of September 1809, when the work was again left off during the winter months. Early in the spring of the year 1810, the building was again resumed, but with very faint hopes of bringing the whole to a close in the course of this year: however, as it fortunately happened, not a single stone was lost or damaged, and, by the month of December, every thing was got into its place; and the interior having soon after been finished, the light was exhibited, for the first time, on the night of the 1st February 1811.

Having now, in a very general way, noticed the various stages of the erection of the Bell Rock Lighthouse, it only remains to give some of its dimensions, and a few other particulars.

The foundation-stone of the lighthouse is nearly on a level with low water of ordinary spring-tides, and consequently the lower part of the building will be about fifteen feet immersed in water when the tide has flowed to its usual height at new and full moon. But during the progress of the work, the sea spray has been observed to rise upon the building to the height of eighty feet; and upon one occasion to ninety feet, even in the month of July. The house is of a circular form, measuring forty-two feet diameter at the base, from which it diminishes as it rises, and only measures thirteen feet at the top, where the light-room rests: Including which, it measures in height altogether 115 feet. To the height of thirty feet it is entirely solid, excepting a drop-hole for the weight of the machinery which moves the reflector, which hole is only ten inches diameter. The ascent to the door, which is placed at the top of the solid, is by a kind of rope-ladder. A narrow passage leads from the door to the stair-case, where the walls are seven feet in thickness: at the top of the stair-case, which is thirteen feet in height, the walls get thinner, and diminish gradually to the top. Above the stair-case, the ascent to the different apartments is by means of wooden-ladders; and the remaining fifty-seven feet of masonry is divided by five stone floors into rooms for the light-keepers, and stores for the light, and the light-room is placed on the top of the building. The three lower apartments have each two small windows, while the upper rooms have each four windows; and the whole are provided with strong shutters, to defend the glass against the sea in storms.

The two first courses of the building are entirely sunk into the rock; and the stones of all the courses are dove-tailed and let into each other, in such a manner as that each course of the building forms one connected mass, and the several courses are attached to each other by joggles of stone and askes trenails, upon the plan of the Eddystone Lighthouse formerly alluded to. The cement used at the Bell Rock was a mixture of pozzolana earth, sand and lime; which last was brought from Aberthaw in Wales, where the lime for the Eddystone Lighthouse was got.

Round the balcony of the light-room, there is a cast-iron rail, curiously wrought like net-work, which rests on bats of brass. The light-room is twelve feet diameter, and fifteen feet in height, made chiefly of cast-iron, with a copper roof. The windows are glazed with large plates of polished glass, which is one quarter of an inch thick.

The light is from oil, with Argand burners, placed before silver-plated reflectors, hollowed out to the parabolic curve. That the Bell Rock light may be distinguished from all others on the coast, the reflectors are ranged upon a frame which is made to revolve upon a perpendicular axis once in three minutes. Before some of the reflectors are placed shades of red coloured glass; so that the effect produced in each revolution of the frame with the reflectors,

reflectors, is a light of the natural appearance, and a light with the rays tinged red, with intervals of darkness between the lights. In a favourable state of the atmosphere, these lights are so very powerful, as to have been seen at the distance of twenty-five miles. During the continuance of thick and foggy weather, two large bells are tolled night and day, by the same machinery which moves the lights; and as these bells may be heard in moderate weather considerably beyond the limits of the rock, the mariner may be advertised of his situation, in time to put about his vessel before any accident can happen; for in thick and hazy weather, she might otherwise run ashore upon the rock, notwithstanding the erection of the lighthouse.

About the commencement of these works, it was a very common saying, that "Although the Bell Rock Lighthouse were built, (which it never will be), no one will be found hardy enough to live in it." The sequel has, however, shewn the fallacy of such a supposition; for no sooner was the house ready for possession, than numerous applications were made for the situation, and many were of course disappointed. Of these applicants, a principal light-keeper and three others were nominated, and took up their abode at the term of Martinmas 1810, and each in his turn gets ashore on liberty at the end of every six weeks, and remains a fortnight, when he goes off to the lighthouse again. The pay of the light-keepers is about L. 50 *per annum*, with provisions while they are at the lighthouse; but ashore they provide themselves. At Arbroath, there are buildings erected, where each keeper has apartments for the accommodation of his family; and, connected with this establishment, there is a very handsome signal-tower, 50 feet in height, in which an excellent telescope is kept, and signals arranged with the people at the rock for the attending vessel; this vessel is about 40 register tons, and is capable of carrying a large enough boat for landing at the rock in moderate weather, with stores, provisions, fuel and water; and the master of this vessel has also the charge of the stores at Arbroath.

This establishment, which is as complete as can well be imagined, says much for the humane consideration and proper liberality of the Honourable Board of Commissioners. At present, the exact amount of the expence of the erection of the lighthouse, and establishment connected with it, cannot be ascertained, but will probably be about L. 55,000 Sterling. Whether, therefore, we look to the peculiar position of the reef on which this lighthouse is built, or to the success which has attended the operations, from their commencement in 1807, to the period of their final conclusion in December 1810, this work will be found to do equal honour to the spirit and resources of the age in which we live.

As many of the seamen and artificers engaged in this memorable work claim kindred to the county of Forfar, besides those brought from Mid-Lothian,

thian, Aberdeenshire, &c. &c. it may be proper to mention, much to their honour, that the Magistrates of Arbroath give the most ample testimony of their orderly conduct during the three years which the work was going forward; and having been engaged in the erection of the Bell Rock Lighthouse, will always be a sufficient passport for abilities in the line of their profession. Although in a work of such extent, necessarily divided into various departments, it would be impossible to mention all who signalled themselves for their faithful exertions, yet we cannot withhold the mention of the following gentlemen, upon the best authority.

Mr Peter Logan, foreman to the building operations at the rock.

Mr David Logan, draughtsman, and foreman at the work-yard, Arbroath.

Mr Francis Watt, foreman of the joiners.

Mr James Dove, foreman of the smiths.

Mr James Slight, mould-maker.

Captain James Wilson of the Floating-light, and landing-master at the rock.

Captain David Taylor of the Sir Joseph Banks tender.

Captain Robert Pool of the Smeaton stone-lighter.

Captain James Spink of the Patriot stone-lighter.

Captain John Reid, acting-master, and principal light-keeper of the Floating-light.

And Mr Lachlan Kennedy, clerk and cashier, Engineer's Office.

Several of these gentlemen are still in the Lighthouse service; while others have removed to works of celebrity, or are engaged in business on their own account.

It must be a matter of very general satisfaction to learn, that the lighthouse, in its entire state, has sustained no injury whatever from the storms of the first and second winters. And we shall conclude these remarks with observing, that Mr Forrest, the Superintendent for the instruction of the light-keepers, after remaining at the lighthouse from December 1810 till April 1811, reported, that "the lighthouse was as dry and comfortable as any house in Edinburgh."

APPENDIX E.

ACCOUNT of the Peat Mosses and Marl on the Estate of Dumnichen, in the County of Forfar,—communicated by ANDREW STEELE, Esq. in 1802.

THE changes that have occurred, and the revolutions that have taken place during ages, and are still in their progress, in the filling up of the valleys of the earth, cannot perhaps be more beautifully displayed to the philosophic eye, than by examining Restennet peat-moss, the property of George Dempster, Esq. in the parish of Forfar.

Situated 200 feet above the level of the sea, in a hollow from which the water of a copious spring has had no clear and sufficient issue, this peat-bog, consisting of about 70 acres, must have been once a lake. Indeed, that is sufficiently obvious, not only from its connection with a very considerable lake, called Restennet Loch, almost a mile in length, but especially from a bed of shell marl, found beneath the peat, and situated immediately above the solid ground. The bed of marl (of which substance there is also a great quantity found in Restennet Loch) is in some places fifteen feet in thickness, gently diminishing towards the margin of the moss. Its average thickness is about five feet; but the layer is very irregular. On dissolving a portion of this marl in the muriatic acid, I found it a very pure calcareous matter, containing only about a tenth part of its weight of peaty and other substances. The shells composing the marl, many of which are quite entire, are of the water-snail, or cochlea kind, (*Helix putris, Linn.*) and other species.

The great value of such a bed of marl, ought to be a powerful inducement to every one that possesses any moss grounds, to search them carefully, and particularly in their deepest recesses, and even beneath their immediate sub-soil, for this important article of manure.

Mr Dempster has sold from the bottom of this moss, marl to the extent of upwards of L. 12,000 Sterling; or at the rate of L. 1000 *per annum* ever since the period it was drained, which is about twelve years ago, and the quantity that remains is yet very great.

The immensity of time that I apprehend it would take to form so vast a collection of such minute shell-animals, is beyond our conception, if we might be permitted to judge from natural causes and effects.

This valley, when it ceased to be a lake, from circumstances now to us incomprehensible, unless the vast accumulation of shells can be deemed a sufficient

sufficient cause, seems to have acquired a surface fit for the production of trees; for all the under layers of the moss, next to the marl, are composed of roots, stems and branches of alder, birch, hazel, (with the nuts of this last tree externally entire), and some oaks of considerable size.

It has been supposed possible that this collection of trees may have been floated from the higher grounds; but it is not probable that all these trees could be deposited in this manner, as there is no appearance of any rivulet having ever run into the valley. It may rather be presumed, that the sediment of water percolating from the adjacent grounds, may have formed above the marl a soil proper for the growth of trees.

From a wood, the valley must have been transformed into a peat-bog or moss, probably by a stagnation of water, which would naturally occasion the destruction of the trees, and the growth of aquatic plants, which in such situations accumulate, and never fall into a state of total decomposition. The peat-matter is found about six feet thick above the marl, and at the time of the drainage its surface was covered over with heath.

By drainage, and the consequent alteration of the nature of the soil, the heath has been entirely obliterated, and the moss, even at the surface, formed into a fine light mould, and covered with grass, coarse, indeed, in general; but where it has been gravelled for a road, it is not unworthy of notice, that it is swarded at the sides with the finest pasture grasses and clovers: couch-grass, or twitch, (*Triticum repens*), was there also particularly observable.

This moss has been drained by one deep cut through the middle of it, and through a sand-bank of the depth of thirty feet, which obstructed the issue of the water. The drainage, however, having been intended for the purpose only of obtaining the marl, no artificial general improvement of the surface of this ground has yet taken place; but by every appearance, when it shall be done, the crops afforded will be uncommonly luxuriant, from the decomposed nature of the moss, caused by its being so long in a drained state. Mr Dempster has inclosed, levelled and dug over with the spade about six acres of it, which he means to sow with grass seeds next spring, without any corn crop.

Here are observable some holes which had been dug to the bottom of the moss, containing stagnated water, but now almost filled up again to the level of the general surface, by bog-moss or fog, (*Sphagnum palustre*), not yet solid,—a plain example of the quick re-production of peat-matter, by the growth of vegetables, of the moss or musci tribe.

It is also to be remarked, that the peat-earth at the bottom of this moss, which appears to have a small mixture of clay, is very solid, and, when cut into peats and dried, makes excellent fuel; and Mr Dempster observes, that firm peats of this sort, and particularly what is found on some of the High-

land grounds of Scotland, is very little inferior to coal. He burns such peats commonly himself, and has sold many hundred pounds worth to his neighbours from this moss. Their ashes also are valuable as manure, and, by slow and confined combustion, may be produced from the peat in considerable quantity.

The Moss of Dunichen, in the parish of the same name, now partly under culture, is situated near 400 feet above the level of the sea, in a small valley, kept wet like that of Restennet by a copious-spring of water, and also by surface waters, descending in rainy seasons from the higher grounds.

It consisted of fifty-nine acres, mostly of peat-soil, shallow at the margin, but deepening to fifteen feet towards the middle. The drainage of it, which was accomplished forty years ago, at the expence of L. 50, was originally intended merely for the purpose of procuring more easily peats for fuel, of which the country stood in great need. Beneath the peat-soil was found, on cutting a deep level, a layer of sand, mixed with a little mud, six feet thick, and immediately under the sand, in some places, beds of marl, mixed, however, considerably with sand.

On the subject of marl, as connected with moss, it may not be improper to observe, that though the common practice of searching for marl is by the boring-irons used in trying for coal and other hard mineral substances, yet Mr Dempster very judiciously advises rather to make use of a long wooden pole for this purpose, with an iron auger fixed to its end. This makes the operation of boring for marl both cheap and easy. A pole of twenty-five feet will, he thinks, be of sufficient length. If the moss be found to be deeper than this, it is easy to join another pole to the first, or to obtain a new one of greater length.

Shell marl is found in the bottoms of the generality of lakes, and of meadows and mosses which have once been lakes, throughout Great Britain and Ireland. It is the remains of myriads of those sorts of small testaceous animals, which commonly inhabit pools of water, and have lived and died in these situations.

Some of those shells are univalves, (generally *Helix*, animal *limax*, *Lin.*), others are bivalves, (generally *Tellina*, animal *tethys*, *Lin.*), and are frequently very entire when taken up; but after a short exposure to the atmosphere, they crumble into a fine whitish powder, which effervesces with acids, and is in fact no way different from powdered limestone. It is commonly more pure from foreign useless ingredients than most limestones. Some moss marl examined by Dr Coventry, Professor of Agriculture at Edinburgh,

Edinburgh, was found to contain 84 *per cent.* of pure chalk, or carbonate of lime, which is more than lime generally possesses, and the refuse of the marl was chiefly peaty substance, which makes the refuse of such marl of more use as a manure than that of limestone, which is generally sand or clay.

Shell marl may be converted into quicklime by burning: Its solution changes vegetable colours to green; and it possesses all the other properties of quicklime, and as such is used for building in many parts of England.

De Pagès, in his Travels, mentions, that the inhabitants of the south banks of the Mississippi make oyster shells serve all the purposes of limestone. And lands that receive manure from towns where much shell-fish is used, or that have shells in their soil naturally, or by being brought to them from a shelly sea shore, stand in no need of lime for their culture, and are not at all benefited by it.

Some naturalists, indeed, believe that all limestones, marbles, and other masses of calcareous substances, are derived from the remains of animals, and consolidated either in consequence of fusion by heat, or solution in water; and some of the finest limestones and marbles shew unequivocally that they are a congeries of shells of the ocean. Beds of these materials are frequently found near the summits of mountains, in which the shells that compose them can be distinctly traced and enumerated by the naturalist.

As a manure, shell marl uncalcined is therefore to be used as lime; but as in that state it is not so minutely divisible, and is not so soluble in water, it is of course more tardy in its operation. As a consequence, however, it remains much longer in the soil than quicklime. On the comparative value of shell marl and lime, Mr Lummis, in an Essay quoted in Maxwell's Husbandry, remarks, "Notwithstanding that lime is so very good manure, yet I prefer marl to it, because lasting five times as long, it is in the end much cheaper, although sometimes it is more chargeable at first than the other." Likewise it is obvious, that the quantity of calcareous matter in a boll of shell marl is more than double that in a boll of powdered quicklime. The price ought, therefore, to be more than double.

When Dunichen Moss was drained, it must have been covered with heath. The heath-turf, and the remnant of the stems and floriferous parts of the heath plants, are yet found everywhere on the surface. It had afterwards, however, from being long drained, acquired a sward of coarse grass. Beneath, there are found birch and alder trees, and large oak roots fixed in the sand, with the remains of musci, rushes, sedges and flags. Before the improvement of the surface was first conceived, it had been cut everywhere into deep pits for fuel. The levelling and digging of the surface of that part of it now improved, therefore became the first necessary operation. It was all dug over, and levelled with the spade, and division-furrows, at thirty feet distance,

were made down to the sand, for carrying the water into the main drains. These operations, by reason of its inequality of surface, cost L. 4 per acre, amounting to about L. 69, for digging and levelling near sixteen acres in summer 1800. In spring 1801, these grounds were sown with early oats, except a quarter of an acre planted with yams. The yams had the manure of dung administered to them; and though their haulms were cut off after they had sprung up, by a frost that did not affect the potatoes in the higher grounds, yet they grew up again, and a crop was produced more weighty, by double, than on any of Mr Dempster's best fields that season. The oats, indeed, which received no manure whatever, were too rank, and therefore lodged. The produce was sixty bolls Linlithgow measure, estimated at 15s. per boll, amount, - - - - - L. 45 0 0

The yams amounted to twelve bolls, of twenty stones Dutch weight each, at 5s. per boll, 3 0 0

L. 48 0 0

Deduct expence of the seed, and the labour of harrowing, . 14 0 0

Gain on the first year's produce, L. 34 0 0

For the second year's cropping, the moss supported a plough and horses even on the places that had been hollowed by pits. It was sown with early oats, except one acre sown with flax. The whole was laid down also with grass seeds. Though the produce of this crop of oats has not yet been ascertained, it is presumed it will be more than last year. It shall, however, be here put down the same as it was ascertained to be last crop, viz. sixty bolls, at 15s.,- - - - - L. 45 0 0

Lint, 15 8 6

L. 60 8 6

Deduct the expence of seed and labour, 25 8 0

Gain on second year's produce, L. 35 0 6

Add gain on the first year's produce, 34 0 0

L. 69 0 6

From this statement it is obvious, that an yearly rent of above L. 30 is by the improvement of sixteen acres of this otherwise useless piece of moss ground added to the produce of the estate in future, the two first years crops being sufficient to repay the expences incurred in improving it.

It is to be remarked, that the last crop of oats was so strong as to destroy partly the sown grass. This may be avoided, by sowing the ground in future with grass seeds in April or May, without a corn crop. Some patches also of the moss that had been hollowed for fuel, and levelled with coarse peat turf, seem to have had but a thin crop. That loss might have been avoided probably, if peat ashes had been mixed with the soil on the surface, or a top-dressing of an inch thick of sand or earth had been given it, or perhaps by heavy rolling alone. Nothing seems necessary further for rendering a peat-bog that has been so long drained as this a better or more productive soil. The crop of grass on it at present is most luxuriant; indeed, it is so beyond belief. But it is partly fine natural grass, the sown grasses having been in some places destroyed by the over luxuriance of the crop. It remains doubtful to Mr Dempster, whether, from its appearance of producing so great quantities of good grass, he will let it remain for pasture, or admit it into a due rotation of crops, as part of his farm.

Mr Dempster remarks, that the cultivation of the mosses of Scotland cannot fail to contribute greatly to the fertility and richness of the kingdom, and that it seems to be one of the safest speculations in which a proprietor or tenant can employ his money; more especially, since experience has proved, that the mere act of draining mosses is the principal expence attending their improvement; for while lime or other calcareous manures were understood to be necessary, its distance from many mosses, as well as the expence of purchasing it, might naturally deter prudent people from the undertaking.

As to the growth of trees on drained mosses, Mr Dempster observes, that on the dry parts of the Moss of Restennet, the Scots firs, the seeds of which had been blown from some neighbouring plantations of that wood, had not end grew very kindly, though they have since been destroyed by the pasturing of cattle in the moss, after attaining the height of two or three feet.

APPENDIX F.

Copy of MINUTES of the Proceedings of the Barony Court of Lowre.

Court of the Barony of Lowre, holden at the Mansion-house thereof, this 19th day of April 1742 years, by David Thom at Lowre, baillie specially constitute by Patrick Carnegy of Lowre, heretable proprietor and baron of the said barony; William Ker, writer in Forfar, clerk constitute by the said Patrick Carnegy, and William Stewart, appointed officer.

Curia legitime affirmata.

THAT which day the said Patrick Carnegy represented to the judge, That the tenants had been in a practice of allowing their bestial to break in upon the inclosures in the moss, and destroy the ditches and hedges of the same, and eating up the grass thereof, to the great prejudice of the said Patrick Carnegy, and craved an act of the Baron Court might be made, prohibiting the said tenants of Lowre from such a practice, under the several penalties mentioned in the acts of Parliament made for preserving inclosures, &c. ; which the said judge took to consideration, and found reasonable: And therefore enacted, and hereby enacts, That no tenant, or any other person within the ground of Lowre, shall presume or take upon them to allow any of their bestial, such as horses, nolt, cows, or sheep, break in over the ditches and hedges of the said inclosures, or any other inclosures belonging to the said Patrick Carnegy, either in summer or winter, under the penalties mentioned in the said acts of Parliament, rigorously to be exacted: And appoints this act to be immediately intimated to the said tenants, convened in face of Court, that none may pretend ignorance; which was accordingly done.

(Signed) *Will Ker*, Clerk. *David Thom*, Baillie.

[The same Court ordained Agnes Goodale to make payment to Patrick Carnegy of certain arrears of rent, on pain of poinding, she being held as confessing the justice of the claim, by not appearing, after being duly summoned.] “ And ordains precepts and executorial to pass, and be directed hereon for that effect.”

Court

Court of the Baronie of Lower, holden at the mansion-house thereof, this 7th day of June 1742 years, by William Ker, writer in Forfar, Judge specially constitute by Patrick Carnegie of Lower: to which court William Lyon, son to Mr William Lyon, advocate, is appointed clerk, and John Ogilvy of Pitmowes, procurator-fiscal, and William Stewart, officer.

Court lawfully fenced.

The which day the said fiscal gave in a complaint against Alexander Hutchon and Robert Forbes, both in the ground of Lower, mentioning, That they and each of them had, upon Saturday the 5th of June current, in manifest contempt and open breach of his Majesty's peace, fallen on one and other, and violently beat each other, to the great effusion of blood: Therefore, craved each of 'em should be fined and ammerciat in the sum of L. 50 Scots, and ordained to make payment of the same to the said procurator-fiscal, in terror of others to commit the like in time coming.

John Ogilvy, Fiscal.

The said Alexander Hutchon and Robert Forbes being lawfully summoned by the ground-officer to compare day and place foresaid, to answer to the above complaint, they compared accordingly. And the said Alexander Hutchon being interrogate, Whether or not he was guilty of beating the said Robert Forbes to the effusion of blood? He judicially acknowledges that he gave him a stroke or more upon the head, which occasioned a wound, from which blood issued; the said strokes being given with a staff, which was thereby broken. And in like manner the said Robert Forbes being interrogate, Whether or not he had beat the said Alexander Hutchon, or wounded him to the effusion of blood? He denied the same; and the said Alexander Hutchon acknowledged he was not guilty thereof.

(Signed) *Will. Lyon, Clerk. Will. Ker, Bailie.*

The Judge, in respect of the above judicial acknowledgment of the said Alexander Hutchon, fines and amerçiates him in the sum of L. 50 Scots moneey, and ordains him to make payment thereof to the said procurator-fiscal within term of law, he being lawfully charged thereto *apud acta* by the officer, under pain of poinding: And hereby assoilzies the said Robert Forbes from the libel.

(Signed) *Will. Lyon, Clerk. Will. Ker, Bailie.*

[A tradition that this court put a man caught in the act of theft in the thumb-stocks,—an instrument which compressed the thumbs, and detained the culprit as an object of derision to spectators. Of this no record is left, nor of any severe corporal or capital punishment.]

Courr

Court of the Barony of Lower, holden within the laigh dining-room thereof, upon the 26th day of July 1742 years, by David Thom, in the Mains of Lower, baillie specially constitute by Patrick Carnegie of Lower, heretable proprietor thereof, John Jaffray, writer in Forfar, clerk, James Ross, servant to the Lady Lower, fiscal, and William Stewart in Cottown of Lower, officer

Court lawfully fenced and affirmed.

The which day the said James Ross, fiscal of Court, gave in a complaint to the baillie against Thomas Hendry in Loanend of Lower, and Alexander Hutchon in Southward, That on Friday last, the 23d day of this instant, they, in the town of Dundee, within the dwelling-house of James Mathie, had beat, wounded, bled and bruised each other; and therefore craved, that each of them should be fined and amerciat in the soum of L. 50 Scots money. The said Alexander Hutchon being lawfully summoned to this day and place, accordingly compeared in face of Court, and being interrogate, Whether or not he beat, bled, wounded or bruised the said Thomas Henry? To which he answered, He was innocent, and noways guilty. The fiscal offered to prove the same by his oath. Accordingly, being solemnly sworn and examined, depones, That he neither beat, wounded, bled or bruised, the said Thomas Henry; but confesses that there was high words betwixt them, and that he is not positive but he took the above Thomas Henry by the breast: Confesses he was in liquor; and that it's rumoured in the country there was a plee betwixt them. And this is truth, as he shall answer to God. Depones he cannot write.

(Signed) *John Jaffray, Clk. A. H. David Thom,*

The Judge having considered the complaint, with the deposition of the said Alexander Hutchon, finds the blood not proven; but fines and ammerciates him in the sum of L. 10 Scots; and ordains him to make payment thereof within the term of law, for which he was warned *apud acta* by the ground-officer.

(Signed) *John Jaffray, Clk. David Thom.*

Eodem die.

William Stewart, ground-officer, made affidavit, That he summoned the within Thomas Henry to this day and place; and being called three times, and not compearing, the Judge fines and ammerciats him in the sum of L. 10 Scots, and ordains him to be cited of new.

(Signed) *John Jaffray, Clk. David Thom.*

Court continued to Friday next, the 30th instant.

Forfar Report.]

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At

At and within the laigh dining-room of Lower, the 30th day of July 1742 years, the within David Thom, constitute bailie by Patrick Carnegie of Lower, John Juffray writer in Forfar, clerk, James Ross within designed, proctor-fiscal, and William Stewart, officer.

Court lawfully fenced and affirmed.

The proctor-fiscal resumed his complaint against the said Thomas Henry, for beating, wounding and blooding the within Alexander Hutcheon. Compared the said Thomas Henry in face of Court, being lawfully summoned to this day and place; and the fiscal offered to prove the complaint by his oath, which he refused to give. The Bailie, in respect whereof holds him as confess, and decerns him again in L. 10 Scots money of fine, and ordains him to make payment thereof within the term of law; to which he was wazned *apud acta* by the ground-officer.

(Signed) John Juffray, Clk. David Thom.

Court of the Barony of Lower, holden at the mansion-house thereof, this 29th day of December 1742 years, by Patrick Gray, surgeon in Forfar, Judge specially constitute by Patrick Carnegie of Lower, to which court John Ogilvy of Pitmues is appointed clerk, Patrick Carnegie, procurator-fiscal, and William Stewart, officer.

Court lawfully fenced.

The which day Patrick Carnegie, procurator-fiscal, represented to the judge, that several of the tenants of the said barony absent themselves on court-days, contrary to an act of the said court: Therefore, the said Patrick Carnegie craves that, each absent person should be fined and amerciated in the sum of L. 10 Scots, to deter any one to absent himself in time coming. The judge having taken it into consideration, does fine and amerciate each of the following persons in the sum of L. 10 Scots each, viz. George Maxwell in Crook, Jean Ramsay, Robert Forbes, Robert Hodge, and Agnes Wroster in the Cottown of Lower, James Robert in Cottown, also Thomas Henry in Lone-end, James Hutcheon in Southward, Alexander Hodge, David Dalgy William Ker in Newmuir, and David Lowson in Muir's-nook of Lower, and ordains them to make payment of the said fine in term of law.

(Signed) John Ogilvy, Clerk. Pat. Gray.

Court of the Barony of Lower, held within the Mansion-house thereof, upon this 6th day of April 1744 years, by Andrew Brown, tenant in Mains of Lower, Judge appointed by Patrick Carnegie of Lower, proprietor; and to which court Andrew Binny, town-clerk of Forfar, is appointed clerk, James Ross, procurator-fiscal, and William Stewart, officer.

Court lawfully fenced.

The said Patrick Carnegie, with the whole tenants of the barony present, represented to the Judge, That Nicoll Fauld, the millmaster of the barony, had set aside William Smith, the miller, from his service, and engaged a young man to serve in his place at Whitsunday next. And the master and tenants having confidence in the said William Smith's honesty and sufficiency, do recommend it to Nicoll Fauld to continue him at the mill, and to quit the young man he had engaged; which the Judge ordered the officer to represent to the young man.

(Signed) *Andrew Binny*, Clerk. *Andrew Brown*.

[Next follows a long minute of a court held 2d November 1747, in which a great number of tenants are ordained to pay up certain arrears of rent therein specified, on pain of pouding, and other legal execution.]

Another court, held 2d December 1747 years, fines all the tenants in the barony in the sum of L. 5 Scots money for each offence, for going into a large broom park under cloud of night, pulling up, and otherwise destroying the same, to the great hurt and prejudice of the said Patrick Carnegie.

At a court held 29th June 1752, Patrick Carnegie complains of the tenants setting houses to people who cast his moss and muir; and of their keeping sheep, to the injury of the land in his own possession. The first is prohibited under a penalty of L. 6 Scots, *toties quoties*. The keeping of sheep is prohibited under a penalty of L. 3 Scots for each trespass.

The millmaster complains of corn carried from the barony, without paying his multures. Those who have done so, ordered to pay their multures; and those who abstract corn in future, to pay such penalty as the Judge may determine, over and attour their dry multures.

[*Copy of the Minutes of a Court which are engrossed on a separate sheet of paper.*]

Court of the Barony of Lower, held within the Mansion-house thereof, upon the 10th day of August 1744 years, by Andrew Hacknow in Cottown of Lower, Judge appointed by Patrick Carnegie, proprietor, and to which court David Nicoll, servant to Andrew Binny, town-clerk of Forfar, is appointed clerk, James Ross, servant to Lady Lower, procurator-fiscal, and William Stewart, appointed officer.

Court lawfully fenced.

There was a complaint given in by the proprietor, Patrick Carnegie, against Thomas White, in Moss-side of Lower, for cutting and sueding some trees in his yard, in the month of July last, without liberty asked or granted, and contrary to the act of Parliament made anent the preservation of planting: Ordered to give the officer sixpence. The said Thomas White being called, judicially acknowledged his being guilty of the above complaint given in against him. The Judge, in respect of the above acknowledgment, especially in being guilty of the like at such a time of the year, fines and amerces him in the sum of L. 30 Scos, to be payed to the procurator-fiscal of court, in terror of others to commit the like in time coming; and likewise ordains him to make payment thereof within the time prescribed by law. to the said procurator-fiscal foresaid.

(Signed) *A. Hackney*, Bailie.
David Nicoll, Cleric.

Eodem die.—There was a complaint given in by Patrick Carnegie. That upon Thursday last, the 9th current, that Isobel Bennet, spouse to Robert Forbes, and Agnes Thair, spouse to David Cargill, both in Cottown of Lower, did, in a furious manner, not only give base and opprobrious language to each other, but also beat and bled one another, to the great effusion of their blood.

Compeared Agnes Cauty, spouse to Alexander Arnot, witness cited, purged of partial council, examined and interrogate, depones, That she saw Agnes Thair throw a stone at Isobel Bennet, which hit her on her thigh; and thereafter she saw the said Isobel Bennet tear and pull off the matches from off Agnes Thair's head, and both beat one another. And this is the truth, as she shall answer to God. Depones she canpot write.

Compeared Jeanet Arnot in Cottown of Lower, witness cited, purged of partial council, interrogate, depones conform to the precedente *in omnibus*. And this is the truth, as she shall answer to God. Depones she cannot write.

The

The Judge, in respect of the above depositions of witnesses, finds both the parties guilty of both beating and blooding of one another, and fines and americiates them in the sum of L. 50 Scots each of them, and to make payment thereof to the procurator-fiscal of court; they being lawfully cited to make payment thereof by the officer *apud acta*.

(Signed) *A. Hackney, Bailie.*
David Nicoll, Clerk.

Complains Alexander Arnot against Andrew Douglas, both indwellers in Cottown of Lower, That contrary to his express orders, the said Andrew Douglas, again and again, pesters down all his corn, and pulls up, not only all his thistles, but also the corn, and ought to be fined for his numerous transgressions, and discharged to commit the like in time coming; and also that he was guilty in stealing the leet of peats out of the moss, and also ought to be fined therefore.

The said Alexander Arnot having no witnesses to prove the above complaint, refers the same to the defender's oath: For which he refuses to depone. The Judge, in respect whereof, fines him in the sum of L. 12 Scots for the above two transgressions, and ordains him to make payment thereof to the procurator-fiscal, under pain of poinding, he being charged so to do, by the officer.

(Signed) *A. Hackney, Bailie.*
David Nicoll, Clerk.

APPENDIX G.

LINEN MANUFACTURES.

QUERIES for Mr GILLIES from Sir JOHN SINCLAIR, Baronet.

1st, What was the price of flax for Osnaburghs, as sold to the weaver when the bounty was originally granted?

The bounty was originally granted in the year 1743. A particular quality of flax (Rakitzter) sold from that year to the year 1783 at 36s. to 38s. per cwt. to the weaver.

2d, What is the price now?

The same quality of flax now sells at 50s. to the weaver. The difference in the price of other qualities of flax is much in the same proportion.

3d, What is the difference in the price of the manufactured article now and formerly?

At an average for these two years past, the prices of Osnaburghs do very little if any thing exceed the prices when the bounty was granted.

4th, Where does the raw material come from?

From Russia only.

5th, Can it be raised in this country to advantage?

In the opinion of many people extremely well informed on this subject, it may; and why should it not? Ireland, I am told, now raises flax sufficient for its own supply.

6th, What ships, and tonnage, and seamen, does the importation of the raw material employ?

It is not easy to answer this with accuracy, as the ships in which the flax is brought to Scotland are not constantly employed in that trade, and some of these make one voyage, some two voyages in the season; few make more than two. However, a voyage to Riga, Petersburg or Narva, will employ a vessel at an average ten weeks or three months. A vessel of 84 tons measurement will not bring home more than 50 to 60 tons of flax. Such a vessel will also require six or seven men and boys. Now, 3000 tons of flax are imported into Angus-shire only. The tonnage therefore employed for

ten weeks or three months in the year, cannot be less than 4,500 to 5000 tons measurement; the men not fewer than 400 to 500; the number of vessels are sixty to eighty.

7th, Is there any exportation to compensate for the importation of the raw material from Russia?

None that I can learn of from Scotland *.

8th, What number of persons are employed in the manufactory?

How many men?

How many women?

How many children?

How many parents of families?

How many in towns?

How many in villages?

How many in the country?

Without attempting to ascertain the number of each description, (in which I could by no means be accurate), I may very safely say, that in Angus-shire only, there are employed in the linen manufacture from 20,000 to 25,000 people. Many of these reside in the towns of Dundee, Arbroath, Brechin and Forfar; but many, and I believe the greater number, are scattered through the villages and the country, where every one has a garden, and generally an acre or two of ground. As their trade admits, without prejudice, of short interruptions, they cultivate these little farms very successfully, greatly to the benefit of their own health, and the improvement and beauty of the country. As weaving may be carried on in any place, so all ages and each sex are employed by it. The women spin; the men weave; and the children who are able to do any thing, are able to fill the yarn.

9th, What bounties do the Irish give?

The bounty is the same on *British* and *Irish* linens exported from Great Britain, and it continues on both for the same time; that is, to the 24th of June 1788, and to the end of the then next session of Parliament. Each yard of British or Irish linen exported from Great Britain to Africa, America, Spain, Portugal, Gibraltar, and the East Indies, made of hemp or flax, of the width of twenty-five inches or more, and not under 5d. in value, is

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entitled

* I am informed, that the ships employed in the importation of flax from Russia to England, particularly to the port of Hull, carry out large quantities of woollen cloths, and Manchester, Sheffield and Birmingham manufactures; also Burton ale, and other malt liquors.

entitled to $\frac{1}{2}$ d. of bounty on exportation; of the value of 5d., and not more than 6d., 1d.; and of the value of 6d., and not more than 1s. 6d., $\frac{1}{2}$ d. Each yard of checked and striped linen, from 7d. to 8d. in value, and of the width of twenty-five inches, is likewise entitled to a bounty of $\frac{1}{2}$ d. on exportation; and every square yard of diapers, sheeting, huckabacks, and other linens upwards of one English yard in width, and not more than 18d. per square yard in value, to a bounty of 1 $\frac{1}{2}$ d. on exportation. By the act 21st Geo. III. these bounties were further extended to British and Irish buckrams and filletings, and to British calicoes and cottons, or cotton mixed with linen, printed or stained in Great Britain, of the breadth of twenty-five inches or more, which, before printing, painting or staining, was of the sort that entitles plain linen to bounty, and this for so long as the Irish Parliament continue their bounty to the same articles.

11th, What other advantages do the Irish enjoy?

12th, Do they raise the raw material?

13th, What is the difference in the price of labour?

I am not able by any means to answer these queries in the manner their importance requires. But the Irish have our bounties, and they have particular bounties of their own, the extent of which I have not learned. They raise the raw material, and their labour is considerably, though I cannot say in what proportion, lower than ours. They seem to me to have the advantage in every thing.

14th, At what price can other nations afford Osnaburghs?

15th, Is there any duty on foreign Osnaburghs, when exported to the West Indies?

German Osnaburghs are imported into Scotland and England, and from thence re-exported to the West Indies. On importation, they pay a duty of 24s. for 120 ells, and on re-exportation, drawback of that duty 22s.; so the duty they pay on exportation is about 10 per cent., notwithstanding which they are still able in some degree to compete with us, although we have nearly driven them out of the market, and will no doubt do so wholly, if the same encouragement that has been hitherto given be continued to our manufacture. I have not been able to procure an account of the average price of German Osnaburghs for a year; but it is of less consequence, as one can judge from the before-mentioned circumstance of their comparative cost price (to the manufacturer) to ours, and will perceive how certainly Britain would lose that valuable manufacture were the bounty taken off.

16th, From what duty is the bounty paid?

17th, Is the whole duty exhausted by the bounty?

The bounty was first payable out of the duty on foreign cambrics imported; which fund falling, by the prohibition of French cambrics and lawes

in the year 1748, it is now payable out of any of the duties, revenues or customs.

18th, What is the total price of the raw material ?

It is calculated, that into the county of Angus there is imported annually 3000 tons of flax, prime cost L. 110,000 Sterling, or L. 36 : 13 : 4 per ton.

To judge of the gain to this country by manufacturing for exportation, let it be supposed that 1000 tons of flax are manufactured into cloth for exportation ; the prime cost of the flax, at L. 36 : 13 : 4 per ton, is L. 36,666, 13s. 4d.

19th, What is the total price of the manufactured article ?

1000 tons of flax manufactured into Osnaburghs, shirtings and sheetings, entitled to bounty, will produce 4,100,000 yards, which, reckoned at 7½d. per yard, (which is a low valuation), amount to L. 128,125.

20th, What is the total amount of the bounty ?

On 4,100,000 yards, at 1½d., it is L. 25,625. Now this country pays to Russia for the raw material, say for 1000 tons of flax, L. 36,666 13 4
Government pays for the bounty on the linen made from

these 1000 tons,	-	-	-	-	25,625 0 0
Paid for the raw material, and of bounty,					
					L. 62,291 13 4
This country draws from foreign parts,					
					128,125 0 0
Gain by manufacturing 1000 tons of flax,					
					L. 65,833 6 8

MEMORIAL, representing the expediency and necessity of continuing the present duties on Foreign Linen, and the bounties granted by Parliament on the exportation of British Linen, and enacting the same for a fixed period of years, humbly submitted to the Right Honourable the Lords of the Committee of Council appointed for the consideration of all matters relating to Trade and Foreign Plantations ; by the Committees of the Merchants, Manufacturers, and Dealers of Linen in the shire of Forfar, North Britain, specially appointed for that purpose.

The great importance of the linen manufacture of Britain has been so often acknowledged by the Legislature, and has been so frequently the subject of parliamentary discussion, that it requires no prefatory explanation. It is the staple manufacture of Scotland, and the source of its improvements and most useful wealth. It has amounted in one year to 19,138,593 yards, value

value L. 932,617 : 1 : 11 of linen legally stamped for sale ; but on the most circumspect estimation of what is manufactured, and not stamped, and of that which is made for consumpt in the country, the amount, when added to what is stamped, has been found to be little short, on an average of late years, of thirty millions of yards, in value nearly L. 1,600,000 *per annum*, employing and supporting about 200,000 people. We believe that the amount of the linen manufactured in England is still greater.

The basis on which the linen manufacture of Great Britain rests, is without doubt the duties on foreign linens imported, chiefly imposed by the act of tonnage and poundage, 12th Charles II. Had these duties operated according to the apparent intentions of Government, and been duly proportioned and levied, the encouragement must by this time have proved effectual, and the British linen manufacture been enabled fully to supply the home consumpt. But such effect is very far from being produced, having been prevented in part by ignorance of, or inattention (when the act first passed) to, the real value of the foreign-linens, by which the duties were to be paid, and by too great a complication and subdivision of the denominations, (to the number of sixty, it is said,) which have proved too abstruse for official practice. The effect has moreover been partly obstructed by the decrease in the value of money, and the improvements in the fabric of German linen, from whence the real cost is still more above the rates established in the act. But what has principally opposed the natural operation of these duties, has been the shameful elusive artifices practised by the importers of foreign linens, in entering higher denominations for a lower, &c. by which the revenue has been defrauded of nearly one-half of the intended duties. From these causes, and from our not producing the raw material by our own agriculture, (which ought to be an object of vigorous national encouragement), our linen manufacture has hitherto struggled with many and great difficulties. It is, however, valuable in its present state, and, if protected by the continuance of well regulated encouragement from Government, it will in time supply all the demands of our consumpt and trade. But it has still many internal disadvantages to combat, and a competition to struggle with against those countries which have been long in the possession of the manufacture, and wherein taxes, living, labour and material, are all much lower than in this country.

In this situation of the manufacture, should those duties, which are even now unequal to their purpose, be in any degree diminished, our linen manufacture would speedily be annihilated, and thereby all our former exertions and expence rendered fruitless.

But the object to which the attention of your memorialists is at present particularly called, and to which it is the purpose of this paper to solicit the
attention

attention of your Right Honourable Board, is the bounty granted by Parliament on the exportation of British made linens; for by that being renewed for one year only, we apprehend some alteration or diminution of it may be in the contemplation of his Majesty's ministers.

However useful the duties on foreign linens were in promoting our home manufacture, by affording it a chance of gradually supplying our own consumption of linen, yet, as those duties are almost wholly drawn back on exportation, they could be of little or no service in encouraging our own manufacture of linens for the export trade. So little, indeed, had the advantage of gaining to ourselves such exportation been attended to by Government, that until repealed by the act 3d George I., our home manufactured hempen and linen cloth had paid on exportation a duty of 6d. every forty ells. Conformably to act 12th Charles II. and the book of rates, undressed flax was next year freed from duty. And at length, the importance of the export trade in linen having been maturely weighed, Parliament, in 1743, granted a bounty of 1d. per yard on all British and Irish linens of the value of 6d., and not exceeding 1s. per yard, exported to Africa, America, Spain and Portugal; and $\frac{1}{2}$ d. per yard on every yard under 6d., for the term of seven years; and in 1745, this bounty was farther increased and altered, to 1d. in all, on every yard of such linen, value from 5d. and not exceeding 1s.; and $\frac{1}{2}$ d. on that from 1s. and not exceeding 1s. 6d. per yard, exported to the above-mentioned countries, with addition of Gibraltar and Minorca.

These bounties being payable out of the duties on foreign cambrics imported, and that fund falling by the total prohibition of French cambrics and lawns in 1748, they were, in 1750, (act 20th and 22d Geo. II.), continued only for three years, payable from incidental funds, and a sum for the payment granted annually by Parliament in aid; at the expiration of which term, in 1754, the bounties were permitted to lapse. But this measure being pregnant with the most distressful and ruinous consequences, Parliament found it highly expedient, 29th Geo. II.; to renew the bounties from the 24th June 1756, payable out of any of the duties, reverses or customs, viz. to British and Irish linens exported to the same places as before, and the East Indies added, of the width of twenty-five inches or more, and not under the value of 5d. per yard, a bounty of $\frac{1}{2}$ d. per yard, and to those of the value of 5d., and not more than 6d. per yard, a bounty of 1d. per yard; and of the value of 6d., and not more than 1s. 6d., a bounty of $1\frac{1}{2}$ d. per yard, and that for the term of fifteen years. In the year 1770, *anno* *decimo* Geo. III. they were farther continued to June 1778, and end of next session of Parliament; with an extension to checked and striped linen, from 7d. to 1s. 6d. per yard in value, and twenty-five or more inches wide, of a bounty of $\frac{1}{2}$ d. per yard; and of $1\frac{1}{2}$ d. on every square yard of diapers, haccabacks,

kabacks, sheetings, and other linens, upwards of one English yard in width, and not more than 1s. 6d. per square yard in value. By act *anno* 19^o of this reign, these bounties were farther continued to 1786, and end of ensuing session; and the property before then being restricted to persons residing in Great Britain or the American Plantations, it was now extended to persons residing in Ireland. By the act 21st Geo. III., these bounties were farther extended to British and Irish buckrams and filletings, and to British calicoes and cottons, or cotton mixed with linen, printed or stained in Great Britain, of the breadth of twenty-five inches or more, which, before printing, painting and staining, was of the value that entitles plain linen to bounty, and this for so long as the Irish Parliament continue their bounty to the same articles; and by an act last year, the bounty act nineteenth of his present Majesty, was continued to the 24th June 1788, and to the end of the then next session of Parliament. It is on these acts that the linen manufacture of this county is founded; and hence is derived its general prosperity, for our manufacture consists almost wholly of Osaburghs, sheetings, soldiers' shirtings, and other coarse articles drawing bounty.

To prove this more particularly, we must request your Lordships' permission to lay before you a few facts, forming a comparison between the state of this country when the bounty was first granted, and its present condition; and we do not doubt that the other counties where the linen manufacture has been established, have experienced a no less favourable change.

In 1743, the linen manufacture was indeed our chief one, but yet at a very low ebb. The amount of linens stamped for sale from 1st November 1741 to 1st November 1742, was 1,140,933 yards, value L. 28,298 : 12 : 9; and including what were not stamped, and what was made for our own consumpt, did not exceed, together with other manufactures we possessed, the annual amount of L. 60,000. Our agriculture was in the most unimproved state:—Our people unemployed, depressed by idleness, and comparatively few in number:—Our shipping few, and these mostly employed in the coasting trade in foreign seas:—The rents of our lands were low; money difficult to be procured:—Our consumpt of English commodities and manufactures trifling; and in short, we shewed no symptoms of our being in a thriving situation. The duties of excise paid by the whole country was only L. _____; and the duties of customs amounted to no more than L. 3089, 8s. *per annum*. From this gloomy state, we turn with pleasure to contemplate the more animating prospect of the era in which we write.

Notwithstanding the interruption occasioned by three foreign, one civil, and the colonial war, we now possess a busy manufacture, a brisk com-

merce, more extended navigation, an agriculture highly improved, beneficial industry, and a productive revenue. The amount of our linens stamped for sale, from the 1st of November 1785 to the 1st of November 1786, was 7,438,816 yards, value L. 222,243 : 16 : 7, sail-cloth not included; to which, if we add the linens which were not stamped, and made for home wear, the aggregate will not be less than from eight to nine millions of yards, and L. 290,000 value. The amount of our other manufactures for trade, are not short of L. 100,000 *per annum* more. Our exports of corn and black cattle are also very considerable; and we employ three times the amount of shipping we did in 1743. We import from the Baltic about 3000 tons of flax annually, prime cost L. 110,000, each ton of which, when manufactured, leaves the country, in freight, wages, and manufacturing, from L. 50 to L. 60 per ton. Our imports of English manufactures and commodities, are not less than L. 200,000 *per annum*. With regard to population, we possess the advantage of having actual enumerations of the inhabitants of Dundee, taken with much attention by the clergy of the town. About the year 1743, they were estimated at 7000: In the year 1766, they amounted to 12,426: In the year 1781, to 15,689; and in the year 1787 to 19,298. The neighbouring towns of Forfar, Arbroath and Brechin, and the market-towns of Cupar-Angus and Kirriemuir, have, we believe, increased nearly in the same proportion. In the whole county, we have reason to believe there is more than twice the number of people there was in 1743. Their productive industry is more than doubled; and since that period, the rents of land have risen almost in a threefold proportion. We now pay into the revenue for duties of customs L. 7829, 12s.; and for those of excise L.

per annum. The profits on our trade and manufactures, though not exorbitant, are equally dispersed among the industrious; and our people in general, though not what may be called rich, yet wear the appearance of sobriety and active labour, are decently lodged, and moderately, but sufficiently clothed and fed. That this remarkable alteration is solely to be ascribed to our linen manufacture, we do not pretend to affirm. Scotland in general has no doubt been greatly benefited within the period alluded to, by the more general extension of constitutional liberty. The abolishing the remains of the feudal system, and by the laws which a wise policy enacted for promoting greater personal independence, and establishing greater safeguards to property. Much praise is also due to the landed interest, for improvement of our agriculture. The establishment of the British Linen Company in 1746, was also of material service to our manufacture; yet that the largest share of our prosperity has been derived from the linen bounty, is manifest beyond any possibility of doubt; it is that which has essentially supported and promoted our linen manufacture, the source of all our other improvements.

But

But requesting leave to detail more particularly the effects of the bounty, we shall observe, that two-thirds of the linens made for sale in this county are and have long been of the denomination named Osnaburghs, which constitute a capital part of our exports to the West Indies, and all of which were formerly manufactured in Westphalia. With the assistance of the linen bounty, and by much persevering industry and exertion, we have carried this manufacture to a considerable extent, and greatly reduced the importation and export of German Osnaburghs. Indeed, on the face of the Customhouse entries they have almost disappeared; but it is asserted, that the importers of foreign linen practise in small with regard to this fabric, what they carry to a much greater extent in the finer fabrics, and to save some tenths of a penny per ell in the duty, instead of entering them as Osnaburghs, which have a specific rate, they enter them under the head of narrow German linen.

It appears by the Customhouse books, that prior to the year 1746, British linen formed so little an article of the export trade, that the whole quantity exported from England never amounted in any one year to 200,000 yards, nor in Scotland to 90,000 yards; whereas on an average of ten years, from the 5th January 1776 to the 5th January 1786, the British linen drawing bounty exported from England, has been 5,315,354 yards, and from Scotland, on an average of the same period, 2,579,067 yards; and it is to be observed, that the greatest part of this extraordinary increase of export, both of England and Scotland, consists of Osnaburghs and Silesia linen, the first made in this county, and the last in the neighbouring ones of Perth and Fife. The quantity of Osnaburghs made in Scotland, by the books of the Trustees for Manufactures, appears never to have been more, prior to the year 1746, than 10,000 yards *per annum*; but for many years past, it has amounted to from four to five millions of yards annually. The effect of the bounty on our export linen trade, will appear conspicuously from the following statement, taken from the public accounts. The quantity exported from England, drawing bounty, was in

1743,	52,779 yards.
1753,	641,510 yards.
1763,	2,308,310 yards.
1773,	5,868,238 yards.
1783,	8,867,915 yards.

In 1754, when the bounty, from the failure of the fund, and political causes, was allowed to lapse, it occasioned very ruinous consequences. A gentleman who wrote near the time, and who had particular opportunities of observing, describes them in a very pathetic manner, lamenting "that thousands of looms stood unemployed; and that many thousands of weavers, spinners, and work people were in a starving condition; of the men, some emigrated, and some enlisted as soldiers," &c.

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The exports of linen immediately decreased two-thirds, and the manufacture sunk almost to nothing, notwithstanding the manufacturers strained every nerve to keep their weavers employed, in full hopes the bounty would again be renewed; yet in this county, when the linens made for sale in the year 1753, amounted to 3,058,644 yards, value L. 87,286, in 1755, they amounted only to 2,298,846 yards, value L. 58,808. Had they increased in the yards and price in proportion to the progress they were making prior to 1754, and as they continued to do after the renewal of the bounty, they would have been 3,825,569 yards, value L. 122,449. In 1753, the amount of the Osnaburgh manufacture in Scotland was 1,089,865 yards: in 1755, only 430,977 yards; but according to its accelerating progress prior to 1754, it would have amounted to 1,863,709 yards.

Although the bounty was renewed early in the 1756, yet the linen manufacture did not recover this temporary interruption in the 1753 until the year 1758,

If such, then, were the effects of a short suspension, the ruinous consequence of any event of similar tendency now, would be aggravated in proportion to the wider extent of the manufacture.

The high charges and duties in the Russian ports, from whence our flax is brought, adds a farther necessity for the continuance of the bounty, in order to counteract them, for they amount to about 18 *per cent.*, the Court of Petersburg having heightened those duties very greatly of late years,—a circumstance no doubt adverted to by our Government. Indeed, from the pressure of these heavy duties and charges, and from the extravagant price of foreign flax, which has been raised 30 *per cent.* since the period when the first bounty-act was passed, it would appear to be very essential that our Legislature should give effectual encouragement to flax husbandry in Great Britain; for which purpose, a plan to collect the full duties payable by law on the foreign linens imported, would supply a sufficient fund. The reasons for encouraging the hemp culture are equally, or even more, cogent; but until it can be raised in sufficient quantity, the permitting hemp to be imported duty free, in like manner as flax, would be of great advantage to the coarse linen manufacture.

When we consider the preceding relation of the advantages derived from the linen bounty, in a national light, as well as respecting this particular county, we cannot bring ourselves to think that the general arguments in opposition to it will be allowed to have any influence; and indeed, unless we are very much mistaken, such as we have heard will not appear forcible to your Lordships, nor bear discussion, seeming rather to be derived from the refinements of a system, than from a knowledge of real business.

The most ingenious theories have their day; they seem, like our dress, to be under the absolute dominion of fashion, retaining their vogue only till they

they are overturned by the speculation of some newer and more engaging theorist.

The subject of this memorial appears to us to require no very refined reasoning, but to have its foundation on plain common sense. We are emboldened, therefore, to trouble your Lordships with a very few observations upon it.

Experience has shewn the wisdom of the Legislature in granting bounties on the exportation of linens manufactured in Britain. A great branch of manufacture is in a train of being snatched thereby from the hands of foreigners, and planted in our own country: without this measure, which puts us more on a footing with the Germans, this manufacture would either never have been attempted, or the attempt must have proved abortive. It subsists, therefore, by the aid it has received from Parliament; and the question, How long Parliament ought to continue the aid? seems to admit of this general answer: The aid of Parliament ought not to be withdrawn, until this valuable manufacture has acquired strength enough to maintain its ground without such aid, provided there be a probability of it ever acquiring this degree of strength, which we believe there is. That this period is not yet arrived, we are very confident; for it will be found, that if the duties on foreign linens were to be reduced, these linens would be sold cheaper here in Great Britain than any we could manufacture. The quantity of foreign linens vended in Great Britain, considerable as the duties are, is a proof of this assertion, which cannot be refuted. The same reasoning is equally applicable to the sale of foreign linens for exportation; many of them are still exported in preference to our home manufactured linen. But were the bounties on the exportation of our own withdrawn, it is certain the exportation would be wholly of foreign linen. We are therefore humbly of opinion, that any alteration at present of the system of duties and bounties, would prove as fatal to our linen manufacture as it would have done at any former period. It is difficult for us to assign the precise time when the present system may with safety be altered; but we very humbly beg leave to mention, that in our opinion there are strong reasons to prevent even the most rigid economist of public money from being too impatient for the arrival of that period. It appears by the public accounts, that when these bounties were first granted, the gross produce of the duties of excise and customs of Scotland did not exceed L. 150,000 a-year; that these branches of the public revenue have been in a gradual state of progression ever since, and now amount to no less a sum than L. 600,000 a-year. We know the prosperity of this part of North Britain to be in a high degree owing to the increase of the linen manufacture. The bounty for its encouragement, far from operating to the diminution of our revenue, has conduced greatly to its increase, and has returned fourfold to the Treasury what it has drawn from
thence,

thence. Of this great and important truth, we are so fully persuaded, that we could almost venture to rest the continuance of these bounties on the financial arguments in their favour; more especially when we can with truth assert, that the ability of Scotland to pay her taxes has increased far beyond the taxes themselves.

As to any particular answer to the question, When it may be expected that this manufacture will be able to subsist without bounties, it will be more becoming in us to mention such facts as seem to us to render this event probable, than to deliver any positive opinion on the subject. It is within the memory of persons now living, that any fine linen was manufactured in Scotland: Holland and Flanders supplied us exclusively with that commodity. Fine linen, when first made in this country, was manufactured at a great expence, and sold considerably dearer than it now is; its price has been gradually falling ever since the manufacture of it began. This we impute not unjustly to our people having acquired more skill, and better methods of spinning, weaving and bleaching, and to the increased quantity of the raw material, flax, which is now produced in Scotland. We have no reason to think that any of these improvements have yet attained their utmost pitch of perfection; and we know from our imports, that the growth of flax in Great Britain is far short of the demand for it. We cannot doubt, therefore, when these causes shall have produced the full effects, that our home manufacture may be able to maintain its ground with less encouragement than it now receives, and in time prosper without any adventitious aid.

Permit us to mention, that though the bounty be not yet withdrawn, its precarious continuance, from year to year, is detrimental to our manufacture, without saving any thing to Government; for young adventurers are absolutely prevented from embarking while the encouragement is so precarious, and those engaged in the business are unwilling to extend their concerns. We humbly suggest, therefore, That it would become the wisdom of our Rulers to take a full and decisive view of this subject, and to continue these bounties at once for such a term of years as may be thought necessary for establishing fully this valuable branch of our manufactures.

The uneasiness and anxiety of mind under which we now labour, not only on our own account, but on account of thousands of industrious families depending on us for their daily bread, makes some such measure highly desirable to us.

We need only touch lightly on the superior advantage that Ireland enjoys in the linen manufacture. Our ports are open for the importation of all her linens duty free, without reciprocal indulgence on her part to our manufactures. Ireland producing now, by the wise attention and unbounded liberality of its Parliament, flax sufficient for its own supply, sharing in our ex-

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Forfarshire Report.]

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port bounties here, and having peculiar bounties of her own, by which, if our British bounties were to be discontinued, that kingdom, which has access to the same foreign marts with ourselves, would infallibly establish a direct trade, to our utter exclusion from the trade of our own colonies.

It is sufficient we have hinted at those topics; there is no occasion for expatiating upon them in a memorial addressed to those that are more enlightened than ourselves.

We shall therefore conclude with assuring your Lordships, that the trouble we now give you, proceeds from a sincere conviction that the prosperity of Scotland, and our own fortunes, are involved in the subject on which we have now ventured to address your Lordships in this memorial. If the concurrence of numbers would add to its weight, there are many thousands impatient to give it their signatures, who are only withheld by our opinion, that this more private mode of application will be equally successful.

= LETTER Mr W. GILLIES to Sir JOHN SINCLAIR, Baronet.

SIR,

Brechin, February 9. 1788.

I have been often extremely afraid that you might suppose me negligent of the queries on the subject of the linen manufacture which you left with me in this country; and I have often intended to write you in excuse of a delay which, however, I could not avoid. It would give me the greatest pleasure could I flatter myself that you would consider this delay in any degree compensated by the information contained in the different papers which I have now the honour to send you.

I persuade myself there will be found no material inaccuracy or misrepresentation in the answers to your queries, which are here inclosed, as, besides consulting gentlemen of knowledge and experience in the flax and linen business in this county, I have had the advantage of my brother's assistance, whom I consulted in every article in which there appeared to me any difficulty. He likewise got for me the four accounts, which I have inclosed in a separate cover. These are, An account of cloth stamped in Scotland for certain years, beginning 1st November 1727: An account of cloth stamped in Forfarshire for the same period: An account of cloth stamped in Scotland from 1st November 1785 to 1st November 1786, distinguishing the total quantity and value in each county; and an account of cloth stamped in Forfarshire for the same period. The first of these shews the gradual and very large increase of the manufacture in Scotland, as the second does of its corresponding progress in this county; both undoubtedly owing to the bounty. The third and fourth accounts, especially the third,

I hope you will think curious at least, as ascertaining the state of the manufacture in the different counties of Scotland. But I ought to make an apology for hinting to you any thing of the usefulness of these papers. It is sufficient to mention, that their accuracy may be depended upon.

In a third cover, I have inclosed a copy of the memorial of the Committee of merchants and manufacturers in Dundee, Arbroath, Montrose, Forfar, and this place, which has been presented to the Lords of Trade. The gentlemen of these Committees, extremely desirous to call the attention of Government to a subject conceived to be of the very utmost importance to this county, have presented similar memorials to Mr Pitt, and (I believe) to Lord Cambden and Mr Dundas.

I am not a little happy to have an opportunity of submitting it to your consideration.

This memorial appears to me to be so full and satisfactory, that I have omitted many things which otherwise I intended to introduce in the answers to your queries. I could wish, indeed, that some topics had been more dwelt upon in the memorial, particularly the great and clear gain to this country by the manufacturing of this raw material of flax, which, even reckoning the bounty as a part of the price, (which, however, it does not appear to me to be,) brings the country more than double its cost.

The manner of life of the weavers is also peculiarly advantageous to the country, weaving being of all or most others that trade which may with the greatest conveniency and profit be carried on in any place: I mean in a town, in the villages, or the country. Is not this a manufacture that should meet with the utmost support in such a country as Scotland?

With regard to the raising of flax, I am persuaded (if the linen manufacture be protected for some time in the same manner it has been) it will become a great object to the most enterprising and wealthy farmers and manufacturers. Of the latter, there are some who are now employed in pointing out means by which the cultivation of flax may be greatly improved, of which, and of the practicability of extending it in Scotland far beyond what is generally thought of at present, they seem to have no doubt. If, to our knowledge of the trade, and the encouragement of Government, were added the great advantage of raising the raw material, it is not easy to set bounds to the extent to which the linen manufacture of this country might arrive.

On inquiry as to spinning-wheels, I find, that a wheel made to spin with one hand, may be altered at a small expence, and made to spin with two hands. And I am given to believe, that a woman might be hired to go from this part of the country, and teach the women in Caithness to spin with both hands. It will give me great pleasure if I can be useful in any of these matters. I am, with much respect, &c.

W. GILLIES,

COMMUNICATION from Mr COLIN GILLIES, Brechin.

From the papers regarding the linen manufacture in Scotland, and particularly in the county of Forfar, transmitted to Sir John Sinclair in 1788, it appears, that the quantity of linen stamped for sale in the county of Forfar, from 1st November 1785 to 1st November 1786, was 7,438,816 yards, value L. 222,243 : 16 : 7, sail-cloth not included; to which, if added the linens which were not stamped, and made for home wear, the aggregate would not be less than eight to nine millions of yards, and L. 290,000 in value: Farther, that the annual amount of other manufactures for trade, are not less than L. 100,000 value *per annum* more: Farther, that the quantity of flax imported from the Baltic annually, amounted to about 3000 tons, prime cost L. 110,000. These papers further contain a full and accurate statement of the great benefit the country reaps from the manufacturing of that flax, by comparing the prime cost of 1000 tons of the flax with the value when manufactured. The same statement will hold at the present time, in proportion to the quantity of flax imported and manufactured; and it may be taken for granted, that the quantity of linen manufactured for home wear is full as great now, if not greater, than it was in 1788.

These being premised, what comes now to be considered, is the increase of the linen stamped for sale in the county of Forfar, from 1788 to the present time, of the sail-cloth manufactured, and of other branches extended, or that have been introduced since 1788.

The quantity of linen stamped for sale from 1st November 1785 to 1st November 1786, and which was no doubt greater than any year preceding, has been mentioned, and amounted to 7,438,816 yards, value L. 222,243, 16s. 7d. The quantity from 1st November 1793 to 1st November 1794, was 10,573,086½ yards, value L. 322,330 : 14 : 1½; and from 1st November 1794 to 1st November 1795, the amount was 11,256,969½ yards, value L. 346,202 : 15 : 11½, being an increase in this last-mentioned year, from that first mentioned, 1786, of 3,318,153½ yards, value L. 123,958 : 19 : 4½.

This is an amazing increase, and it is the more worthy of notice, as other manufactures have at same time made great progress in the county of Forfar, and improvements in agriculture have during the same period been carried on with unremitting industry, as shall be afterwards more particularly noticed. The other articles of manufacture, however, not being stamped, the increase of them cannot be so exactly ascertained; yet we may come at it with some tolerable degree of precision. In the papers referred to, the quantity of sail-cloth manufactured in 1788 is not mentioned, but forms part of the L. 100,000 before stated, and which comprehended threads, leather, shoes, cottons,

cottons, cordage and various other articles, the manufacturers of all which, setting aside the articles of sail-cloth and cottons, which are here to be stated by themselves, is as extensive now, or more so, than it was in 1788.

In 1788, and for some years preceding, so far as can be learned, the annual value of sail-cloth manufactured in the county of Forfar, did not exceed L. 30,000. It kept gradually increasing till 1792; but in that year, and 1793, it advanced with great rapidity, and for three years past, the annual value manufactured in the county of Forfar is understood not to have been less than L. 110,000, being an increase of L. 80,000 from what it was in 1788. No doubt, when peace takes place, the amount of this article will decline; but the same event will without doubt tend to the further extension of the linen manufacture, so as fully to compensate for any decrease which may happen in that of sail-cloth. In the meanwhile, the manufacture of sail-cloth, a considerable part of which is made of flax, added to the great increase of the linen manufacture, has extended the importation of foreign flax to a very great degree, in so much, that in place of 3000 tons, which was the highest in 1788, the importation into the county of Forfar, for each of the years 1794 and 1795, was nearly 5000 tons.

It is to be observed, at same time, that a considerable quantity of flax is raised within the county, and that the quantity raised is upon the increase.

In addition to linen and sail-cloth, the manufacture of cotton, which had just commenced in the county of Forfar in 1788, and could not then be supposed to amount to more than L. 8000 or L. 10,000 annually, although it has not been carried to any great extent, is now supposed to amount annually to from L. 20,000 to L. 30,000. Within the same period, the spinning of flax by water has been introduced into the county of Forfar, and some considerable works have been raised, and are going on very successfully. There is reason to believe, that this mode of spinning is still capable of great improvements, and that it may arrive at such perfection as will enable the manufacturers of linen to carry the business to an extent beyond what has hitherto been so much as thought of; more especially, if proper attention is paid to the raising of flax in this country. The benefit that would arise to the country from the growing of flax being more encouraged by Government is fully pointed out in the papers sent Sir John Sinclair in 1788; but this mode of spinning opens a new and more extensive prospect for the consumpt of flax; and it is likewise to be considered, that the Court of Petersburg have immediately laid on an additional duty on flax exported. The duties were before excessively high, and it is from that country that almost our whole supply of flax comes.

The growing of flax furnishes another article, too, of very general use. Although the flax seed raised in this country seldom answers so well for

sowing as that imported, it is equal for crushing to any, and affords a great quantity of oil. Two crushing-mills have of late years been erected in the county of Forfar, and go on very successfully. They are chiefly supplied with home seed.

Another branch has also of late years been established in Forfarshire, and found to answer, that is, the making of salt. From the heavy duty on coals, it could not, till that was taken off, be attempted; but the freight is not found to be an obstacle, and the works go on with advantage.

From what has been mentioned, it will appear, that the increase of the manufactures, particularly of linen, since 1788, has been very great, and the extension of them has had a happy effect in facilitating the improvements in agriculture in the county, which had before made great progress. From the rapidity with which these improvements have been carried on, notwithstanding a great increase in the number of inhabitants, the quantity of grain shipped off from the county is in general much greater now than it was previous to 1788. To mention only one year:—of crop 1794, there was shipped from the districts of the Customhouses of Montrose, Dundee and Perth, L. 374,000 value of grain, upwards of one-half of which was from the county of Forfar, in which the two first-mentioned Customhouses are situated.

In consequence of this flourishing state of the manufactures and agriculture in the county, the prices and rents of land in it have, since 1788, undergone an amazing advance, and are still advancing.

December 1796.

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APPENDIX H.

FLAX.

*Board of Agriculture,
Sackville Street, 8th May 1809.*

SIR,

THE paper herewith transmitted to you, on the subject of flax, having been favourably reported to the Board, and the culture of that article being carried to a considerable extent in the district you are surveying, you are hereby authorised to incorporate the same in your Report of the County of Forfar, or to print it separate in an Appendix, as you may think most advisable. I remain, Sir, your very obedient servant,

J. M. SINCLAIR, *President.*

The Reverend Mr Headrick, }
Dunichen, Forfar, N. B. }

A MEMOIR on the Cultivation and Preparing of Flax, addressed to Sir JOHN SINCLAIR, Bart. M. P. President of the Board of Agriculture, &c. &c. by G. ORR, Esq.

SIR,

HAVING seen lately on the above subject two Essays, one by Mr Somerville, and the other by Mr Durno, the British Consul at Memel, both of whom no doubt wrote with the best intentions, but they seem not to have understood the subject well on which they wrote, I take the liberty of communicating to you the following observations on the subject, and which are not advanced on a visionary theory, but are the result of actual observation in the north of Ireland, a part of the British Empire very celebrated for its linen manufactures, and of course well acquainted with the management of flax.

Flax-seed, within the last hundred years, was commonly imported from America, and some of it from the northern parts of Europe, and as it could be had on tolerably reasonable terms, the people of Ireland took no trouble to raise it at home, though I have often seen small quantities the produce of that country; but as a change of seed is found in almost all kinds of grain

or vegetables to be best, the foreign was preferred to the domestic. However, I am of opinion, that the seed might be as well raised at home, were it attended to. Though the province of Ulster is the most celebrated province of Ireland for the linen manufacture, this arises from the industrious habits of its population, more than that its soil is better adapted for the growing of flax, which certainly is not the case; for much of the land of that province is exceedingly light, and too poor for the production of flax; but to remedy this, the small farmers usually sow their flax after a crop of potatoes, where, if the land is any way good, it is sure to succeed. Land not too light, nor yet too heavy, is best adapted for flax. A mixture of clay and sand, and, above all other, land newly broke in, answers best, and particularly if potatoes have been the first crop: A crop of flax is a very exhausting crop, and impoverishes the land exceedingly.

The general seed-time of this crop is from the first of April to the middle of May; if sown sooner, as Mr Somerville would recommend, the frosts in the morning would nip it, and the crop would fail. What the people dread most who raise it, is too much dry weather; for in that case the crops will turn out short, and of course very unproductive, and the women who spin it cannot manage it so well, nor make so good a thread from short flax. If flax be raised on land that is too rich and fat, it will be exceedingly coarse, if sown thin, and will be more like hemp than flax; and if on such ground the seed be sown too thick, the crop will lodge, and, for want of air, the stalks will corrode and rust, just the same as wheat would do under similar circumstances. The weeding of flax should take place very soon after it has covered the ground; in this stage of its growth it will more easily recover any bruises it may receive, than when more advanced, and if the weeds are cleared out of it at this period of its growth, it will, on account of the quickness of its growth, smother all weeds that appear afterwards. The best crops of flax are those that are raised on ground newly broken in, for on such ground weeds very seldom appear: it will succeed as well on such ground without any crop having been raised before it, provided the land be three or four times ploughed, and well harrowed. Flax requires more nutriment than almost any other crop whatever, and this is sufficiently evident, from the quantity of oil which is found in the flax, and especially in the flax seed; this comes principally from the ground, and to afford such nourishment, the ground must be rather of a rich nature, and unexhausted by other crops. There is a particular period, which experience has found to be the best for pulling flax, which must not be when the crop is too green, nor on the contrary when too ripe, but the happy medium between these two. If the crop be pulled too green, the top part will melt away and waste in the various processes which it must undergo in the manufacturing: on

the

the contrary, if it be suffered to become dead ripe, (such as it ought to be for seed), the flax will be harsh, coarse and strong. (A) The proper time for pulling flax, is when all the blue blossoms are completely gone, and the seed quite full, round and perfect, but not quite ripe; the green appearance of the stalk, as well as the seed, must generally prevail; and this is the proper period for pulling flax. Those who choose to raise their own seed, should for that purpose sow a certain quantity on ground newly broke in, or on ground that has lain to rest two or three years; or on ground after potatoes, turnips, or such like roots: It should be suffered to ripen, until the whole crop, stem and seed, becomes quite yellow, pulled, tied up in sheaves, and if the weather be fine, stooked, or set on end, every five sheaves against five others, with two hood-sheaves, to be put on at night, and taken off in the morning; these prevent the wet or damp from injuring the seed, and when it has dried tolerably well in the stook, it is taken and (B) rippled on a rippling comb, which is simply a piece of a beam, or log of any kind of wood, with spikes drove into it about five or six inches high, and sufficiently close to pull off the seed; the seed then is laid out in the sun to dry, or under cover if wet, and is repeatedly turned with a rake or the hands until quite dry; and after this, it is run through a corn-mill, and winnowed clean of the husks, the same as is done with oats for oatmeal; it is then laid up in sacks or barrels until spring.

To return to the remaining process of preparing the flax. It may remain a few days in the stooks, after pulled; or should the weather be wet, it is better to steep or drown it immediately, otherwise the wet will cause it to heat, and injure it in a very short time. The place in which this part of the process is performed, is (contrary to the opinion of Mr Somerville) in stagnant water; and the water found in moss or peat-holes, is always preferred, if convenient, to water that is filtered over a sandy bed. If this be not convenient, the stream is conducted out of its course, into what are called lint-dams, which are nothing more than any common hollow, with a ditch of sods or turf run across, to stop the water from running away: these are about four feet deep; they are filled up with the flax sheaves, and plenty of stones or timber laid over to prevent the flax from rising when it ferments, which it will always do, unless loaded with much timber or stones. The dam is kept full, and the flax well covered, which is done by occasionally letting the water on until the dams are filled; but on no account should the stream be suffered continually to run, as this will retard the fermentation, which must take place before the flax is ready to be taken up. If the weather be warm, the fermentation thereby will be accelerated, and in six or eight days it will be enough; if the weather be cold, it will take longer. The water becomes very warm; and in order to know that it is done enough,

a small quantity is taken up, and if the stalk break freely when bent, this is a sure sign that it is done enough; if it bend without breaking, it must be left longer, until this will take place.

When taken out of the water, one or more men are employed in doing this; they strip off their shoes, stockings, and small clothes, remove the stones that kept it down, flood off the dirt that may adhere to the upper sheaves, (all the under ones are generally clean), and lay the sheaves along the bank: others draw it away on cars; and women, men and boys take it in half sheaves, or smaller parcels, and spread it thinly in rows along the ground, the rows close to each other. If properly watered, seven or eight days will be sufficient; but if taken out of the water too hard, it must have more of the grass, else it will be very difficult to manufacture. New mowed meadow ground, or close fed pasture, is best for spreading it. Flax is taken up, and tied in sheaves again, and a dry day must be chosen for this; but the flax must by no means be suffered to lie too long on the grass, or it will rot, and be good for nothing; so that, should there be a series of wet weather, it must be raised up, and set in small parcels on end, and kiln-dried, and beetled as soon as possible.

After the flax is got off the grass and housed, the next step to be taken is the drying of it gently over a fire of peats, or any other sort of a fire, which is performed as follows: A small covered shed is erected, to screen it from the rain, and two sides of dry stone or turf wall are erected, and across over the fire a wooden rack is placed, and upon this the flax is placed, by three, four, or more sheaves at a time, being loosed out: the flax thus placed, sweats, as it is called, viz. all the moisture or water comes out on the surface of the stalks. After this, it dries, and must get no more fire than will make it work; for if it get too much fire, it scorches, and the flax all breaks, and lies in working. After drying, it is beetled by a number of persons with beetels of hard wood, the handle about six inches, and the part to beetle with about twelve: the stalk is completely bruised; it is tied up in handfuls and bundles, and next undergoes the scutching operation, which is performed by women:—they bend it in handfuls over a broad piece of wood, called a scutching-stock, with a broad piece of wood at bottom, to place their foot on to keep it steady, and an ear, or higher piece of the stock rising next themselves, to prevent their striking their hand. They usually sit to it; place the left foot on the bottom of the stock, to keep it steady, hold the flax in the left hand, and in the right the scutching-handle, as it is called, which is a broad piece of ash or other wood, with a handle, thick at the back, and coming gradually to an edge, and with this they scutch out the tubes or stalks, and prepare it for the next operation, called cloving, which is performed with a very simple instrument, made of a piece

wrought

wrought iron, made hollow, and a wooden tongue in it; one end has a socket to receive a wooden shaft, which bears upon the ground; the other end, with the hollow iron and wooden tongue, rests on a common wooden stool or bench, and the operator continues to let the tongue fall open from the hollow iron, and draws it through, until quite soft, which the scraping of the two edges of the iron effects; the wooden tongue is loose, and tied in at the socket by a piece of cord or thong, and thus the flax is prepared for the heckler, viz. the person who finishes the manufacture of the flax before it is spun.

The hecklers in Ireland go about and are paid for this: they have a set of heckles, consisting of three, a coarse, finer, and finest, or finishing heckle. They are neatly made, about twelve inches long, and six broad; the teeth are tempered steel prongs; the coarse one has them six inches long, the finer four, and the finest three inches; they are fixed in pieces of hard wood of the above dimensions, and the teeth are fixed through a piece of good tin, which is placed on the wood. After heckling out all the flax, they also heckle the tow, which answers for coarse sheeting and sacking. This is the whole process, from beginning to end.

P. S. To what is already said, I beg leave to add, that the idea of boiling the flax is perfectly trifling, and moreover doing it in such small quantities as handfuls, and also dipping it in boiling water: it will be sufficiently fermented in the dams; nay, it runs the risk of being too much, if not carefully attended to.

(C) I should also have mentioned, that there are flax, or as they are called, scutching mills, which are had recourse to when hands enough cannot be had to manufacture it as already described; but the flax is more liable to be cut and fly to waste by these, and therefore they are not had recourse to unless where the quantity is great, and through necessity.

LETTER WILLIAM POLLOCK, Esq. Inspector-General of Linen in Ireland, to the Right Honourable ISAAC COBBY, with Observations on Mr ORR's Paper on the Culture of FLAX.

My dear Sir,

London, 21st March 1809.

I have read with attention Mr Orr's Treatise on Flax Culture, which is very nearly the mode adopted in the province of Ulster in Ireland, the principal

principal seat of the linen manufacture in all its branches. I have taken the liberty to make a few remarks on his mode of saving flax seed, and marked the lines A B C. I remain, Dear Sir, &c.

WILLIAM POLLOCK.

Right Hon. Isaac Corry.

(A) Flax in general, particularly that intended for fine yarn, ought to be pulled on the commencement of the blossoms beginning to decline. If left to stand so long as mentioned in the Treatise, the flax will not be so productive, and the seed will be of so little value, as to be no compensation for the delay and injury the flax must sustain.

(B) Instead of rippling the seed in the harvest, I am of opinion, it should be allowed to remain on the stalk until February or March, carefully stacked and thatched, and protected from vermin. This mode will effectually prevent the seed from heating, and it will turn out of the pod much brighter and healthier, and in all respects superior seed to that rippled in the autumn.

The flax should then be carefully laid past until the approach of warm weather, when it may be watered and brought to perfection, without steeping, by spreading it on a clean pasture taken up for meadow, and by turning it three or four times occasionally, to receive equally the effect of the dew and weather. The bark (which is the flax) will by this process improve in colour, and the haulm will rot, and in the usual way of breaking separate, and the flax become fit for use, particularly for coarse linen.

(C) The author states, that scutching-mills are more injurious, and waste the flax more than by hand-scutching.

I differ materially with him on this point, and know from experience that mill-scutching is preferred to any other mode, where the flax is sound, as well for economy as expedition.

OBSERVATIONS by Mr HEADRICK.

Conversing with Dr Tennant at Edinburgh on this subject, I learnt that his brother, who is inspector of the linen trade of Ireland, has introduced a great improvement in the mode of preserving flax seed. The bolls being rippled off, are laid in thin layers on the floor of a drying-barn, which is made of wicker-work, so that a free circulation of air is admitted. The barns have as many floors as there are bolls to be preserved, and have lateral windows, which admit air, but exclude rain, and are roofed above. Where there are no barns, the bolls are placed in alternate layers among whins, which are built up into stalks that are thatched above. This keeps them open to the circulation of air. In spring, the bolls are beaten with flails or sticks on a barn-floor, the husks cleaned out, and the seeds sown.

APPEN-

APPENDIX I.

Extract of a LETTER from Mr WEMYSS of Lauriston, near Dundee, with a Calculation of the Advantages to be derived from Plantations.

SHelter is what our climate wants above all other things ; and I hope the inclosed will in some degree shew that it can be accomplished with the advantage of both beauty and immense profit.

I have ever considered planting in this point of view ; and if my observations can in the smallest degree be of any service to the Honourable Board of Agriculture, I shall be happy indeed.

Beside the plantation referred to in the inclosed, I have planted about 58 acres more of stripes and dens, upon a small estate of 300 acres, by which, and other improvements, I have brought it from a rental of L. 65 at my entry, about eighteen years ago, to now above L. 300 per annum.

My being a partner in the house of Thomas Leslie and Company, nursery and seedsmen here, for these twelve years past, has (with my partiality in favour of planting) made me be particularly attentive to that object.

At a sale of growing timber lately in my neighbourhood, there were a parcel of larch trees, about forty years old, which sold upon an average at 8s. I therefore presume, when I class them at 6s. in my state, of fifty years old, I am considerably within the mark.

Government, in my humble opinion, has very judiciously laid the last additional duty on foreign timber, as it will certainly promote the sale of the wood of this country, and so encourage planting, to afford us shelter.

CALCULATION

CALCULATION upon 44 Acres Muir, planted by THOMAS WEMYSS of Lauriston in 1777, the Expences attending it, the Produce, and apparent profit at the expiry of Fifty Years.

Dr.	Cr.
1777. To expence of inclosing 44 acres muir with ditch and earth fence, sown with white seed, back and breast, consisting of 290 rods, of seven yards or six ells each, at 1s. 2d.,	L. 16 18 4
To cost of 1000 ash, elm and beech, for hedge-rows, at 4s. per 100,	2 0 0
To cash paid planting the above 44 acres muir with 2000 larch, at 8s. 6d. per 100, and 2000 Scots firs, at 2s. 6d. per 100, seedlings, say 22s. 6d. per acre,	49 10 0
To rent of 44 acres muir for fifty years, when it is understood all the wood is to be cut down, at 5s. per acre, for 44 acres, is	L. 68 8 4
To interest account, per state, on expences of planting, rent, &c.,	550 0 0
To compound interest on ditto, per state,	603 14 0
To profit on 44 acres planting, at the expiration of fifty years,	644 7 7½
	7409 0 0½
	<u>L. 9275 10 0</u>
1792. By cash for weeding of the plantation at the expiry of fifteen years, say 1500 per acre, 44 acres, being only fit for firing, sold for 10s. per acre, after paying expence of cutting, &c.,	L. 22 0 0
1799. By a supposed further weeding at seven years more, of 1000 per acre, at 17s. 6d.,	38 10 0
1806. By ditto at seven years more, for thinnings of 500 per acre, at 1d. each, or L. 2 : 1 : 8 per acre,	91 13 4
1811. By ditto at five years farther, of weedings, of 200 per acre, at 2d. each, or L. 1 : 13 : 4 per acre.	73 6 8
After the above thinnings, there will remain upon the grounds, at the expiration of fifty years, 800 larch, the Scots firs being all thinned out; the larch at that age will bring 5s. each, or L. 200 per acre, for 44 acres, is	8800 0 0
By value of 1000 ash, elm and beech, to be sold at expiry of fifty years, at 5s. each, (hedge-rows),	250 0 0
	<u>L. 9275 10 0</u>

STATE of Interest and Compound Interest on Rent and Expences
of Planting 44 Acres Muir upon the grounds of Lauriston, by
THOMAS WEMYSS, in spring 1777.

To amount of inclosing and planting 44 acres, per de- bit of account-current in- closed, in spring 1777 Add one year's rent of 44 acres, at 5s. for 1778,	l. s. d.	Simple Interest.	Compound Interest.
		1 year, £ s. d.	1 year, £ s. d.
	68 0 0	1 year, 3 8 0	1 year, 0 3 8
	11 0 0		
	79 0 0	do 3 19 0	
1779,	11 0 0		
	90 0 0	do 7 7 0	do 0 7 4
1780,	11 0 0	do 4 10 0	
	101 0 0	do 11 17 0	do 0 11 10
1781,	11 0 0	do 5 1 0	
	112 0 0	do 16 18 0	do 0 16 11
1782,	11 0 0	do 5 12 0	
	123 0 0	do 22 10 0	do 1 2 6
1783,	11 0 0	do 6 3 0	
	134 0 0	do 28 13 0	do 1 8 8
1784,	11 0 0	do 6 14 0	
	145 0 0	do 35 7 0	do 1 13 4
1785,	11 0 0	do 7 5 0	
	156 0 0	do 42 12 0	do 2 2 7
1786,	11 0 0	do 7 16 0	
	167 0 0	do 50 8 0	do 2 10 4
1787,	11 0 0	do 8 7 0	
	178 0 0	do 58 15 0	do 2 18 9
1788,	11 0 0	do 8 18 0	
	189 0 0	do 67 13 0	do 3 7 6
1789,	11 0 0	do 9 9 0	
	200 0 0	do 77 2 0	do 3 17 2
1790,	11 0 0	do 10 0 0	
	211 0 0	do 87 2 0	do 4 7 1
1791,	11 0 0	do 10 11 0	
Carried forward,	222 0 0	97 13 0	

	£. s. d.	Simple Interest.	Compound Interest.
	£. s. d.	£. s. d.	£. s. d.
Brought forward,	222 0 0	1 year, 97 13 0	1 year, 4 17 8
Rent, 1792,	11 0 0	1 year, 11 2 0	
	233 0 0	do 108 15 0	do 5 8 9
By wood sold at Martinmas		do 5 16 6	
1792, per acct-current,	22 0 0	do 114 11 6	do 2 17 3
	211 0 0	do 5 5 6	
Rent 1793,	11 0 0	119 17 0	do 2 19 11
	222 0 0	1 year, 11 2 0	
1794,	11 0 0	do 130 19 0	1 year, 6 10 11
	233 0 0	do 11 13 0	
1795,	11 0 0	do 142 12 0	do 7 2 7
	244 0 0	do 12 4 0	
1796,	11 0 0	do 154 16 0	do 7 14 9
	255 0 0	do 12 15 0	
1797,	11 0 0	do 167 11 0	do 8 7 6
	266 0 0	do 13 6 0	
1798,	11 0 0	do 180 17 0	do 9 0 10
	277 0 0	do 13 17 0	
1799,	11 0 0	do 194 14 0	do 9 14 8
	288 0 0	do 7 4 0	
Wood sold at Martinmas		do 201 18 0	do 5 0 11
1799, per acct-current,	38 0 0	do 6 5 0	
	250 0 0	do 208 3 0	do 5 4 0
Rent 1800,	11 0 0	1 year, 13 1 0	
	261 0 0	do 221 4 0	1 year, 11 1 2
1801,	11 0 0	do 13 12 0	
	272 0 0	do 234 16 0	do 11 14 9
1802,	11 0 0	do 14 3 0	
	283 0 0	do 248 19 0	do 12 8 11
1803,	11 0 0	do 14 14 0	
	294 0 0	do 263 13 0	do 13 3 7
1804,	11 0 0	do 15 5 0	
	305 0 0		
1805,	11 0 0		
Carried forward,	316 0 0	278 18 0	

	£. s. d.	Simple Interest.		Compound Interest.	
		£. s. d.		£. s. d.	
Brought forward,	{ 316 0 0	278 18 0		1 year, 13 18 10½	
Rent, 1806,	11 0 0	1 year, 15 16 0			
	327 0 0	do 294 14 0		do 14 14 8	
Wood sold at Martinmas 1806, per acct-current,	91 0 0	½ do 8 3 6			
	236 0 0	302 17 6		½ year, 7 11 5	
Rent 1807,	11 0 0	½ do 5 18 0		½ do 7 14 4½	
	247 0 0	308 15 6			
1808,	11 0 0	1 year, 12 7 9			
	258 0 0	do 321 2 6		1 year, 16 1 1½	
1809,	11 0 0	do 12 18 0			
	269 0 0	do 334 0 6		do 16 4 0	
1810,	11 0 0	do 13 9 0			
	280 0 0	do 347 9 6		do 17 7 5½	
1811,	11 0 0	do 14 0 0			
	291 0 0	do 361 9 6		do 18 1 5½	
Wood sold at Martin. 1811,	73 0 0	½ year, 7 5 6			
	218 0 0	368 15 0		½ year, 9 4 4½	
Rent 1812,	11 0 0	½ do 5 9 0			
	229 0 0	374 4 0		½ do 9 7 1	
1813,	11 0 0	1 year, 11 9 0			
	240 0 0	do 385 13 0		1 year, 19 5 7½	
1814,	11 0 0	do 12 0 0			
	251 0 0	do 397 13 0		do 19 17 7½	
1815,	11 0 0	do 12 11 0			
	262 0 0	do 410 4 0		do 20 10 2	
1816,	11 0 0	do 13 2 0			
	273 0 0	do 423 6 0		do 21 3 3½	
1817,	11 0 0	do 13 13 0			
	284 0 0	do 436 19 0		do 21 16 11½	
1818,	11 0 0	do 14 4 0			
	295 0 0	do 451 3 0		do 22 11 1½	
1819,	11 0 0	do 14 15 0			
Carried forward,	306 0 0	465 18 0			

	£ s. d.	Simple Interest.	Compound Interest.
Brought forward,	306 0 0	465 18 0	1 year, 23 5 10½
Rent, 1820,	11 0 0	480 4 0	do 24 1 2
1821,	317 0 0	do 15 17 0	
	11 0 0	497 1 0	do 24 17 0½
1822,	328 0 0	do 16 8 0	
	11 0 0	513 9 0	do 25 13 5½
1823,	339 0 0	do 16 19 0	
	11 0 0	530 8 0	do 26 10 4½
1824,	350 0 0	do 17 10 0	
	11 0 0	547 18 0	do 27 7 10½
1825,	361 0 0	do 18 1 0	
	11 0 0	565 19 0	do 28 5 11
1826,	372 0 0	do 18 12 0	
	11 0 0	584 11 0	do 29 4 6½
1827,	383 0 0	do 19 3 0	
	- - -	603 14 0	do 30 3 8½
			644 7 7½

Besides the above *apparent profit*, the ground will acquire a considerable degree of soil from the dropping of the foliage annually, which will, in the course of thirty years, effectually destroy the strongest heath, and afterwards produce good pasturage for cattle, and the trees against that period will receive little or no injury from cattle of any kind; and by the close of fifty years, the ground will receive such additional soil and manure from the cattle, as will make it fit for cultivation, with very little expence. The adjacent grounds also will receive great benefit from the shelter which such plantations afford.

Larches may also be planted to great advantage as hedges, which, in the course of a few years, will become a fence, and, when fully grown up, no cattle whatever will penetrate, affording at same time effectual shelter through the winter. They should be put in from the nursery grounds of four year old, and two of these years transplanted in the nursery, and then planted out in the fields, at the distance of twelve or fifteen inches, in as close an irregular manner as possible, so as they may meet the cattle in every direction. Four rows will be found quite sufficient, but it will be necessary to have them protected for a time with a wooden paling, or some such fence. They may be planted thus,



Larches, when planted for hedges, may be cut upon both sides next the fields, in the months of June and October, three years after planting; but while other hedges are generally cut upwards with a hedge-bill, they must be cut to the downwards with a knife, as striking with a hedge-bill is apt to make the branches fly off close to the body of the tree, which makes it bleed, and consequently hurts the growth; therefore, at the above periods, the side branches next the fields should be cut about a foot from the body of the tree, or they may be platted or warped through other in the same months, which will effectually thicken the fence, so as no cattle can penetrate it.

APPENDIX K.

MONASTERY of ABERBROTHWICK.

THE Abbey of Aberbrothwick was erected 1175, for the entertainment of Tironesian Monks, by King William the Lion, in honour of Thomas of Becket, falsely entitled *Saint* and *Martyr*. This dedication, it seems, obtained for the inhabitants of Aberbrothwick a grant from John, King of England, whereby they were to enjoy the several privileges of his own subjects in all parts of England, London excepted. Pope Benedict granted the Abbot, and his successors, a right to wear the mitre, rings, robes, and other pontifical ornaments. The receipts of this monastery, in 1562, were in money, L. 2553, 14s. ; 30 chalders 3 bolls 3 firlots 2 pecks of wheat ; 143 chalders 9 bolls 2 pecks bear ; 196 chalders 9 bolls 2 pecks of meal ; 27 chalders 11 bolls of oats ; three last and one harrel of salmon ; the small receipts, by fines, beasts, poultry, &c. being omitted. The last Abbot, John Hamilton, second son to the Duke of Chatselherault, becoming a Protestant, he was created Marquis of Hamilton, March 19. 1599. The Abbey being erected into a temporal lordship, James VI., by his letters-patent of May 5. 1608, granted the same to James, son of the former ; but it afterwards coming to the Earl of Dysart, Patrick Maule of Panmaure purchased the same with the right of patronage of thirty-four parishes.

APPENDIX L.

*ROLL of FREEHOLDERS, as made up on 1st October 1811,
being Michaelmas Head Court.*

- George Dempster of Dunnichen.
James Guthrie of Craigie.
The Honourable Walter Ogilvy of Clova.
William Douglas of Brighton.
8 Patrick Chalmers of Auldbar.
Alexander Ogilvy Fotheringham of Powrie.
John Erskine of Dun.
James Ogilvy of Isla Bank.
John Rankine of Mains of Dudhope.
10 David Allardice of Dunfin.
James Mill of Graystone.
William Alison of Fallawa.
Alexander Nairne of Drumkilbo.
Francis Erskine of Kirkbuddo.
15 James Fyffe of Smithfield.
Thomas Kinloch of Kilrie.
George Skene of Skene and Carriston.
John Rait of Anniston.
Colonel John Carnegie, for the lands of Carcary.
20 John Græme, Writer to the Signet.
Alexander Watson of Turin.
Thomas Renny Strachan of Tarry.
John Mill of Noranside.
David Laird, Strathmartin.
25 James Clayhills of Invergowrie.
David Lyall of Galry.
John Guthrie of Guthrie.
Hercules Ross of Rossie.
Charles Wedderburn of Pearsie.
30 Patrick Scrimseoure of Tealing.
Charles Gray of Carse.
Alexander Gibson Hunter of Balskelly,

The

- The Honourable Charles Hay Mudge of Newton, one of the Senators
of the College of Justice.
Mungo Dick of Pitcarro.
- 35 Charles Lyell of Kinnordy.
Alexander Murray Guthrie, younger of Craigie.
The Honourable William Ramsay Maule of Panmure.
Robert Douglas, younger of Brigton.
Patrick Proctor of Halkerton.
- 40 David Hunter of Burnside.
Charles Gardyne of Ravensby.
James Cruickshanks of Langley Park.
Robert Lindsay of Almericloss.
Robert Speid of Ardovie.
- 45 Patrick Murray of Simprim.
George Robertson Scott of Hedderwick.
Thomas Kerr of Grange of Monifieth.
John Laurensen of Invereighy.
Alexander Brodie of Arnhall.
- 50 John Ouchterlony of Guynd.
David Blair of Cookston.
William Chalmers, Town-Clerk of Dundee.
Alexander Riddoch of Blacklunans.
Robert Kerr of North Grange of Monifieth.
- 55 Colin Bruce of Flemington.
David Carnegie of Craigo.
Alexander Benny Tylour of Borrowfield.
Henry Henderson of Grange of Barry.
John Duncan of Rosemount.
- 60 George Chaplin of Colleston.
Robert Mill of Woodhill.
Hercules Tylour of Carcharie.
Charles Greenhill of Fearn.
Patrick Carnegie of Lower.
- 65 Thomas Farquharson of Baldovie.
Thomas Gardyne, Merchant in London.
Alexander Ritchie of Bearhill, Town-Clerk of Brechin.
John Taylor of Kirktonhill.
Robert Baird of Newbyth.
- 70 Charles Ogilvy of Tannadice.
Thomas Fotheringham, younger of Powrie.
David Scott of Dunfinald.

- Alexander Duncan of Parkhill.
John Harvey of Kinnettles.
- 75 Alexander Lyall of Gardyne:
Alexander Erskine of Balhall.
Alexander Hay of Letham.
Robert Scott, in the service of the East India Company, for the lands
of Scotstown and others.
The Honourable James Wortley Mackenzie of Belmont.
- 80 Lawrence Brown, Constable of Wallace Craigie.
John Lennox of Woodhead,
David Millar of Ballumbie.
James L'Amey, younger of Dunkenny,
James Fotheringham of Bolgershoe.
- 85 The Honourable Douglas Gordon Halyburton of Pitcur.
James Ford of Finhaven.
Adam Gillies of Kintrockat, Advocate.
The Honourable Lieutenant-Colonel James Ramsay, for the lands of
Craichie and Bowhouses.
Gilbert Meason of Lindertis.
- 90 Robert Lyell of Newbigging.
Peter Fotheringham, Esq. Advocate.
William Douglas of Balgillo, Major in the 91st Regiment of Foot,
The Hon. Archibald Douglas, eldest son of the Right Hon. Archibald
Lord Douglas of Douglas.
The Hon. Charles Douglas, second son of the Right Hon. Archibald
Lord Douglas of Douglas.
- 95 Isaac Watt of Logie.
The Honourable John Ramsay of Dysart.
The Reverend Francis Nicol of Balgillo.
William Wilson of Whitefield.
James Webster of Balruddery.
- 100 William Ford of Westwood.
The Reverend Alexander Carnegie of Baldovie,
Alexander Greenhill of Vane.
Andrew Knox of Mercus.
James Carnegie of Balmamoon,
- 105 John Baxter of Idvies.
George Lyon of Ogie.
Brigadier-General John Hope, Deputy-Adjutant-General in Scotland.
James Lindsay Carnegie of Boysick.
John Allan of Lochlands.

- 110 David Arklay, liferenter of Cleppington.
John Wilson, younger of Whitefield.
Henry Wedderburn of Wedderburn and Birkhill.
Adam Tait of Pittermo.
- 115 The Hon. Captain Henry Duncan, Royal Navy.
Sir John Ogilvy of Invercarity.
John Lyon of Pitpointie.

FINIS.