Manfred Baddell
A TREATISE ON DAIRY HUSBANDRY.
WILLIAM AITON ESQ.
A TREATISE
ON
THE DAIRY BREED OF COWS
AND
DAIRY HUSBANDRY;
WITH AN
ACCOUNT OF THE LANARKSHIRE BREED
OF HORSES, &c.
DEDICATED, BY PERMISSION, TO THE HIGHLAND
SOCIETY OF SCOTLAND.

By WILLIAM AITON, Esq.
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COUNTY OF BUTE, A TREATISE ON MOSS, &c.

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TO

THE HIGHLAND SOCIETY OF SCOTLAND,

WHOSE LAUDABLE AND UNREMITTING EXERTIONS
IN PROMOTING IMPROVEMENTS
IN EVERY BRANCH OF RURAL ECONOMY,
FROM A CONVICTION OF THEIR UTILITY,
AND WHICH ARE SO HIGHLY DESERVING OF IMITATION;

THIS TREATISE ON DAIRY HUSBANDRY,
WHICH, IF FOUND WORTHY OF THEIR PATRONAGE,
MAY DISSEMINATE MORE EXTENSIVELY THE KNOWLEDGE OF THAT
IMPORTANT BRANCH OF AGRICULTURE;
HITHERTO GREATLY OVERLOOKED;
IS, BY PERMISSION, HUMBLY DEDICATED

BY

THE AUTHOR.
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ERRATA.

Page 38, line 2d, for still read till.
143, lines 20th and 25th, for annatto read arnatto.
line 6th from bottom, dde " not only."
165, line 6th from bottom, for week read week.
167, line 22d, for Y'ells read Y'ull.
PREFACE.

As Dairy Husbandry, and the Dairy Breed of Cows, have been formerly treated of by the Author of this publication, it may seem to savour too much of bookmaking for him now to write a Treatise on these subjects. But as his former writings on the Dairy are engrossed in his Surveys of the Counties of Ayr and Bute, the Farmer's Magazine, and the General Report for Scotland, all of them works of considerable size; and as Scots Dairies have not, so far as he knows, been treated of by any other person, except Doctor Steell, about 30 years ago; the Author has yielded to the solicitations of his friends in drawing up and publishing a Treatise *per se* on the Breeding, Rearing, and Feeding of Dairy Stock, and the Management of their Produce.

The importance of the subject, the little attention it has hitherto met with, and the objections made to it by some, have induced the Au-
thor to make one other effort to diffuse, as far as in his power, a knowledge of Dairy Husbandry.

As milk is a species of food that is very palatable and nutritive, it must be of importance to show by what means it can be increased, and how it can be manufactured to greatest advantage. All sorts of Cows yield some milk; and even the most slovenly people can use it as food in one way or another. But if a breed of cattle exist, or have been formed by nature or by art; or if it is possible to form a breed of Cows that can be brought to yield far more milk than any other breed in the kingdom; and if the inhabitants of any district have made useful discoveries, or greater progress in improved modes of converting milk into food, it is surely of great importance that the knowledge of such improvements should be diffused over the Empire.

That the Ayrshire Dairy Breed of Cows have been brought to a degree of perfection unequalled by any other in Scotland, and not excelled by any in England, is a matter that none who know them will dispute. That many of them yield double the quantity of milk of any other breed in Scotland,—that they fatten as well, and generally faster than any other breed,—that their flesh is of the best quality, and more mixed with fat than that of any other cattle—are facts that have been established beyond all manner of controversy; and it is certainly for the interest
of mankind that those facts should be made more generally known than they have ever yet been.

The means by which that breed has been formed, from one of the worst to the most valuable in Scotland, is interesting, as it shows the great pliability of animal economy, and holds out encouragement for improving every species of Live Stock. If such alterations have been made on that breed, within living memory, what may not be further effected, now that the flexibility of animal economy, and the general principles of breeding, begin to be much better understood than they were at any former period?

That the mode of feeding Calves for veal, as now practised in Strathaven and in some of the neighbouring parishes, is far superior to the modes pursued in any other part of Scotland or of England, is well known;—that the manufacture of milk into butter and sour-milk is better understood in the neighbourhood of the city of Glasgow, and the milk sold there far superior to that in any other part of Scotland;—and that the cheese known by the name of Dunlop Cheese, which is now made through the greatest part of the counties of Ayr, Renfrew, and Lanark, is vastly superior to any other cheese made in Scotland, and in many respects not inferior to the best English cheese,—are matters established beyond all doubt.
To point out to the inhabitants of other districts how such improvements have been made, and to show them how they may be put in practice in other counties, is surely of importance, not only to those actually engaged in agriculture, but also to the proprietors of land, and to those who consume that species of food.

That the demand for Dairy produce has increased, and is still increasing, far more than any other species of farm produce, is a fact that is well known to all. It will be shown in this Treatise, that while the average price of oatmeal has only advanced about 50 per cent, in course of a century, cheese has advanced 200, and butter about 400 per cent, in less than forty years last bygone.

Great as these advances in the prices of Dairy produce have been beyond the rise in the price of grain, it would have been still much greater, had it not been for the vast quantities of butter and cheese imported into Scotland from Ireland, England, and the Continent. Many thousands of pounds of money are drained from Scotland every year, not only for Irish butter and English cheese, but for both butter and cheese brought from the Continent, purchased from people who were then at war with us, and who may soon be again our enemies. Such advances in the prices of butter and cheese, above that of grain, and notwithstanding the vast quantity of the former imported
into Scotland every year, shows that Dairy produce is in great demand, and that a sufficient quantity of it is not raised within the kingdom to supply its inhabitants. It must therefore be a matter of importance, not only to proprietors and farmers, but to the consumers of cheese and butter, to discover the means of extending the manufacture of these, so as to supply the demand, and at the same time to improve the quality of that species of food. The present is an humble attempt to bring into view that interesting, but hitherto neglected, branch of rural economy, and to point out how a much greater supply of an article of food, for which the demand is still increasing, can be multiplied, and its quality improved.

The subject treated of in the following sheets has not as yet met with attention any way suitable to its importance. It was only those who had resided in one or other of the counties of Ayr, Renfrew, or Lanark, that could be qualified to give a satisfactory account of the Scots Dairy Husbandry. Mr. Nasmith, a writer on many subjects, and surveyor, for the Board of Agriculture, of the county of Lanark, has altogether overlooked Dairy Husbandry, as unworthy of his notice. Colonel Fullerton, who wrote the first Survey of Ayrshire in 1793, describes the Dairy breed of Cows, mentions the quantity of milk they give, and their prices at that period; but says very little about manufacturing their produce.
Mr. Wilson, in his Survey of Renfrew, is rather more particular on these subjects; but he has not treated of them at such length as to diffuse a knowledge of Dairy Husbandry over the kingdom, or even to the readers of his Survey.

By the time the Author of this Treatise drew up the Survey of Ayrshire for the Board of Agriculture, in 1811, the Dairy breed of Cows, and management of their produce, had been brought to much greater perfection than when Colonel Fullerton had written, eighteen years before; and as Dairy Stock, and Dairy Husbandry, had by that time extended over much of the counties of Lanark and Renfrew, as well as that of Ayr, he considered it his duty to enter more at large into these subjects. He gave a short history and description of the breed, and a particular account of Dairy Husbandry. And that both might be better known, he drew up, as connected with the subject, an account of Dairy Stock, and of the improved modes of making cheese and butter, which was published in Volume XIII of the Farmer's Magazine. He gave a similar account of both in his Survey of the County of Bute, drawn up in 1813. To bring the improved breed into notice, he got drawings taken, and plates engraved at his own expense, from which copies were thrown off for all these and some other publications.

Having been employed by the Board of Agriculture to write the draught of the 14th and some
other chapters of the General Report for Scotland, the Author was eager to give in it a still more particular account of that improved breed and branch of industry. And as the extensive circulation of his former writings on these subjects had attracted some notice, and led him into an extensive correspondence respecting them, he had it still more in his power than at first to do justice to Dairy Husbandry. He gave, in that draught, as full an account of Dairy Stock, and the management of their produce, as the nature of that work would admit. And as the Board employed an excellent artist, Mr. Howe, to take new drawings of the Dairy breed for that chapter of the General Report, the author confidently expected (and the public had good right to expect) that justice would have been done to the subject in that Report. But he is now sorry to say he has in this been much disappointed,

The Right Honourable President of the Board, Sir John Sinclair, had empowered Mr. Brown in Markle, and some others of the farmers in Lothian, to correct the original draught of that Report; and that gentleman and his friends have thought proper to lay aside the account which the Author of this treatise had drawn up, of Dairy Stock and the manufacture of milk into cheese and butter, and to frame a garbled account of these, in which they attempt to shew that a Dairy Stock is far less profitable than a rearing or feeding stock of cattle. By framing statements of the
expense of feeding, and the returns of produce, suited to their own fancy, they contrive to reduce the clear profit of a Dairy Cow to the trifling sum of one pound two shillings sterling per annum!

The Author of this publication had stated in all his writings on the subject, that farmers frequently let out the milk of their Dairies to undertakers or contractors, who pay them from fourteen pounds to seventeen pounds ten shillings of rent for every Cow on a large farm, the proprietor furnishing the Cows their food and houses, and the contractor performing all the labour in feeding, herding, taking the dung from the byres, manufacturing the milk into cheese, butter, &c.; furnishing salt, fuel, servants' wages, carrying the produce to market, and running every risk. He had stated in that draught, that all good Dairy Cows yielded their own value, or their full weight of sweet-milk cheese every year; that vast numbers of them yielded, on an average, when in good plight, and properly fed, two thousand Scots pints of milk in the course of a season; that in large towns, milk sold at sixpence, in smaller towns, at fourpence, and in places more remote at threepence or upwards per Scots pint; that eight pints of milk generally gave a pound of butter, worth, on an average, at that time, about one shilling and eightpence; and that fifty-five Scots pints of milk, with its cream, yielded a stone, Lanarkshire weight, of sweet-milk cheese, which
brought the farmers from eleven to fourteen shillings, for some years prior to the time he drew up that chapter of the General Report. And he stated, that in the feeding of calves for veal, milk would generally make, when the feeding was skilfully conducted, and a healthy calf selected, a return of nearly fourpence per Scots pint.

These statements appeared to the Author of this Treatise too interesting to be silently passed over in the General Report; but Mr. Brown and his friends, to whom the publication of that work was entrusted, seem to have thought otherwise; and they have stated to the public, in the name of the Board of Agriculture, that the Dairy Cows yield only a clear profit each of one pound two shillings per annum. Neither have the drawings of that breed of Cows, which had been executed at considerable expense, been given to the public.

The following sheets contain a sufficient refutation of the errors of Mr. Brown's statements, and also of the returns of Dairy Stock. As to his motives for suppressing the fair and candid accounts given of Dairy Stock and Dairy Husbandry, in the draught which the Author of this Treatise laid before the Board, and which the Board put into his hands to correct, it remains for Mr. Brown to explain. One word of these he has not and cannot dispute. If they were correct, was it not doing gross injustice to the public, to deny them a place in that Report, which was
drawn up at the national expense, and published in the name and by the authority of the Board of Agriculture, as the result of its labours regarding Scotland, and as containing a faithful account of the state of every branch of Husbandry in North Britain at that time?

Whenever the Author of this publication saw the garbled account that was meant to be given of the Dairies, he drew up, and forwarded to the President, a remonstrance on the subject; and requested that if Mr. Brown's statements were not to be altered, that the Author's name might be expunged from the chapter, and from the whole Report; as he could not endure that such absurdities and contradiction of all his former publications, and of what he knew, and could instruct beyond all manner of doubt, to be the truth, should be given to the public, as written by himself. But even that reasonable request was not complied with!! An account of the Dairy, one word of which he had not written, and in many things in direct contradiction of all his writings, and of what he knew to be correct, was, in spite of his remonstrances, published as drawn up by him and others.

Had Mr. Brown, or any of those who acted with him in that matter, been in the least conversant in things relating to the Dairy, the breed of Dairy Cows, the returns they yielded, the making of butter or cheese, or the feeding of veal;
or had he or they gone to the Dairy district to inquire into that branch of husbandry, and found that the Author's accounts were not correct, they would have had a good right to refute him, and to publish their own statements. But as they neither understood the subject themselves, nor were at pains to make due inquiry, it was the height of presumption in them to substitute their own random conjectures on the subject, and to publish these as written by the Author of this Treatise. And it was a strange instance of misplaced confidence that allowed them to publish to the world their own scraps and manufactured statements of profits and expense, as the result of many years labour of the Board of Agriculture, conducted at considerable expense, especially after the Board had seen, in the Survey of Ayrshire, and other works that have been mentioned, a candid and correct account of that branch of husbandry, and which no man conversant in it will venture to dispute.

The Author of this Treatise would be sorry to impute improper motives to any man. But he conceives himself warranted to say, and he is ready to show, that a marked prejudice against the West Lowland district of Scotland pervades every chapter of the General Report, as well as the other works that have been published under the direction of Mr. Brown. This might so far proceed from his being a stranger to that quarter of the kingdom; but why should any man
publish, even in his own name, on a subject he has not duly studied? And why should any man be permitted to write at random, in the name and at the expense of the Board of Agriculture, and to put forth his own whims and conjectures on a subject he does not understand, and into which he has not made due inquiry, as drawn up by another person, who remonstrated against his name being coupled with such nonsense? Yet Mr. Brown sets up, under the name and sanction of the Board; his own ipse dixit, not only on a subject respecting which he has not acquired proper information, but in opposition to the concurring testimony of thousands of the best-informed in these counties, carefully collected by a person employed by the Board, and shewn to and approved of by hundreds of the most intelligent farmers in that district, who had the best access to know the facts, and who would have detected any errors that might have crept into the account.

The Writer of this Treatise had, upwards of forty years ago, considerable experience and knowledge of Dairy Husbandry, as practised in the county of Ayr, from the earliest stages of the improvements in that branch of agriculture. He had not only traced its progress from its rudest stages to its present refinement, but had made the most minute inquiries into every particular, and consulted with many hundreds of the Dairy Farmers, their wives and servants, before he ventured to lay the account of that
subject, given in his Survey of Ayrshire, before the Board of Agriculture and the public. That Survey, and the account he gave of the Dairy in the Farmer's Magazine, had been seen and read in all the counties of Scotland, and in many parts of England and Ireland, before he drew up the account of Dairy Husbandry for the General Report.* The circulation of these introduced him to an extensive correspondence on that subject,

* Though Mr. Brown, in his review of the Survey of Ayrshire, in Volume XII of the Farmer's Magazine, evidently shows a dislike to the district, and snarls at harvesting of grain on Sabbath, the account given of the habits of the people, and at some quotations made from the Poems of the immortal Burns, who had not the good fortune to be born or to write in Lothian,—yet he durst not then venture to call in question what was there stated on the subject of the Dairy. But though that was at that time altogether a new subject to the Board, and to the public beyond the Dairy District; and though it had not been till then, so much as mentioned in the Farmer's Magazine, which he at that time conducted; Mr. Brown thought proper to pass over that subject, with only one sentence of four lines in his review. He catches eagerly, however, at the name of a man from Lothian, who had been only for a very short time farmer to the Earl of Eglinton, about seventy or eighty years before; and who, he would have us believe, carried west in his cranium, or in his pocket, as much of the superior wisdom of the east, as laid the foundation of the future improvements of Ayrshire. But as the improved breed of Cows, and superior management of the Dairy, cannot be traced to Mr. Brown's favourite district of the Lothians, they are held as unworthy of a place in all that gentleman's publications, or those he is allowed to garble. They must not even be mentioned in his reviews, lest the public should come to know, that anything worth notice in Agriculture existed beyond the bounds of the Lothians, or that any useful information could be found beyond the boards of his own publications.

The Author of this Treatise thought it a duty which he owed to himself, and to the public, to point out to the Conductor of the Magazine what he conceived to be some errors in that review. But his paper was denied a place in that impartial work, to which it is well known he had been a liberal contributor.
and afforded him an opportunity of learning much more respecting it than he had formerly known regarding Dairy Stock and Dairy Produce. Some things he had stated, as to the quality of milk and the butter it yielded, were partly controverted in a paper published in the Glasgow Chronicle, drawn up by a man who had been bred to the loom, and who knew nothing of the subject but by hear-say, and an anonymous writer in the Farmer's Magazine objected to the account he had given of the quantity of milk yielded by the Ayrshire Cows. All these gave him an opportunity of reconsidering the subject. He not only consulted every person in the district whom he knew to be best qualified to give him correct information, but traversed Cheshire and several other counties south of the Tweed, to see how the English Dairies were conducted. Having done so, he anxiously stated to the Board, in the draught he was employed to make of Chapter 14 of the General Report, the whole truth, and nothing but truth, so far as he knew or could obtain information;—believing that he was thereby doing a piece of service to the Board and to the public. He entertained confident hopes that the superior excellence of the improved Dairy breed, the excellence of Strathaven veal, the improved qualities of the butter-milk sold in the city of Glasgow, and of the Dunlop cheese, above those known in any other part of Scotland, being all detailed to the public, in the name of the Board of Agriculture, and a knowledge of them thereby
diffused over Britain, and the Continents of Europe and America,—that branch of industry would come to be extended, to the mutual advantage of the proprietors and occupiers of land, as well as of the consumers of that species of food, all over Scotland.

But these hopes have not been realized. A man who was a stranger to that branch of industry, and evidently prejudiced against it, and against every thing that could do credit to the district where it originated and is carried on,—who appears to be actuated by districtal vanity, and who seems disposed to combine with others of his own kidney to raise themselves, not only over their hinds, but to dictate to the proprietors of land every where and on every subject, whether they understood it or not,—has been permitted to suppress the painful labours of the Author of this Treatise, and to publish, in name of the Board (and as written by him too), things he knows to be incorrect, and against which he remonstrated before they were published. But though the Author has been disappointed, and the public interest, as he conceives, betrayed, by those who were entrusted with the publication of that and some other parts of the General Report, he has still the consolation to know, that Dairy Husbandry, and the Dairy breed of Cows, in the counties of Ayr, Renfrew, and Lanark, are begun to be known and sought after, not only in every county in Scotland, but in many parts of Eng-
land. Colonies of that breed of stock have been carried from Ayrshire, to every county from Caithness to Kent. Several thousands of them have been carried from Ayrshire to England in one single year, and many hundreds of them every year since the Survey of Ayrshire was published; and the fame of, and demand for these Cows, is still increasing, although justice has not been done to them in the General Report for Scotland, and in spite of the ignorance or prejudices that led to that injustice.

The cheese made in the counties of Ayr, Renfrew, and Lanark, is every year in greater demand. Though the price of oatmeal fell from three shillings and sixpence to one shilling and sixpence per peck, between the beginning of eighteen hundred and twelve, and the end of eighteen hundred and fourteen, the cheese of these counties sold nearly as high in the latter, as it had done in the former of these years. During the hardships which the labouring classes endured in the year eighteen hundred and sixteen, the price of cheese fell about a fourth part below its usual rates, but butcher meat was at that time one half, and meal about a third lower than their former prices; and whenever the prices of other provisions began to advance, the cheese advanced faster than either meal or butcher meat; and that although a vast quantity of cheese and butter was then imported into Scotland, from England, Ireland, and the Conti-
In the year eighteen hundred and fifteen, the price of cheese was scarcely one shilling per stone below the highest rates it had ever given, and as the returns were one-fourth greater that year than their fair average, the Dairy Farmers never had a better season; while the grain farmers, whose interest Mr. Brown is so anxious to support, were much greater sufferers, and many of them almost ruined.

But though the Author has found it necessary to refer to the General Report for Scotland, and to shew that it is defective on the subject of the Dairy, still he is satisfied, that that Report contains a great mass of useful matter, and that it is a work of great merit, from which it would be invidious to attempt to detract. He hopes nothing he has found it to be his duty to say in this Preface, will be interpreted as in the least degree disrespectful towards the Right Honourable President, with whom he had carried on, for many years past, a very extensive correspondence. No man living can hold that worthy Baronet in greater esteem than the writer of this Treatise has done, ever since he has been honoured with his correspondence, personal acquaintance, and friendship; and that respect is in no shape diminished.

That a gentleman of Mr. Brown's knowledge, as to some branches of rural affairs, should have been employed to arrange and edit the General Report, or to examine and correct the original
draughts written by so many different persons, is what might have been expected. But that he, or those who assisted him, should have been allowed to garble subjects to which they were altogether strangers, to throw any particular district in every respect into the back-ground, and to set up himself, his own kidney and district, with their habits and prejudices, good or bad, as the *fac totum* of Scottish Husbandry, is not so easily accounted for.

However these matters may stand, it is impossible that the prejudices of any description of men can much longer keep out of view the great advantages of a well-conducted Dairy Husbandry. The excellence of the improved breed of Cows in Ayrshire, as well as the superior quality of Strathaven veal, the Glasgow butter and butter-milk, and Dunlop Cheese, to all others in Scotland, are things that cannot be disputed; and as they have begun to be known in other districts, they will be brought to a fair trial, in spite of the prejudices or interested views of one man or other, and whatever be the authority they may be permitted to assume or to pervert. To diffuse as much as possible the knowledge of that branch of Husbandry, and to extend and render the subject useful to the public, is the object and the earnest wish of

THE AUTHOR.
A TREATISE

ON

DAIRY HUSBANDRY.

INTRODUCTION.

The important art of Husbandry is divided into two great branches,—The raising of the Grain and Roots; and the rearing and feeding of Cattle, and managing their produce. Grain and roots form the chief articles of human food, especially to the labouring classes. The flesh of animals forms a common dish at the tables of the rich, and an occasional luxury to the lower orders; but milk is the most wholesome food for old and young, rich and poor. The human frame, as well as that of animals, is so constructed as to require to be fed on milk when young; and it forms at all stages of human life a wholesome, substantial, nutritive, and palatable aliment. The rearing and feeding of Dairy Stock, and the right management of their produce, must therefore become an interesting subject of enquiry, not only to those who are more immediately engaged in it, but to the public at large.

The importance of the subject to individuals, and to the nation, will appear from the vastly increased demand, and consequent advance in the price of Dairy produce beyond that of grain within the last 40 years. The price of oatmeal during the first 80 years of last
century, was, on an average, nearly one shilling per peck; and, with the exception of three or four inclement seasons, it has not averaged more than about one shilling and sixpence per peck since that period. As sweet-milk cheese was but little known prior to the year 1770, or rather till about 1780, its price till then can scarcely be stated. But about the middle of last century, and till after 1760, a stone of skim-milk cheese and a stone of butter of 24 oz. per pound, and sixteen pound per stone, were sold as low as five shillings; or 3s. 6d. for a stone of butter, and 1s. 6d. per stone of cheese. And between the years 1760 and 1770, new made butter sold in pounds in the markets of Kilmarnock, Irvine, &c. at from fourpence to fivepence per pound; equal to 1½ pound English. Between 1770 and 1780, the best of full-milk cheese was sold in Ayrshire at from four shillings to four and sixpence, or at most four shillings and eightpence per stone, Ayrshire weight; and for several years prior to 1816, cheese of the same quality sold at from eleven shillings to fourteen shillings, and sometimes in retail at or above sixteen shillings per stone. The price of butter was, in Glasgow and Paisley, in 1780, two pounds seven shillings and threepence per hundred-weight (one hundred and twelve lbs. avoirdupois); in 1790, it sold at three pounds four shillings and sevenpence; in 1800, at five pounds four shillings and fourpence; and in 1810, at six pounds fifteen shillings and tenpence; and it was as high as seven pounds per hundred-weight in 1813. So that while oatmeal had only advanced from about one shilling to one shilling and sixpence, or so, per peck, in the course of more than 100 years, butter and cheese have advanced to nearly three times their former price in about a third part of that time. In Edinburgh, butter sells generally higher than it does in the western counties; and in Liverpool, it is
INTRODUCTION.

usually about one eighth part higher than it is in Glasgow.*

These show that the demand for Dairy produce is great, and that its price has advanced about six times as much as that of grain, notwithstanding the vast quantities of butter and cheese that have been imported into Scotland every year. And as Dairy Husbandry, on any thing like an improved plan, is still confined to a mere corner of Scotland—as it is well adapted to the melioration of land of an indifferent or medium quality—and as it is by far the most profitable mode of managing live stock, the extension of the Dairy seems to be a matter of high national interest.

As no branch of agriculture, however, can be equally well suited to every description of land, it may be proper to enquire what is the soil, situation, state of cultivation, and other circumstances, to which Dairy Husbandry is best adapted.

The surface of Scotland may be divided into,—1st, Muirs and Mountains; 2dly, Rich Arable Land, fit for improved grain husbandry; and, 3dly, Land of a medium quality. The Dairy may be carried on more or less in any of these descriptions of land, but it seems to be remarkably well suited to that which is of a medium quality.

1st. Mountains are certainly but ill adapted to a Dairy Stock; but such stock is often kept to advantage on

* During the commercial distress in 1818 and 1819, the price of cheese sunk for a short time to about 8s. or 9s. per stone. But now, in 1822, the common selling price of full-milk cheese is 11s. 6d., and butter 17s. per stone; while oatmeal is selling at 1s. and 1s. 1d. per peck.
moorish ground. Dairy Cows are kept, and a considerable quantity of the best of butter and cheese is produced on the most moorish lands in the counties of Ayr, Lanark, and Renfrew; and much of the land appropriated to the pasture of Dairy Stock in these counties is damp and wild, buried under moss-earth, the land unsheltered, the climate wet, and the herbage coarse. Sheep are kept on the highest, and the Dairy Stock are fed, and young cattle reared and fed on the lowest and best of the land in these moorish districts; and from many such farms very large quantities of butter, cheese, and fatted veal are sent to the market.

If large quantities are produced from ground so inferior in quality, and in unsheltered stormy regions, certainly a much greater quantity might be raised from the moorlands of some other districts. Where the ground is incapable of being laboured and cropped, it would be improper to attempt Dairy Husbandry. But wherever it is practicable to raise abundance of good fodder, though the grain should misgive in bad seasons, the Dairy may be pursued with greater success than any other branch of husbandry. Land that produces fodder will yield grain four years in five, and abundance of potatoes, turnips, clover, and rye-grass, every season; and where these can be raised, the Dairy may be turned to good advantage. Though the pasture may be coarse, yet when manure is applied, and the land ploughed, the herbage will grow finer, and no other mode of occupation is so well calculated to form manure as that of the Dairy Husbandry. Manure and cropping will ameliorate the soil, as well as improve the pasture; and better pasture will render the stock more productive.

A Dairy Stock is therefore better calculated than
any other mode of occupying land to improve waste ground, or land of an indifferent or medium quality.

If this be the case in the western counties, similar land in other districts may be equally well improved as that of Ayrshire by a Dairy Stock. In many parts of the Highlands, Galloway, &c. the mountains are too high, steep, and bare, to admit the plough. But there are many situations in all the counties in the south and east of Scotland, where extensive tracts of moorish land, hitherto neglected, are highly capable of being so far reclaimed as to support a Dairy Stock. Even where the greatest part of the surface is only fit for a Sheep Stock, there is frequently a good deal of land in low situations, which, if duly cultivated, would support a Dairy Stock to great advantage, and yield, at least occasionally, good crops of oats, potatoes, and barley; and wherever such land is to be found, a Dairy will pay better than any other mode of farming. I know that the store farmers who occupy such land will remonstrate against breaking up the smallest portion of it, and will plead a thousand excuses for keeping it in statu quo; though the only insurmountable objection I can discover is their own indolent habits, and their ignorance of, or inattention to Dairy Husbandry. In a large store farm, for instance, in the Lammermoor, Annandale, or in any other of the south or eastern districts of Scotland, fifty, one hundred, perhaps several hundred acres of land, much of it lying in a state of complete waste, overrun with brambles, heath, and rushes, or burns or streams of water at times running over and wasting the best of it, might by proper industry be converted into excellent Dairy ground, and rendered productive of much grain, roots, and hay, without doing great injury to the sheep walk. Part of it could be appropriated every winter to the feeding of
the young or weak of the sheep flock; and when the hill pasture was buried under snow, the sheep would often find relief on the low and cultivated lands, or be supported on the hay, turnips, &c. raised thereon, and stored up for their use in winter. Some of the storemasters argue that the rich grass on such land would induce disease on the sheep stock; yet when deep snow lies long, they drive their sheep many miles to come at similar pasture. Now I would ask these sagacious storemasters, whether it would not be still more safe and profitable to have such relief on their own farms, than to be obliged to drive their flocks ten or twenty miles to procure food to keep them alive? They will also tell you that lime injures the land in moorish districts. The minister of Muirkirk gravely said so in the statistical account he gave of his parish; but if that reverend gentleman were now alive, he would see many of the most industrious of his parishioners applying lime to their land with the best effect. The range of sheep pasture would no doubt be a little narrowed by taking off part of the lowest lands for Dairy ground; but is nothing to be reckoned upon ten, fifteen, or twenty milk Cows, and a considerable portion of good grain in early or ordinary seasons?

2d. The richest and best of the arable land, which is capable of being kept under liberal rotation courses, should not be occupied chiefly, or to any great extent, with a Dairy Stock, but ought to be appropriated to its proper use, the raising of grain crops. But even on these best lands, a small portion of the Dairy might be introduced to advantage. Whatever part of the lands may be thought proper to turn into pasture, a Dairy Stock, if well managed, will make it pay better than either rearing or fattening Cattle.
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It would be out of place, in a publication on the Dairy, to enter on the consideration of rotation of crops. But whatever be the rotation adopted on any description of ground, it will be highly advantageous to turn part of it into pasture for a few years at proper intervals. The rotation courses that have been followed in the grain districts form one of the greatest improvements in the Grain Husbandry of modern times. But still the soil, like many other things in nature, will be improved by occasional rest. When the rotation courses, and especially those of four or five course-shifts, are pursued, the soil has not sufficient time to recover from the exhaustion of the different crops in the shift till these very species of crop are repeated. In that case, the land, if not enriched by the application of extraneous manures, cannot be so productive, or the grain of such good quality, as when the same crop is only repeated at a greater distance of time after each other; and even where manure can be procured, the grain is not so sound and good, when too often repeated, as that from land which has been longer rested.

I am afraid the present race of grain farmers have fallen into the same error as to rotations that a former generation did with the application of lime. Finding that lime, when first applied to land, brought an excellent crop, they imagined they had nothing more to do but to repeat the dose and reap a similar return. They did not consider that the first liming having exhausted the inert vegetable matter in the soil, the after applications, before more vegetable matter was collected in it, could only tend to exhaustion, and reduce the soil to a caput mortuum. From the same causes, the constant rotation of grain and green corps, without rest, must, after a while, reduce the fertility of the soil, and
render it far less productive than when these rotations were first begun; unless a reasonable portion of rest were allowed to restore the fertility of the soil.

It would therefore be advantageous to allow even the best of land occasional rest; and when it is turned to pasture, a proper Dairy Stock will, if rightly managed, pay better than any other species of stock.

The grain farmers on the east side of the island will probably be as much displeased with these observations, as the store-masters are likely to be with what is stated as to their farms; and some of them may now, as they did formerly, hold these observations up to ridicule, or endeavour to get them suppressed.

But I am not to be deterred from any part of my duty by the contradiction or sneers of those who are ignorant of that branch of industry, or who are prejudiced against it, or are too conceited of their own peculiar modes to listen to anything out of their beaten path. I respect the farmers in the grain districts for their intelligence and industry. Many of them are the greatest ornaments to that honourable profession; and I am ready to give them credit for the important improvements they have made in their own departments of agriculture. But when these gentlemen assume to themselves the direction of branches of husbandry to which they are strangers, or against which, or the district where it is carried on, they are prejudiced, I do not conceive that their errors or whims ought to be regarded. It might wound their pride to propose that their wives and daughters should leave the drawing-room, to milk, or even to superintend the milking of the cows, set the curd, or do the other labours of the Dairy; but they should not be displeased
at other farmers who have not attained the same degree of wealth and refinement as themselves, if they should choose to exact such services from the females in their own families. I rejoice to see the farmers in easy circumstances, and attaining refinement; but whenever these raise them, or their wives or families, above the duties of their station, I would be happy to see others, who are willing to be more industrious, promoted to the occupation of their farms. Too much refinement renders a farmer unfit for the duties of his station. It is one of the evils to be lamented in the rural economy of the Lothians, that too many of the tacksmen of farms aim at refinement above the proper sphere of mere occupiers of land, while the great body of the inhabitants of these counties are reduced to a situation far less comfortable than the labouring people in the western counties. I know from experience that the respectable farmers in the eastern districts will be displeased at these remarks, and probably Mr. Brown or other bookmakers may in some shape or other attempt to chastise me for vending opinions so very unpalatable. But so long as I can move either tongue or pen, these shall be exerted in the cause of humanity, rural improvement, and truth.

3d. Land of a medium or inferior quality, if it is already arable, or capable of being easily reclaimed, is remarkably well adapted to Dairy Husbandry, and no other mode of management will pay so well, and tend to improve the soil so much, as occupying such land with a Dairy Stock.

In land of that description, dung is of the utmost value, and there is no way that so much dung can be made upon a farm, if the straw is to be eaten at all, as by keeping a Dairy Stock. Land of a medium or inferior quality is not capable of being brought under
liberal rotation-courses of cropping; and if it is occupied with a rearing stock, or even with cattle to fatten on the pasture, they are not kept in the byre, but laid out in the fields, and therefore the one half of the dung cannot be made, as when Dairy Cows are kept and properly managed. A Dairy farmer, in order to raise fodder for his stock in winter, and to preserve as much of his land as possible in pasture, is obliged to enrich what land he crops by means of lime, compost and other adventitious manures, which, with the large quantity of dung made, enriches the soil that is in crop, while that part of the farm which is in pasture is enriched by rest; and by being ploughed up, and manured in its turn every seven or eight years, the pasture never grows coarse and wild, as land of an inferior quality will always do when it is kept in pasture more than ten years without being manured and cropped.

But when from one fourth to one third of the land is cropped alternately, and a proper quantity of manure applied, the soil is improved, not only by the application of the manure, but even by the cropping, for two or three years, after having been pastured for seven or eight years. Such cropping opens the pores and pulverizes and deepens the thin stubborn soil, destroys the fogs (Hypna), rushes, and coarse herbage, and raises new and fresh grasses in renovated vigour; and when the land is again turned into pasture for a few years, the rest (if it is not continued too long till the ground begins to grow wild) also improves the soil in its turn.

Land of a medium or inferior quality, or that which is in too great altitude, is not capable of being brought under any of the improved rotations pursued in richer soil, and in lower situations. Neither is it capable of being kept long in pasture without being broken up,
as it returns fast to a state of waste, after ten or twelve years' rest. But if such land is rested from six to ten years, and cropped two, three, or four years alternately, and a proper quantity of manure applied, such land is not only kept from returning to the state of waste land, but is gradually improved; and if the soil and climate are any way favourable, such land, under the treatment here recommended, will in time become fit for the most liberal rotations.

I am well aware that I am likely to be again held up to ridicule for talking of a rotation so barbarous. That such a course would be improper in rich good ground, in moderate altitude, I readily admit; but whatever some conceited people who understand the liberal modes of farming on the best of land, and measure every other description of soil by their own standard, may say on that subject, I am confident that no other mode of husbandry will pay so well, or improve ground of a poor or medium quality so much, and at so little expense, as that which I here recommend. By far the greatest part of the arable land in the counties of Ayr, Renfrew, and Lanark, is of the quality here referred to, namely too thin, too poor, and situated in too great altitude for liberal rotations, and is occupied, cropped, and managed nearly in the way I have pointed out; and in no other part of Scotland are such high rents paid for land of the same quality, in the same state, and in a climate so unfavourable; and however much the more dashing farmers in the other side of the island may despise their homely modes, there is no part of Great Britain, or of the inhabited globe, where so large a portion of the inhabitants employed in cultivating the ground are so independent, intelligent, and happy. The proprietors of land in these counties are paid a higher rent than is drawn by those of any other district of the same
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extent, where soil and climate are equally unfavourable. The tenantry, though they do not make such a figure in life as some of those of the eastern counties, are ten times more numerous, many of them as intelligent, and generally as industrious as those of any other quarter; and there is no other part of Europe where servants and labourers are so well paid, and well treated, and where they perform so much labour, as in the three counties here referred to. If so, the sneers of these gentlemen do not merit much regard. Wherever the soil, climate, and state of culture is similar to those of the better districts of the Lothians, the modes pursued there are and ought to be followed; but where they are far different, other modes, better suited to local and relative circumstances, must be pursued. Wherever these are disregarded, the scheme, however plausible,—however well it may have succeeded elsewhere under different circumstances,—however well the story may be made to appear in a book,—or however many great men may have been deceived by it,—will lead to the ruin of those who embark in it.

Some have thought, that as there is generally a greater growth of natural grasses in the western than in the eastern counties, the former is best adapted to Dairy Husbandry. That the greater, or rather the more frequent falls of rain in the west than in the east side of the island raises more herbage, though of a coarser sort than is generally found on the dryer side of Scotland, is no doubt true; but the question still remains to be decided how that herbage, whether coarse and bulky, or richer and more scanty, can be turned to the best account. That grass is as well suited to the rearing (where it is not too coarse) and fattening of stock, as it is to the Dairy. But, for the reasons that have been mentioned, the Dairy seems much better cal-
culated to promote the improvement of the soil and raising of grain, than either rearing or fattening of stock on pasture, as will be shown in course of this Treatise.

The more frequent rains in the west render the operations of improved grain husbandry more difficult and much more precarious than they are under a better climate; and for these reasons the farmers find it their interest to keep a large portion of the land in grass. And as improved Dairy Husbandry originated in the county of Ayr; as dairy produce has advanced in price six times as much as that of grain; and as the farmers know it pays them better than either rearing or feeding cattle (as will be shown in this Treatise), it is not surprising that they are as partial to that branch of industry as the Lothian farmers are to their rotation courses and drill husbandry. It is not uncommon to find people partial to the modes they can perform with the greatest dexterity, and averse to things they do not properly understand.

To conclude this discussion, I am humbly of opinion, that no improvement in agriculture would be more interesting than the reclaiming of as large a portion as possible of the moor or waste land capable of being rendered arable: And wherever that is attempted, I am confident that it can be done in connection with a Dairy Stock, better than by any other mode of occupancy that I am acquainted with. I am also persuaded, that introducing a greater proportion of pasture into the rotation on good land, would be a great improvement in the grain husbandry; and at any rate, whatever is turned to pasture in such land, beyond what the farm horses require, would yield a better return when occupied with a Dairy Stock, than where that of any
other species is kept. But whatever diversity of opinion may prevail on any of these subjects, I presume that none who knows any thing of that branch of industry will doubt, that in land of a medium or inferior quality, the Dairy is of all others the most proper mode of husbandry. And when the vast proportion of that species of land in Scotland is taken into view, and the high and still increasing demand for Dairy Produce considered, the subject cannot fail to be viewed as interesting.
CHAPTER I.

THE DAIRY BREED OF COWS.

Sect. I.—The Pliability of Animal Economy pointed out.

The domestication of so many different species of animals, as have been subjected to the control of man, all of them useful, and many of them so well calculated to promote the ease and comfort of the human race, is undoubtedly a most important acquisition, which calls for gratitude to the bountiful Giver of all good. And that acquisition has been rendered still more interesting by modern discoveries, which have shown that domesticated animals are capable of being changed into so many different varieties or breeds, suited to almost every diversity of use. We have for instance horses for the turf, the road, and the draught, as well as ponies for the saddle and inferior uses. We have cows of from six or eight to an hundred stones in weight. Some of these are dull, grovelling, glutinous, and inactive; while others are quick, lively, nimble, and hardy;—some that yield twenty, and others that give only one or two pints of milk per day. We have equal varieties of sheep, differing in weight, colour, aspect, fleece, and flesh. Some without horns, some with two, others with four, and

* The original Draught of this Treatise having been written in the year 1815, the dates, prices, state of agriculture, &c. refer to that period. Some of these have been altered to those of 1822, but others remain as first put down.
some with five or six horns. The wool of some breeds is fine and downy; that of others coarse and hairy. The flesh of some is tender, sweet, and juicy; that of others strong in the grain, and of a harsh taste. There are still greater varieties in the dog species.

Of all the domesticated animals, however, none have been formed into greater varieties, or breeds, than Cows. The pliancy of their nature is such, that they have been formed into many diversities of shape, and various qualities have been given them, very different from the original stock. The Urís, or cows of Lithuania, are almost as large as the elephant; while some of those on the Grampian Hills are little above the size of a goat; and Cows are found of every diversity of size between the one and the other.

They are not less varied in their shapes. The Bison, which is a variety of the cow tribe, and which readily propagates with our cows, wears a strong shaggy mane, like the lion; a beard like the goat; as much hair under its neck and breast as covers its fore legs; a hump upon its shoulders, nearly as large as that worn by the camel (sometimes forty or fifty pounds in weight), with a tail that scarcely reaches the top of its buttock; and it resembles the lion much more than it does our domesticated cows, or other varieties of its own species.

The diversity of qualities in the Cow species is also very great. Our cows are so grovelling and inactive, that they scarcely know the road from their stall to their pasture, while those of the Hottentots are so tractable as to be entrusted with the charge of other animals, and keep them from trespassing on the fields of grain, or other forbidden ground. They also fight their master's battles, and gore his enemies with their
horns. Our Dairy Cows are so feeble and inactive, that they are hurt by travelling twice a-day, even slowly, one mile from the byre to their pasture; while those of Tartary are used as riding animals, and in drawing carriages. Those of Hindostan draw the coches, and maintain their rates with horses at the full trot; and the Hottentots teach their cows to hunt down the elk antelope. Cows of the wild neglected breed can with difficulty be removed from one enclosure or one hill to another, while those on whom due attention has been bestowed are docile, and submit to perform all sorts of labour. Some cows will yield upwards of twenty Scots pints of milk per day, while others will not give so much in ten, perhaps not in twenty days.

These are not so many different species of animals, but all of them one and the same species, all capable of generating with each other a perfect offspring. All these varieties have been formed from the parent stock, partly by the diversity of soil and climate, or other accidental or adventitious circumstances; and partly of late by human skill and industry. Mankind having once discovered the pliability of animal economy, and attended to the means by which the shapes and qualities of animals can be changed, an extensive field for the exercise of human industry and ingenuity has been thereby opened; and the success with which it has already been attended excites to perseverance and industry, in order to render that versatile species of farm stock still more useful. If so many varieties of breeds, having such diversity of size, aspect, disposition, and qualities, and capable of contributing in so many ways, and to such an extent, to the subsistence and comfort of man, have been already formed, chiefly by the accidental circumstance of soil and climate, or with but little attention till of late to the principles of breeding;
what may not yet be accomplished by human skill and industry, now that the effects of judicious breeding, and of feeding and treatment, have begun to be understood and acted upon?*

The formation of the Dairy Breed of Cows in the county of Ayr, chiefly in the course of the last thirty or forty years, and from a stock of cattle as far different from what these cows now are as any one breed in the kingdom is from another, affords the strongest proof of what may be done by skilful treatment and crossing, and holds out the greatest encouragement to industry and the exercise of ingenuity in improving the breed of live stock; as will appear from the following history.

**Sect. II.—History of Ayrshire Dairy Breed.**

The Dairy Breed of Cows in Ayrshire, now so much and so greatly esteemed, are not an ancient or indigenous race, but are a breed begun to be formed, first by the inhabitants of the bailliary of Cunningham in that county, within the last forty, and chiefly within the last twenty years. It appears from an adage of unknown antiquity in the county of Ayr,† that Dairy Husbandry had not only been practised in Cunningham, but that the making of butter and cheese had

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* Mr. Cullie and others have by skill and industry formed some entirely new and different breeds of Cows from the common stock, which it is foreign to the subject of this Treatise to detail.

† Kyle for a man,
Carrick for a Cow,
Cunningham for butter and cheese;
And Galloway for woo*.  

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become the peculiar and distinguishing boast of the district at a very remote period; and the last and present generations of the inhabitants have shown that they still attend to that branch of industry, and have greatly improved on the favourite practices of their ancestors.

But though Dairy Husbandry has for many ages past been more attended to in the bailliary of Cunningham than in any other district in Scotland, it was only during the present generation that any material improvement was begun to be made, or even attempted, on the breed of Cows in that district; and it is only within the last twenty years or thereby, that that improvement merited notice.

Every person now of fifty years of age or upwards, who has paid attention from their youth to the cattle in that district, will remember that the Cows in the bailliary of Cunningham, and in that of Kyle, were generally, till after the year 1780, a puny, unshapely, and inferior breed of cattle, not superior in size, shapes, or qualities, to those still met with in the higher parts of Clydesdale, Peeblesshire, or those in the islands of Arran and Bute. They were even inferior to these, from not being nearly so well fed as cattle generally now are in every district, except in some parts of the North Highlands.

The cows then kept in the districts of Kyle and Cunningham were of a diminutive size, ill fed, ill shaped, and yielded but a scanty return in milk,—they were mostly of a black colour, with large stripes of white along the chine or ridge of their backs, about their flanks, or on their faces. Their horns were high and crooked, having deep ringlets at the root; the plainest proof that the cattle were but scantily fed. The
chine of their backs stood up high and narrow, their
sides were lank, short, and thin, their hides thick, and
adhering to the bones; their pile was coarse and open,
and few of them yielded more than three or four Scots
pints of milk per day, when in their best plight; or
weighed when fat more than from twelve or sixteen,
to twenty stones avoirdupois, sinking offal.

It was impossible that these cattle, fed as they then
were, could be of great weight, well shaped, or yield
much milk. Their only food in winter and spring was
oat-straw, and what they could pick up in the fields, to
which they were turned out almost every day; with a
mash of weak corn and chaff daily for a few days after
calving. And their pasture in summer was of the very
worst quality, and eaten so bare that the cattle were
half starved. The land was then under such barbarous
courses of cropping, and so much overcropped, that
when turned to pasture, it yielded little else but weeds,
and a few natural grasses of the worst quality; and that
coarse pasture was so much overstocked, and eaten so
bare, that the cattle were half starved, and had the as-
pect of starvelings.

A wonderful change has since been made in the
condition, aspect, and qualities of the Ayrshire Dairy
Stock. They are not now the meagre unshapely ani-
mals they were about forty years ago; but have been
completely changed into something as different from
what they were then, as any two breeds in the island
can be from each other. They are almost double the
size, and yield about four times the quantity of milk
that the Ayrshire Cows then yielded. Formerly they
were not of any specific breed, nor uniformity of shapes
or colour, neither was there any fixed standard by
which they could be judged. But now they are ge-
nerally of a brown and white colour, in mixed patches; and rules have been adopted for determining the purity of the breed, and excellence of their quality, which will be mentioned in course.

These alterations, although they are extensive, have not been made by merely selling the farm stock, and replacing them with a different breed; but the changes have been effected upon the former breed, partly by skilful breeding, and still more by better feeding and treatment.

But though these improvements in the Dairy Stock of Ayrshire were begun and brought to its present advanced state within the recollection of thousands who are still alive; and though I kept a Dairy Stock for some time in the centre of the district where these improvements were first introduced, and about the time that they began to be improved; I have not been able to trace the commencement of them to any particular person or family.

About the year 1760, or between that and 1770, some noblemen and gentlemen who resided in the eastern and southern counties of Scotland, procured cows of some English or Dutch breed, who were much larger in size than any other then in Scotland; and when these were well fed on the sheltered and improved lands round the seats of their owners, they yielded far more milk than the native cows. It was their greater size, and the superior quantity of milk they yielded, that induced these noblemen and others to purchase them; and wherever their feeding in Scotland corresponded to what they had been accustomed to eat, their owners were not disappointed. But when these large cows were turned into pasture that was much inferior to that
on which they had been reared, they fell short in milking, as all cows that are not well fed will do.

I am really uncertain as to the district or country from which these stranger cows were brought. They certainly were denominated Dutch Cows when first introduced into Ayrshire. But from their being of a brown and white colour, I am disposed to believe they were of the Teeswater breed.

Neither have I been able to discover who it was that first introduced them into the bailliary of Cunningham, nor to point out all those who did so: John Dunlop Esquire of Dunlop, brought some of these English or Dutch cows to his byres at Dunlop House in Cunningham, soon after the year 1760. As they were there provided with the best of pasture, as the Dairy was much attended to in that neighbourhood, and as the improved breed of the mixed brown and white colour came into vogue about Dunlop and Stewarton sooner than in any other part of Cunningham, it is likely that Mr. Dunlop's were among the first of the stranger breed that reached Cunningham.

The Earl of Marchmount, about 1750, purchased from the Bishop of Durham several cows and a bull of the Teeswater or some English breed, all of a brown colour spotted with white, and his Lordship kept them some time at his seat in Berwickshire. Bruce Campbell Esquire, then factor on his Lordship's estates in Ayrshire, carried some of that breed to Sornbeg in Kyle, where they were kept some time, and their progeny spread over different parts of Ayrshire. A bull of that stock, after coupling with many cows on the estate of Cessnock, was by Mr. Campbell sold to John Hamilton Esquire of Sundrum, and raised a numerous offspring in that quarter of Ayrshire.
John Orr of Borrowfield Esquire, about the year 1767, sent from Glasgow, or from some part in that neighbourhood, to his estate of Grougar, Ayrshire, several fine milk-cows of a much larger size than any then on that estate. One of these cost six pounds, which was more than twice the price of the best cows then in that quarter. As these cows were well fed, they yielded a good return in milk, and the farmers in that neighbourhood were eager to procure their calves, in hopes of obtaining similar returns. Cattle of the same appearance were about that time brought to Eglinton, Loudon, and to the seats of other noblemen and gentlemen in Ayrshire. And as most of those were of the same colour, brown, spotted or fleaked with white,—as all of them were larger, and when duly fed yielded much more milk than the native breed,—their calves were reared by such as could procure them, and bulls of that breed, or even of their colour, were preferred to all others. From these, or from crosses of them with the native cows, the whole district has been stocked, and the breed has attained such celebrity, that they have not only supplied the counties of Ayr, Renfrew, and greatest part of Lanark, but, for about twenty years past, colonies of the improved breed have been carried from Ayrshire to every county of Scotland, and to many counties in England.

SECT. III.—On the Shapes and Qualities of Dairy Cows.


Although the Dairy Breed of Cows have now attained considerable celebrity both for shapes and qualities, and though they are superior to all others in Scotland, and probably the first in Britain for yielding milk, taking
into view the soil and climate to which they are confined; yet they were, for some time after being crossed with a stranger breed, far from being so shapely and handsome, or such milkers as they have recently become. The two breeds crossed were by far too distant from each other in their size and qualities, to have been so indiscriminately coupled; and the consequence, as might well have been expected, was at first a mongrel and ill-shaped race of animals. The mode of feeding by the ordinary farmers at that time in Ayrshire was far from being suitable to the large and improved breed that was then introduced; and that circumstance had a tendency to injure for a time the shapes and qualities of their mutual offspring. It was only when they were well fed on rich and improved pasture, that a breed so large, or even their offspring, could thrive well, preserve proper shapes, or yield much milk. When turned out to the bare leys on which the native breed had been fed, they grew up unshapely starvelings. And it was not then duly understood and attended to, that proper feeding was an indispensible requisite to a Dairy Cow. It was not till after the year 1780, and in many places till nearly about the end of last century, that the Dairy Stock of Ayrshire began to be improved by proper feeding.

Another thing that greatly injured the shapes and qualities of that race of cows, was, coupling large bulls of the stranger breed with the cows of the native stock, who were much smaller than the bulls that were put to them. A notion prevailed at that time (and it is not yet altogether done away), that the best mode of improving the breed of animals was from males of a large size and good shapes. And there was then too much anxiety shewn to increase the size of animals by breeding, without a corresponding and improved mode of
feeling. The Dairy Stock of Ayrshire were at first much hurt in their symmetry by these errors.

It is certainly proper to breed from males of the best shapes and qualities, and even from those of a proper size. But to couple a large male with a puny jaded female is bad management, and has been productive of much injury among all sorts of farm stock. The offsprings of such unjust crossing have always large bones, but they are never strong and vigorous in proportion to their size; and they are always deficient in spirit. They are in fact unshapely, unhealthy, spiritless mongrels.

The same effects follow, and the same unshapely animals are produced, when those of a large size are reared on poor pasture, or otherways ill supplied with food.

The Dairy Breed of Cows in the county of Ayr were much hurt in their shapes and qualities by breeding from bulls that were too large for the cows to which they were put; and also from their not being provided with abundance of food. They acquired so much bone, and such ill shapes, that they were despised and rejected by strangers. And though by better feeding their shapes have been greatly improved, yet they are still far from being so handsome, and such round, well formed, and perfect well shaped animals, as the Galloway, Argyle, or Skye breeds.

The proper method of breeding all sorts of animals is to use males of the best shapes and qualities, and of a moderate size, and never to breed from females that are not nearly equal in size to the male that is put to them; as well as those that have good shapes and qualities, and that are not too old.
When these rules are observed, and the offspring properly fed, there is every chance of procuring a well shaped and valuable race of animals. But where they are disregarded, an unshapely and less valuable breed may be expected.

But though the Ayrshire Dairy Breed was much injured at first by injudicious crossing and meagre feeding, yet they have now in a great measure recovered from the effects of these evils, and have become a much more perfect breed. Though they were of too great a size at first for the soil and mode of feeding, yet the after generations were brought down to the size that the mode of feeding in that part of the country was calculated to support. For it will always be found that the size of live stock is just in proportion to the manner in which they are fed. And as agricultural improvements on the soil advanced, the pasture came to be more improved, and the farmers soon discovered the advantage of stocking lighter, and feeding better. By these means the present Dairy Breed have been brought to much greater perfection of shapes than they had even a few years ago. These shapes are continuing to improve in proportion to the attention paid to the crossing and feeding that species of stock.

The Shapes most approved of in the Ayrshire Dairy Breed are as follows:—Head small, but rather long and narrow at the muzzle;—the eye small, but quick and lively;—the horns small, clear, bended, and the roots at a considerable distance from each other;—neck long and slender, tapering towards the head, with little loose skin hanging below;—shoulders thin;—fore-quarters light and thin;—hind-quarters large and capacious;—back straight, broad behind, and the joints of the chine rather loose
and open;—carcase deep, and the pelvis capacious and wide over the hips, with fleshy buttocks;—tail long and small;—legs small and short, with firm joints;—udder capacious, broad, and square, stretching forward, and neither fleshy, low hung, nor loose, with the milk-veins large and prominent;—teats short, pointing outward, and at a considerable distance from each other;—the skin thin and loose;—hair soft and woolly;—the head, horns, and other parts of least value, small, and the general figure compact and well proportioned.—Vide the engravings subjoined.

The Dairy Breed on the Clyde, at and above Hamilton, are mostly of the same colour and general aspect as those in the county of Ayr, and are, upon the whole, fully as handsome and fine looking animals; but any person conversant in that species of stock can easily perceive that those on the Clyde are generally longer and rounder in the chest, much heavier in the fore-quarters, and less capacious behind, than the improved Dairy Stock in Ayrshire. The Lanarkshire breed are therefore better suited to the grazier and butcher than the Cunningham Dairy Stock. The late Lord Belhaven kept at Wishaw House for several years a bull of the Dairy Breed of uncommon beauty, and who became the father of hundreds of calves every year. This bull, however, was a native of Beith in the county of Ayr. He was longer and rounder in the chest, deeper in the ribs near to the shoulder, and his fore-quarters were stronger and heavier than the bulls most approved of in the county of Ayr. The Ayrshire farmers prefer their Dairy Bulls according to the feminine aspect of their heads, necks, and fore-quarters, and wish them not round behind, but broad at the hook-bones and hips; and they like them best that are full in the flank.
If we compare the Ayrshire improved Breed of Dairy Cows with that species of Stock kept in some of the counties of England, the superiority of the former will be obvious to every one who has paid the least attention to the subject. When I passed through the county of Lincoln some years ago, I was astonished to see the coarse ugly mongrels kept there for Milk-Cows; but when I expressed my opinion of them to such of the farmers as I met with, they seemed much displeased at my impertinence, and laughed at me as an ignorant “Sawney” from the north. These cattle are described by Mr. Stone, who wrote one of the Surveys of that county, as beasts that when fat will weigh, the cows from eight to nine, and the oxen from ten to twelve hundred-weight. He says, p. 57, “They are generally large in the head, horns, bones, and bellies,—thick, short, and fleshy in their necks and quarters,—narrow in their hips, plates, chines, and bosoms,—high in their rumps, and their shoulders not well covered,—their eyes small and sunk in their heads.” The cattle reared on the commons, being scarcely half-fed, are smaller and still worse shaped. These mongrel breeds will consume as much food as those of the most improved quality. The Dairy is not duly attended to in Lincolnshire; and as people generally find excuses for their worst practices, the farmers there gravely tell you that the ground in that county is too rich to yield dairy produce, which can only be got on poorer soils.

Mr. Secretary Young, in his Survey of Lincolnshire, says the Cows at three years old are only worth £7 or £8, so that much food is misapplied. He says, however, that Mr. Tyndall has some fine cattle, and it would be injustice to that gentleman, and to the learned Secretary, not to describe them. The Secretary says, “The grand-daughter of the Twa-pap Cow, the daugh-
ter of Bald-Face, the Red Cow, the grand-daughter of Old Blue, and the Cow called Wide-Hips, are all very fine beasts: the last he thinks the best, and would sell at no price." "Apparently they have Durham blood in them." Page 290, he says, "Mr. Hoyle of Osburnby is in the same breed as Mr. Tyndall, having had cattle from him; also in Dun French." After much learned discussion about long horns and short horns, and about *tup-men* and *bull-men*, the Secretary comes to this sage conclusion, p. 303, "It is evident that the Lincoln breed of cattle, upon Lincoln pasture, are profitable; and it appears evident, from the general colour of the comparisons made with the long-horned breed of Lincolnshire, that their own short-horns are superior." In page 297 he says, "The Cows suckle three Calves." In Scotland, however, the Calves suckle the Cow. He says, "Uncommon as Dairies are in general, it is not universal."

Mr. Wedge, in his account of the Cheshire Dairy Breed, mentions the symptoms of a good milker, as follows:—"A large thin-skinned udder, large milk-veins, shallow and light fore-quarters, wide loins, a thin thigh, a white horn, a long thin head, a brisk and lively eye, fine and clean about the chaps and throat," &c. This is more to the purpose than all Mr. Young has said about the Twa-pap Cow, the Blue Cow, or the *tup-men* or *bull-men*.

3. *The chief qualities* of a Dairy Cow are, that she should give much milk; that she fatten readily; and that she turn well out in the hand of the butcher. It will be shewn in course, that the Dairy Breed of Ayrshire are far superior to all others in Scotland, and probably superior to any in Britain, for yielding copious draughts of milk; and that no breed of cattle what-
ever fatten faster, or cut up better in the shambles. Next to these qualities, their docility of temper greatly enhances their value. They are tame, quiet, and contented; they feed at their ease, and do not roam about, break over fences, nor gore one another.

To improve these qualities, they ought to be gently treated, frequently handled, from the time they are calves, and neither hunted with dogs, nor beat or frightened. They have also a tolerable degree of hardiness, though by no means equal in that respect to the Galloway or Highland breeds. They are not injured, but the reverse, by lying out over night six months in the year; and when they are not in full milk, or too near the time of calving, they can travel from one to two hundred miles, at the rate of twelve or fifteen miles per day, which is more than the Highland breed usually travel. From their quiet and peaceable habits, and the eagerness they shew to fill their bellies, some have imagined they were dull and grovelling, but they are as lively and spirited as could be wished for in Dairy Stock; and they are but seldom affected with any sort of disease.

4. The size and weight of the Dairy Breed varies much, according to those of the parents, and the various modes of rearing and feeding them. They will be found of every weight, from eighteen or twenty, to fifty or fifty-five stones English, when fat, sinking offals. The greatest number of these cows will weigh from twenty-four to thirty-six or forty stones English.

5. The prices they bring are still more variable, owing to the diversity of weight, beauty, and aspect, or the age and condition of the animal,—the time of its calving,—season of the year at which it is exposed,—state of
the markets, &c. They have brought every price from eight or ten to twenty-five pounds. Many were sold at about thirty, and some as high as thirty-five pounds, though the average price of good dairy cows was from twelve to eighteen pounds. But, like every other species of farm stock, they had fallen in price at least a third, or almost one half, from 1815 to 1817; but they began to advance in price in the course of 1817, and in summer 1818 they brought nearly as high prices as in 1813. They have fallen back in winter 1821-1822, chiefly owing to the dread of a scarcity of fodder; but they will advance in price by the month of May.


The Calves reared for Dairy Stock are selected from the parents of the best quality, and few are brought up but such as are of the fashionable colour. A good calf may be reared at any season of the year, but those that are dropped about the end of March or beginning of April, as they are ready for the early grass, and attain some size before winter, are generally preferred.

Calves reared for Dairy Stock are not allowed to suckle their dams, but are always fed by the hand from a dish. They are generally fed on milk only for the first four, five, or six weeks, and are then allowed from two to two and a half Scots pints of new milk each meal, twice in the twenty-four hours. Some never give them any other food when young except milk, and lessen the quantity when the calf begins to eat grass or other food; and which they generally do when about five weeks old, if grass can be had; and the milk is totally withdrawn about the seventh or eighth week of the calf's age. But if the calf is reared in winter, or early
in spring, before the grass rises, it must be supplied with at least some milk till it is eight or nine weeks old; as a calf will not so soon learn to eat hay or straw, nor fare so well on them alone, as it will do on pasture. Some feed their calves reared for stock, partly with meal mixed in the milk after the third or fourth week; and others introduce gradually some new whey among the milk, first mixed with meal, and when the calf gets older, they withdraw the milk and feed it on whey and porridge. Hay tea, juices of pease or beans, or pea or bean straw, lintseed beaten into powder, treacle, &c. have all been sometimes used to advantage in feeding calves; but milk, when it can be spared, is by far their most natural food.

Whatever be the food allowed to young calves, it ought not to be suddenly changed. A small quantity of whey, or of flour, or of meal of any kind, may at first be introduced into the milk. The infusion of hay, pea-straw, &c. may next be given, in small quantities at first, and increased as the calf advances in age and size. Even when the calf has begun to eat grass, the milk or other food ought not to be too suddenly withdrawn. A calf must have attained some age before it can thrive without milk, and when a change of food is too hastily introduced, the digestive powers of the young animal are overcome, and its growth retarded.

The Dairy Calves are generally kept on the best pasture during the first summer, and have some preference to the other stock in food during the next winter. From that time, till they drop their first calf, they are generally turned to inferior pasture, and are no better fed in winter than any other species of stock. They are allowed what oat-straw they can eat during the night and morning, and except in time of snow, are
turned out to the fields during the day-time. The greatest part of the young Dairy Stock are kept in byres or in sheds during winter; but some are laid out and supported with straw in the fields.

It would certainly be advantageous to that species of stock, and tend to increase their size, bring them sooner to maturity, and improve their qualities as dairy cows, if they were always to be fed on good pasture during summer, when young, as well as when old; and a few turnips or potatoes given them daily as green food in spring, would certainly bring them to earlier maturity, and render them more disposed to yield milk. In fact, such a mode of rearing and feeding would form in a few generations any ordinary breed of Cows into a Dairy Stock; while turning them to the moors in summer, and restricting their food to a scanty supply of oat-straw in winter, will, in a generation or two, undoubtedly form the offspring of the best Dairy Breed into Highland Cows, or what in the western districts are called "rough beasts."

The Dairy Cows in the counties of Ayr, Renfrew, and Lanark, are fed in summer on such pasture as the farm affords, and in winter on oat-straw in the lower districts; and partly on that, and partly on bog hay, towards the moors. The rye-grass hay raised in these counties is partly eaten by the farm horses, and what of it can be spared from them is sold, but very little of it is given to the milk cows. When they calve in winter or spring, they are supplied daily with boiled chaff, refuse of oats, green-kail, potatoes, turnips, &c.; and by way of luxury, a small quantity of hay is allowed them at that period. But from the time the pasture fails in autumn, till the time they drop their
calves, they seldom get any other food but oat-straw,* or hay of an inferior quality, with what they can collect in the fields, to which they are turned out every day except when it is very stormy,—a practice that is highly injurious to the ground, where the soil is mostly clay, or where it is mossy, and much overcharged with moisture in winter. When land of that description is poached by the feet of cattle in the rainy seasons, the herbage is trodden down, and a pool of water formed wherever the cow has imprinted her foot. The water thus introduced and detained sours and chills the ground, and injures it more than the value of all that the cattle can collect by pasturing in winter.

When the lands are properly fenced, the dairy cows are laid out in the fields during the night, from the beginning of May till about the end of October, and are only brought into the byre to be milked in the morning and evening. But towards the moorish districts, or where the land is not completely enclosed, the cows are put under the charge of a herd in the day-time, and lodged in the byre over-night.

Both these practices are approved of by some, and

* The same mode of feeding nearly prevails in Cheshire. Mr. Holland says, (p. 255), "The usual dry foods are wheat, barley, and oat straw, hay, and crushed oats. The two former kinds of straw are found to make Cows go dry much sooner than the latter. But wheat-straw is esteemed much more wholesome than barley-straw. Oat-straw is not given till the wheat and barley-straw are consumed. The straw fodder is continued till about three or four weeks before calving, when hay is given." About twenty or twenty-five quarts of crushed oats is given to each Cow per week, from the time she calves till she is turned to pasture.

The English Cows do not seem to fare so well as the Dairy Cows do in Scotland. Barley-straw is seldom given to either Cows or Horses in the dairy districts in North Britain; and I never knew of wheat-straw being given to any species of stock in Scotland.
SECT. IV.  MODE OF REARING DAIRY COWS.

disapproved of by others; and both of them have no doubt their advantages and disadvantages. When the cows can be kept in the fields day and night, the expense of a herd is saved, the cattle pasture at their ease without interruption, and they rest or eat as suits themselves. They are generally in that case more hardy, and yield more milk than those that are confined in byres, which are often too warm. Those who keep their cows in byres, however, argue, that they are safer from injury from any sudden change of the weather; that they are not so ready to go astray; that they can be more easily supplied with part of their food in the house; and that a larger portion of their dung is preserved. But cattle that are accustomed to lie out are not easily hurt by any change of the weather during the summer and harvest. It has often been observed, that when cattle accustomed to lie out over-night, were kept in the byre during a stormy night in harvest, they were generally more dried up in their milk next day than those which had been exposed to the storm. As to the feeding in the house; when the cattle have abundance of good pasture, they will scarcely eat any thing in the stall. If a scarcity of pasture renders soiling necessary, or if rich stall-feeding be provided, it can be given to the cattle at the time they are brought in to be milked twice every day. The most industrious dairy farmers are careful at all times to put some delicious food into the stall of their cows at the time they are milked; and it seems very proper to give them something to their taste at the time they yield so copiously to their owners. More dung is no doubt collected when the cattle are kept in the byres during the night, but that which is dropped on pasture ground is not altogether lost. Few farmers, however, keep their cows in the house when their fences are sufficient, and the arguments for the contrary practice
are rather of the nature of excuses for indolence in not having their lands properly fenced.

When cattle are kept in the byre in summer, great pains should be taken to give them plenty of room and abundance of good air. It was not uncommon to see the cows that had been confined in byres that were too small and ill-aired, completely wet over with perspiration when turned out. A perspiration brought on by breathing pulmonoeous air exhausts the vigour of the cows, and exposes them to cold. A shed to keep cattle dry, and cover them from the rays of the sun, may be necessary, but a low-roofed hovel of a byre, where the cows have not sufficient room and plenty of good air, is injurious to their health.

Mr. Ralston in Fine-View, in the parish of Kirkum, county of Galloway, who kept and conducted the largest dairy in Scotland, on the most correct principles, never turned out his cows to grass till it could afford them abundance of supply. If a drought injured the pasture, or when the weather was very hot and sultry, he fed his milk cows with rye-grass and clover in the byre during the heat of the day-time, and turned them out to pasture from the evening till it became warm next day. When the pasture began to fail in harvest, he gave his cows the second cutting of clover in the byre, or the weedings and refuse of his turnips, strewed on their pasture.

But the greatest privation to which the dairy cows are subjected is the want of some green food during winter. When fed on coarse oat-straw, or hay of inferior quality, without any green food, from the time that the pasture fails in autumn till the grass spring up in May, or at any rate till the cow drops her calf,
they become so emaciated, and their milk vessels are so much dried up, that they are not in a condition to yield much milk, or that which is of good quality, until they are brought to a milky habit on the pasture. Milk drawn from a lean cow is always thin and meagre, as well as small in quantity. It ought therefore to be the chief care of every dairy farmer to preserve their milk cows, not only in good condition, but also in a milky habit, during the winter as well as in summer.

Turnips seem to have been formed by nature to render the domesticated animals, and particularly the dairy stock, comfortable, and to keep their milk vessels from being dried up during winter. A small quantity of that valuable root given out daily to every dairy cow during the winter, and as far into the spring as the turnips can be preserved, and a few potatoes in the month of April, would keep the cows open in their belly, prevent costiveness, drying up of the animal juices, binding of their hides to their bones, would remove biliary obstructions, and render the animal healthy, as well as increase the quantum, and enrich the quality of its milk during the season.

Considering their high value in that respect, it is matter of just regret that so few turnips are raised in the dairy districts, and that the few which are raised there are not preserved, as they ought to be, as green food to the dairy stock in winter, but are generally given to them to protract the milk for a few weeks in the autumn. At that season, the bellies of the cows have been long distended with soft wet food, and to give them then the soft turnips and their wet leaves is only increasing the evil. The turnips at that season open the cows' bellies too much; and when they are
eaten up, the Cows are fed for six months on dry fodder, still their juices are dried up, and they assume the aspects of ghosts.

But when the leaves and refuse of the turnips are given out in moderate quantities in the end of harvest and beginning of winter, and the sounder parts of the crop stored up to supply as green food, not to fatten the cows, or make them produce milk for a short time, but to keep them soft and in a milky habit, the turnips will turn to much greater account than when they are consumed in any other way. A single turnip or two every day to each cow through the winter would be sufficient to keep her in good order; even half a turnip every day would be of great service.

Cabbages might also be used for that purpose, during the earlier part of winter, and ruta-baga and potatoes in the spring. Whatever grain is given to cows, or indeed to any other species of stock, ought as often as possible to be malted. The additional saccharine matter which grain acquires during the process of malting, its effects as a green food, and the certainty of the grain being chewed, would more than compensate the trouble of malting.

Fiorin grass seems to be another provision of nature as green food to cattle. It remains green, and abounds with natural sap till the winter is far advanced, and is not injured by the severest weather. It is uncommonly juicy; and as it is much relished by cattle, it ought to be prepared as a species of green food for dairy stock during winter.

The want of a due supply of salt is another privation by which dairy stock, and indeed every species of the
domesticated animals, are materially injured. Salt is an essential ingredient in the food of animals. We feel how requisite it is to our own health and comfort; it is no less so to that of every description of live stock. Salt softens the skin of all the domesticated animals, and renders their hair or wool finer, softer, and more shining. When horses are fed on bruised whins (*Ulex Europoeus*), or any species of food abounding with salt, or when a handful of salt is put into their food daily, the pile of the animal becomes soft and shining. The superior quality of the wool of the Spanish sheep is chiefly owing to their being supplied daily with abundance of salt. When salt is given to cows, it improves the quality and increases the quantity of their milk. Cows relish salt so much, and find it so necessary to their comfort, that they submit to eat the wet litter from under the horses, however much it may be besmeared with dung, merely because it is impregnated with salt from the horse's urine. What a pity is it that an animal so valuable, and whose produce depends so much on its being properly fed, should be reduced to the necessity of eating litter mixed with dung, in order to obtain salt, with which it ought to be otherwise provided! The blame of this privation, however, does not rest with the farmers, but attaches to the government. The duty upon salt is certainly one of the most improper. The revenue it yields is trifling, compared with the injury it does in depriving cattle of that article so necessary to their life and comfort. The same revenue might be raised from some other article in common use; and as there is no danger of the salt of the ocean ever being exhausted, there is no occasion for keeping the cattle on short allowance.

*Soiling*, or feeding cows wholly or in part on cut grass in their stalls, begins to be practised in some parts
of Scotland; and it may well be expected, that, as cultivation advances, the practice will become more general on rich and cultivated lands.

The advantages resulting from that mode of feeding are numerous. The cattle are less fatigued, the grass is not injured by being trodden upon or poached by their feet, and their whole dung and urine is preserved. The cattle are not exposed to the scorching heat of the sun, or vicissitudes of the weather, and the plants are allowed to grow to the greatest perfection. Clover, and other leguminous plants draw much of their food from the atmosphere, by means of their leaves or foliage; and when these are cut down as they grow, and trodden upon before the herbage comes to maturity, the plants are thereby deprived of their chief support, kept in a state of infancy, and never attain perfection. The growth of clover is very slow, till once the plant can put forth leaves to collect aerial food, but after its leaves are extended, the plant grows and increases with more than double rapidity. The clover growing on any given space of land will, when it is allowed to come to perfection, and eaten in the stall, yield double or triple the quantity of food that it can yield when the leaves are nibbled off as they begin to be formed.

In the beginning of summer, when the clover is inadequate to the support of the stock, part of it may be cut, and mixed minutely with the hay or straw on which the cattle are fed; and if the mixture is made up over-night, the hay or straw will be found to have acquired a sweet vegetable taste, and to be rendered so moist and palatable, as to be more readily eaten by the cattle. And by this mode of introducing the grass, the cattle are not suddenly but gradually changed from dry to green food, as the grass springs up.
It is scarcely necessary to mention, that when too much fodder or other food is put into the stalls of cattle at once, they do not eat so much of it as when it is supplied in small quantities at a time. Cattle do not readily eat hay or fodder after they have breathed much upon it. Their food ought therefore to be laid before them in small quantities at a time; and any refuse of the former supply ought to be removed when more food is put into their stall.

Sect. V.—Of the Quantity and Quality of Milk yielded by the Dairy Cows.

Nothing regarding Dairy Stock is more difficult to be determined with precision, than the fair average quantity and quality of the milk which they yield. There is a great diversity in these respects in the different Breeds of Cows, as well as among the individual animals; and that diversity is increased in all sorts of Milk-Cows by various circumstances,—as the age of the cow—the habit of body she is in—the nearness or distance she is from calving—the manner in which she is fed, &c.

1. The diversity of capacity for yielding milk is so great, that of cows sprung from the same parents, reared and fed on the same farm, and every way in the same manner, one of them will often give one, two, or three pints per day more milk than the other. No cow gives so much milk when she is either too young or too old, as when she is from four to seven or eight years of age. A lean cow never gives so much milk, nor that of so good quality, as a cow that is in the proper habit of body. Cows generally give more milk for a few weeks after they have calved than what they do at any
other period; and the mode of feeding has such power-
ful influence on the milking of cows, that an adage has
long prevailed among the dairy farmers of Ayrshire,
that "The cow gives her milk by the mou'.” This
certainly is so far correct. To render a cow a good
milker, it is not only necessary that she be of a proper
dairy breed, but that she be also reared and fed on
dairy food, both when she is young, when she is in
milk, and when she is dry. If a calf of the very best
breed is reared in a moor, or in the way that those in
the Highland districts are generally reared, it will never
turn out so good a milker as one reared on better food;
and if even the best dairy cows are kept on dry meagre
food during winter, when they are yell (dry of milk)
or nearly so, they will not yield near so much milk
after they drop their calves as they would have done
if they had been provided with a small portion of turnip
or other green food, during the time they were com-
pletely yell. Even the state of the weather has often
powerful effects on the milking of cows. From these
circumstances, it becomes difficult to fix what is the fair
average return of a dairy stock; and the diversity
that prevails in that matter puts it so far in the power
of such as wish to quibble on the subject to controvert
any statement that can be given.

In my Survey of Ayrshire for the Board of Agri-
culture, I stated that "Some of the Dairy Cows in
Ayrshire may yield for a time from twelve to fourteen
Scots pints of milk per day, but that such returns are
rare. Many of them will, when in their best plight,
and duly fed, yield at the rate of ten Scots pints of milk
per day, for two or three months; probably about six
pints for other three months; and three pints per day
for four months more; making in all, during the season,
about seventeen or eighteen hundred pints. Many:
SECT. V. QUANTITY AND QUALITY OF MILK.

43 cows, however, will not yield more than the half of that quantity. Probably twelve hundred Scots pints of milk from each cow in the course of the year, may be about a fair average of the returns of the Ayrshire dairy stock.

I was certain, from my own experience and observation, as well as from the candid and concurring accounts given me by many respectable farmers in that county, when I traversed it in the years eighteen hundred and nine and ten, that these statements of returns were not exaggerated, but the reverse; yet they were no sooner published than they were controverted, in a paper inserted in the Farmer's Magazine, by a person who was altogether ignorant of those matters,—who had probably never been in that county,—and who did so on vague report, or on his own conjectures as to that branch of husbandry. But this gentleman, and some others of his cast, entertaining exalted notions of the branch of farming to which they had been trained up, and no small portion of districtal vanity, they had the assurance to contradict, under fictitious names, what had been stated on that subject, and to hold up the whole Dairy System of Farming (of which they knew nothing) to ridicule.

Having been afterwards employed by the Board of Agriculture, to make a draught of the 14th chapter of the General Report,—perceiving that the person who had published in the Farmer's Magazine, and probably written these remarks, had much to say with the Right Honourable President,—and being anxious to do justice to a branch of husbandry and to a district against which I could perceive a prejudice prevailed with him and his friends,—I renewed my inquiries on that subject, and found that I had stated the returns of the dairy
cows below what they really yielded. I mentioned in my draught of that chapter for the General Report, that the farmers in Ayrshire had satisfied me that their cattle yielded more milk than I had mentioned in my Survey of that county; that it could easily be instructed, that sixteen, eighteen, and in some instances upwards of twenty pints of milk, had been drawn from some of those cows every day for a few weeks when they were in their best plight.

These I stated in that draught to be extraordinary returns. But I added, if we consider that several farmers let out or farmed the whole milk of their cows for one year to people who draw the milk from the cows, take charge of the cattle, feed them, remove the dung, manufacture the milk into cheese and butter, furnish salt, carry the produce to market, and who run all risks, and pay the farmer at the rate of fifteen pounds, and sometimes as high as seventeen pounds ten shillings per annum for each cow; the quantity of milk which these cows yield must be very considerable. The wages, bed and board of a dairy-maid, which cannot be less than twenty pounds per annum, falls to be added to every eight or nine cows; and if to that the expense of fuel, furniture, salt, &c. be added, the contingent expenses must exceed three pounds each cow, in addition to the rent. Now if every sixty Scots pints of milk through the season produce only one stone Ayrshire weight (one and one half stone English) of cheese, as some have averred, and which brings ten shillings per stone, on an average of seven years preceding the time I wrote; the quantity of milk given during the season must have been two thousand one hundred and sixty Scots pints each cow, on an average of all the cows on the farm, to pay mere outlay.
I also stated, that if we attend to the returns made by Mr. Ralston at Fine-View, viz. the weight of the cow in full-milk cheese, or her value in that article every year, we would find that the produce in milk must be equal to what I had stated. A cow worth eighteen pounds, for instance, or one that yields thirty-six stones in cheese, answered exactly to the statement I had given. Probably that is more than the average weight and prices of Mr. Ralston’s stock. But he does not give that as the return of his best cows, but says “he would not keep a cow on his farm that did not yield her own value, or her weight in sweet-milk cheese every year.”

Upon the whole, I stated, that it seemed reasonable to conclude that the fair average of the annual returns of the better sort of dairy cows in Ayrshire was two thousand Scots pints of milk; and that if the cow happens to drop her calf about the first of May, her returns might be taken at—

First 50 days, 12 pints per day,  600  
Second ditto, 10 ditto  500  
Third ditto, 7 ditto  350  
Fourth ditto, 4 ditto  200  
Fifth ditto, 4 ditto  200  
Sixth ditto, 3 ditto  150  

2000

I mentioned that there were many milk cows in Ayrshire that did not yield nearly so much, and some of them not a half of these returns. But I also stated, that where the cattle were of the best sort, in proper plight, kept on good pasture and proper winter feeding, these returns might be depended on.
But instead of publishing this part of my draught, or any thing about dairy cattle, or dairy husbandry, as I had written it, the people to whom the Board intrusted the publication of that Report thought proper to lay entirely aside my account of both. And instead of applying to any other person in the dairy district, or to any one who would go there, as I had repeatedly done, to inquire into the facts, and publish the candid result of their inquiries,—these wise men of the East, who are themselves ignorant of that branch of husbandry, and are led astray by their prejudices against that branch, their conceited notions of their own particular modes of farming, their own publications, and districtal vanity,—drew up a sort of garbled hodge-podge account of their own, evidently calculated to give an unfair view of Dairy Cattle and Dairy Husbandry. The result of their labours and calculations, as published in the General Report, in the name of the Board, is, that these Dairy Cows yield only one pound two shillings of clear profit annually!!

I considered it very unfair towards the public, for these gentlemen to contradict on their own authority, and without making due inquiry to publish their own conjectures in the name of the Board, and as drawn up by me, thereby imposing on the public, and making me to contradict myself. Yet all this was done, in spite of every remonstrance I could make to the contrary.

But whatever the Board may think proper to publish, or to whomsoever it may entrust the compilation of its publications, I now repeat the averments I formerly made (and I do so not only upon my own knowledge, but with the knowledge and approbation of hundreds of the most intelligent farmers in the counties of Ayr, Lanark, and Renfrew, whom I have anxiously consulted
on the subject since my former statements have been controverted), that hundreds and thousands of the best sort of the dairy cows of the western district, will, when in good condition and properly fed, yield at the rate of two thousand Scots pints of milk and upwards, each cow, per annum. If Mr. Brown, or any other person, shall call this statement in question, I pledge myself to prove it, and every thing else I have advanced on the subject, by the concurring testimony of hundreds of the most intelligent and respectable witnesses, every one of them far more conversant in that branch of husbandry than any farmer in Lothian, or any member of the Board, ever was. But, as I have stated in all my papers on the subject, it is only the cows of the best sort, when in good condition, and well fed all the year round, that will make the returns I have mentioned. Those of an inferior breed, smaller size, or that are not in good plight or duly fed (and many such there are, even in that district), will not yield so much, many of them not the one half of the quantity I have mentioned.

If Mr. Brown, and those who acted with him, in altering my statements in the draft of the 14th chapter of the General Report, with a view to shew that the clear profits of a dairy cow were only one pound two shillings per annum, had looked into the County Surveys, and communications to the Board of Agriculture, published by the Board itself, they would have found ample proof of returns equal to those I had mentioned. They would no doubt have seen that Mr. Wedge gives the average return of the Cheshire cows at eight quarts (four Scots pints) per day;—that Mr. Vancouver rates the produce of Devonshire cows at three gallons (six Scots pints) per day;—that the average returns of the cows in Northumberland are stated, by the intelligent reporter of that county, at from seven to eight quarts
per day;—and that Mr. Wakefield says that in Lancashire, six quarts (three Scots pints) per day is a common return. If they had examined the returns of the Kyloes from Mull and Sky, or the starvelings from the Grampian Hills, the Fife Runts, or other such breeds, even when they were fed in a straw-yard in Lothian, they would probably have found that their average returns were still smaller than those of the English counties that have been pointed out; and such as only to yield a few shillings of clear profit each cow per annum. Or if these gentlemen had entered on calculations to shew, that many cows of various sizes and breeds in both kingdoms yielded only a trifling profit in milk, and that they were reared, not for their milk, but chiefly for the value of their carcases to the grazier and the butcher; neither the Board of Agriculture, the public, nor any individual, would have been deceived or imposed upon. But their calculations and averments do not apply to the puny half starved mountain breeds, or to those of a larger size in Fife or Forfarshire, reared to be disposed of when three years old to the feeder, and to come to the shambles in a few months after. It was not these, or the least productive of the English Cows, but the genuine Dairy Breed of the counties of Ayr, Lanark, and Renfrew, that these sages sat as a jury upon, and found, or say they found, to yield only a clear profit of one pound two shillings per cow in the year.

These gentlemen were no doubt ignorant themselves of the value of the Ayrshire Dairy Breed, and were not, it seems, disposed to credit the accounts which I had given of their returns. But it was surely absurd in them to publish as they have done on that subject, without making due inquiry. If they had even perused attentively the books and surveys which the Board had
laid before them, and treated the subject with candour, they would, independent of my writings, have found that cows in various parts of Britain made returns equal or superior to those I had pointed out.

They would have found, that in the counties of Stafford, Cheshire, Lancaster, Suffolk, &c. many cows yield through the season twelve quarts of milk per meal, or twelve Scots pints per day, equal to the highest I had calculated upon in the Ayrshire cows. They might have found it stated by Mr. Wakefield, that one gentleman's cows in Lancashire averaged nine quarts per day the whole year round; which amount to one thousand six hundred and forty-two Scots pints per annum. They would have found it stated by the Secretary to the Board, that the Reverend Dr. Ellis had informed him of a Lincoln cow, kept by the Reverend Mr. Heckit of Beckingham near Newark, that yielded "nineteen pounds of butter in one week;" and that six, seven, and eight pounds per week, are common returns. They might also have discovered that Mr. Vancouver, in his Report on Hampshire, mentions a cow of Norman breed, belonging to Anthony Grave, Symington, that yielded in ten months and twenty days, in the year 1797, thirteen hundred and thirty-six gallons, or two thousand six hundred and seventy-two Scots pints of milk, in the course of the year; which at fourpence per pint, the price he mentions, amounts to forty-four pounds eleven shillings. This cow would surely be fed at an enormous expense, if she did not yield a clear profit twenty times greater than one pound two shillings. The same gentleman mentions another cow of a much smaller size, that yielded from fifteen to sixteen pounds of butter per week, for some part of the season.
It cannot be supposed that Mr. Brown and those who acted with him in that matter, could be ignorant of the returns made by a cow kept by William Cramp of Lewis in Sussex, as detailed by the Board of Agriculture, in their Communications, Vols. V and VI. That cow yielded in 1805, nine thousand four hundred and twenty-one quarts of milk, equal to four thousand seven hundred and ten and a half pints, Scots measure. From these, five hundred and forty pounds of butter were taken, and which brought £41: 7s. Mr. Cramp, besides this, sold or used four thousand three hundred and eighty-one quarts of skimmed milk, at a penny per quart, amounting to £18: 5: 1. These, and the dung, which he estimates at £3, make a gross return of £62: 12: 1. From this, the feeding of the cow, £21: 6: 1, is deducted, which leaves a clear profit of £41: 5: 11.

In the year 1806, this cow yielded four thousand one hundred and thirty-seven quarts of milk, from which four hundred and fifty pounds of butter were taken; and the clear profit of that cow for this year was £30: 16: 1.

In the year 1807, the same cow yielded five thousand seven hundred and eighty-two quarts, or two thousand eight hundred and ninety-one Scots pints of milk; from which six hundred and seventy-five pounds of butter were extracted. This, with the milk at a penny per quart, the dung, and calf, brought in whole £76: 7: 3. From this, when the keeping, £24: 14: 2, is deducted, a clear profit of £51: 13: 1, is left to the owner of the cow.

In the year 1808, Mr Cramp's cow yielded four thousand two hundred and nineteen quarts, or two
thousand one hundred and nine and a half Scots pints of milk, from which four hundred and sixty-six pounds of butter were taken. The gross return of the cow this year was £54:13:9, and the clear profit, after paying keeping, £29:19:7.

All these returns are equal, and that of Mr. Cramp's cow far more than double, to what I had mentioned as the returns of the Ayrshire breed. Now, if a cow give such returns in England, where nothing like an improved dairy breed is known, what could hinder others in Scotland, that have been far more improved than any in England, and have been, or may be, equally well fed, to yield as much milk? Lucerne has not indeed been raised there; but as the best of grass, clover, carrots, grains, and bran, abound in Ayrshire, the want of all the lucerne that could grow on twelve and a half perches of ground (for this was all that Mr. Cramp had of that crop), can be no great privation. Two or three tons of turnip for winter green-food to each cow, which it does not appear Mr. Cramp's cow was provided with, and a proper supply of salt, would more than compensate the crop of lucerne raised from twelve and a half perches of ground.

If Mr Brown and his friends had acted consistently, they would have disputed the returns of Mr. Cramp's

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* This Cow was fed in summer on the clover, carrot, lucerne, &c. raised on one rood and twenty-nine perches of land, given to her three or four times a-day, with four gallons of grains (draff) and two gallons of bran mixed, and given her daily about noon. In winter, she had hay, with the same quantity of grains and bran, and was fed five or six times a-day. She got always food when milked, and great pains were taken to keep her stall and trough clean, to wash her udder daily with cold water, and to milk her clean twice every day.
Cow, and every other that was supposed to have yielded a profit of more than one pound two shillings. Because, if a cow yield upwards of five thousand Scots pints per annum on house feeding in England, what, in the name of wonder, would prevent others of a breed still more improved by skilful crossing and good feeding for nearly half a century, to yield 2000 pints in the course of a year? Or what better right had these gentlemen to call in question my Report for Ayrshire, more than those of the other reporters who have been named? The Dairy Husbandry of Ayrshire had been familiar to me from my earliest recollection; and I had practised it myself thirty years before I drew up the Report of my native county. Still I did not write my own opinions merely, but in that and in every part of my report I consulted hundreds of the most intelligent inhabitants of Ayrshire, and reported their collective opinions as well as my own. Some hundreds of copies of my Survey had been sold in that county, and perused by thousands of its inhabitants. My account of Ayrshire Dairy in the Farmer's Magazine, and afterwards in my Survey of Buteshire, have been read by many thousands more; and yet Mr. Brown and his wise friends, who knew nothing about improved Dairy Husbandry, are the only persons, so far as I know, who ever called my statements in these publications in question. No inhabitant of Ayrshire ever did so. And if my accounts were admitted to be correct, and approved of in the district to which they refer, was it not presumptuous, as well as uncivil, for gentlemen so little conversant in the subject to dispute what every person better informed knew to be correct, and to palm their vagaries and conjectures on the public, in the name of the Board of Agriculture?

I had neither interest nor inclination to exaggerate
on that subject, but reported fairly and honestly what I knew to be the truth, and what the most respectable and intelligent men in the counties of Ayr and Lanark attested to be so. If I had rated the clear profit of the dairy stock at from ten to fifteen times more than it really was, would not some of the hundreds or thousands of the inhabitants of the dairy district, who knew as much as I did on the subject, have pointed out my error? But no man in the counties of Ayr, Renfrew, or Lanark (except the weaver already mentioned), nor any man at all conversant in dairy husbandry, has ever, so far as I know, called in question one iota of my report on that subject.

But to sum up all in one sentence, I now repeat that hundreds and thousands of the best Scotch dairy cows, when they are in their best condition, and well fed, yield at the rate of two thousand Scots pints of milk in one year;—that in general from seven and a half to eight pints of their milk will yield a pound of butter, county weight;—that fifty-five pints or thereby of their milk, will produce one stone of that weight of full-milk cheese;—that in the proper season, and when a healthy calf is fed, and the prices of veal as high as they have frequently been within the last fifteen years, milk will yield a profit in feeding veal, equal to threepence halfpenny or fourpence per pint. And where the buttermilk can be sold, it will yield a similar profit.

2. The value of the milk varies with circumstances, and accordingly as it is properly managed. Of these it is also difficult to speak with much precision. Some cows give at all times much richer milk than others. The quality of the milk is affected by the health and habit of the animal,—the season of the year,—and nearness or distance from her calving; and the
milk that is last drawn from all cows every time they are milked, is very much, probably eight or ten times (Dr. Anderson says from eight to sixteen times) richer than that which is first drawn from the same cow at the same milking. Taking advantage of these diversities of quality, some have quibbled about the quantity of milk from which a given amount of cheese or butter can be formed. And such, no doubt, is that diversity, that I shall engage to produce milk unadulterated, every four or five Scots pints of which will yield one pound of butter, and thirty pints of it will give one stone of cheese; and I shall also engage to produce milk, of which thirty, perhaps forty, pints will scarcely produce one pound of butter, and one hundred and fifty pints will not yield one stone of cheese, county weight.

But avoiding such extremes, and speaking of milk in general, or that of a fair average quality, I shall state with candour the result of my experience and information as to the value of such milk.

Milk, as taken from the cow, is sold in large towns at from sixpence to eigthpence per pint. At sixpence, two thousand pints make a return of £50 from one cow of the best description. In towns that are smaller, or better supplied with milk, the price of new milk is generally about fourpence per pint. This, in cows of the best sort, makes an annual return of £37: 10s.; and inferior milkers in proportion. In the most remote parts of the country, and in smaller villages, it is never sold under threepence per pint; and at that price one of the best dairy cows will make a return of £25 sterling per annum.

When it is applied to the feeding of veal, milk will
pay better or worse according to the healthy thriving condition of the calf, and the price of veal in the market. But in general, milk is worth from three-pence to fourpence per pint when used in making veal. I have known some, who had the most accurate knowledge and experience in these matters, use their milk in feeding calves in the winter and spring, when they could have sold it at the byre-door at threepence half-penny or fourpence per pint. I think I can state with confidence, that when the calves thrive well, and veal is in demand, milk will bring fourpence per pint in feeding calves.

But as veal is only fed and in request during winter and spring, the return for a whole season from feeding veal cannot be calculated upon. Neither would that mode of applying milk be answerable in remote parts, where fed veal is too far from market.

Next to these uses, milk pays best when it can be sold in sour or butter-milk. Almost all the milk at more than two miles, and not more than twelve miles distant from Glasgow, is manufactured into butter and butter-milk, and sold in that city. The labour in churning and carrying it to market is considerable; but from the quantity of water that is mixed into it, and the price obtained for the butter and milk (the latter a penny per Scots pint, and the former frequently, prior to the year 1815, from one shilling and fourpence to two shillings per pound county weight, and which still in 1822 brings one shilling and threepence per pound), that mode of manufacture yields a better return than when the milk is made into cheese. In general, eight pints of milk will yield one pound of butter, which on the average of several years past, prior to 1815, may be rated at one shilling and eightpence per pound; and
the eight pints of milk, with the water usually applied, will bring tenpence in summer, and fifteen-pence in winter. But taking the return at one shilling for the milk, and one shilling and eightpence per pound of butter, the two thousand pints made, prior to 1815, a return of fourpence per pint, or thirty-seven pounds ten shillings in the course of the year, drawn from some of the cows of the first quality; and those that give less milk in proportion. And though butter has fallen fivepence or sixpence per pound in price, it has not fallen nearly so much as that of grain. That milk was a few years ago worth fourpence per pint to be manufactured into butter and butter-milk, is evident from this circumstance, that some farmers have bought it of their neighbours who had too few cows to enable them to keep a horse to carry the milk to market, at the rate of threepence halfpenny, and in some instances fourpence per pint,—the purchaser of the milk churning it and carrying it to market along with that of their own cows.

The best information I was able to procure when prying into every thing about Dairy Husbandry at the time when I surveyed the county of Ayr, and that I have yet been able to collect, after my statements had been disputed by some, was, that fifty-five pints of milk with its cream generally yielded a stone of full-milk cheese, county weight. And as the average price of a stone of cheese had for some time prior to 1815 been from ten to twelve shillings, paid to the farmer, the return from two thousand pints of milk at eleven shillings per stone is nearly £20.*

* Doctor Dickson mentions, vol. ii, page 542, that Mr. Marshall had found, on accurate and repeated calculations, that in Gloucestershire, about fifteen gallons of milk were requisite for making little more than eleven pounds
QUANTITY AND QUALITY OF MILK.

As to skim-milk cheese, I have never been able to ascertain whether it was more or less profitable than that of full milk. Some, who have tried both modes of manufacture, are still equally uncertain on that head. I therefore conclude they are, generally speaking, equally profitable.

I need scarcely repeat, that all these calculations as to the quantity of milk given are made on the return of cows of nearly the best quality, that are in the best age, habit, and condition, and that are fed in an ample manner. Though some cows yield still more, others do not yield nearly so much, some not more than the half of the quantity on which these calculations proceed. Where less milk is yielded, a return in money

pounds of two-meal cheese; and that one gallon of new milk produced a pound of curd. This agrees nearly with the calculations I have already given. 55 Scots pints is equal to 27½ gallons of English measure. If that produce so many pounds English weight of curd, that curd will, when dried, form nearly one stone Ayrshire weight of cheese, which is equal to 1½ stone English. Mr. Holland, in his Survey of Cheshire, page 258, also calculates upon a pound of cheese from every gallon of milk. I shall not therefore multiply authorities, nor advance further arguments to establish the fact. If any speculative gentleman should again appear to argue something different, and even get a person from near the sources of the Clyde, whose knowledge of Dairy Husbandry is not much improved from that practised by his great-grandfather a century ago, to corroborate his opinions, I shall not attempt to argue with such people on a subject of which they can only talk or write at random. If it were necessary, many authorities might be quoted to show that a much greater proportion of butter than I have mentioned has been obtained. Mr. Vancouver says, that 3 gallons (6 Scots pints) milk yield in Devonshire 20 oz. of butter. Mr. Wedge stated the return from one gallon of milk in Cheshire to be 16 oz. Mr. Wakefield found on one farm, that 9 quarts per day of milk yielded 4½ pounds of butter per week; or in other words, 31½ Scots pints gave 4½ pounds of butter; and the cows upon another of his farms gave the same quantity of milk, and he extracted from it 6lbs. of butter, or at the rate of rather more than an English pound from four Scots pints of milk.
proportioned to the diminution must be calculated upon; and I need not repeat that the prices stated are those of 1815, when this was first written.

Sect. VI.—Expences of Rearing and Feeding Dairy Stock, and their Value to the Grazier and Butcher, compared with that of other Breeds.

It is quite natural for such as are strangers to the Dairy Breed of Cows, and the profits they yield, to inquire what is the expense of rearing and keeping them, compared with those that are reared solely for the grazier and butcher. And as an attempt has been made, both in the Farmer's Magazine and in the General Report for Scotland, to make it to be believed that a dairy cow eats up all the price of her produce, leaving only a few shillings per annum to her master,—whereas it is well known that a cow of the same weight will, on being fed for one year and fattened, make a much greater return,—it becomes necessary to refute these attempts, and to undeceive the public in that matter, by shewing what is the comparative expense of rearing both breeds, and the difference of expense in keeping them.

This, like many other things regarding the management and profits of cattle, is so precarious that it is difficult to speak of it with precision. Few have ever attempted to make the experiment, and those who have done so have found such variation in climate, season, age of grass, aptitude in the cattle to fatten or yield milk, their age, condition, habit, fluctuation of the markets when bought and sold, skill in making a right selection, activity in buying and selling, industry in feeding, and other circumstances, as in a great measure to render calculations uncertain. The surest method of calculating is by comparison.
There certainly can be no difference worthy of notice in the expense of rearing the dairy cows, and those of the same age and weight intended for the grazier, till the former are ready to drop their first calves, when about two and a half or three years old; and till the latter are ready to be sold lean to the grazier about the same age. It is true that cattle can be reared for the drover or grazier on coarser herbage than it is proper to rear dairy cows upon; but it is equally well known, that the size and early maturity of cattle that are reared for the grazier is also greatly promoted by good feeding when they are young. Their size, and of course the price they give when ready to be turned to pasture to be fattened, depends on how they are fed when young.

The dairy cows, when they begin to give copious draughts of milk, will no doubt consume more food than those of the same age and weight put upon pasture to be fattened for the butcher. But the exact difference has never been, and probably never can be, correctly ascertained; as some cows, like some of the human race, eat more food than others who are as strong, thriving, and fat as themselves.

Some of the most attentive observers are of opinion, that four dairy cows will, while giving good returns of milk, consume as much food in summer as would be sufficient to fatten five cows of the same age and weight. Others have reckoned the food of three dairy cows, when in their best plight for milk, and fed to the highest pitch, sufficient to fatten four of the same age and weight that are stall. But many have also estimated, and probably more correctly, that the food of five dairy cows would be barely sufficient to fatten six stall cows of the same weight. The fodder of both during winter
will be nearly the same; but if a dairy cow is rightly kept, she ought to have a few turnips in winter, some potatoes in spring, and some pot-meat after she calves, which are not necessary for a rearing stock.

Calculating upon these data, and reckoning that of the dairy breed at the highest calculation that has been proposed, the keeping of both for one year (supposing them to be cows of from twenty-five to thirty stone English of beef when fat), and their comparative profit will stand as under:

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<th>Yell Cow</th>
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<td>Expense of keeping</td>
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<td>Ditto on pasture in</td>
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<td>£7 10 0</td>
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When fodder sells at a high price, and the pasture is good and high rented, from local situations, as when it lies near a town, &c. the expense of feeding either of these species of cattle will amount to more than the sums here stated. But the object is, not to fix the precise amount of keeping either species in any particular place or season, for that must vary according to many circumstances; but these statements are given merely to shew the proportional difference of feeding the one species of stock compared with the other. And I am confident that that difference is by no means greater than I have stated it.

The profit which cows of from 25 to 30 stone English in weight will yield to the grazier for one summer's feeding on good pasture, will generally average from £5:10s. to £6:10s. per cow. And when the cows are bought in the autumn, kept on fodder in winter, and fattened on pasture the following summer, they will
yield a return on an average of from £8 to £10 per head. But a good dairy cow, when she is in proper plight, will, with an additional expense of about £3 per annum in feeding, and probably about £2 in labour, fuel, &c. (part of which she repays in dung), yield a return of from £16 to £20 in dairy produce.

Though these calculations and statements were expunged from the General Report, and the profits of a dairy cow reduced in it to £1:2s. per annum, I am still confident that the calculations here given are as fair simple, and correct, as it is possible in the circumstances of the case to render them. They are not merely my own calculations, but those of some of the most intelligent and most disinterested farmers and graziers, both in the county of Lanark and that of Ayr, who have had much experience in these matters; and these statements have been shewn to and approved of by some hundreds of people who are well qualified to judge of their correctness.

The rent of pasture land per acre varies so much, and so does the price of every species of food given to cattle in winter, that it is scarcely possible to fix anything that will at all times and in all cases refute gainsaying. I have seen oat-straw, for instance, sold as low as 1½d. and as high as 1s. per stone; — I have seen hay sold at 2½d. and I have seen it sold at 1s. 6d. per stone; — potatoes I have seen sold at 4½d. and at 2s. 6d. per peck; — I have seen oatmeal sold at 8½d. and at 3s. 6d. per peck. Such variations in prices render calculations difficult, and opens a door to quibblers to say anything they choose. But when the comparison is run between the dairy and the yew stock, and the returns they generally make, the advantage of the former must
appear obvious. This seems indeed the only way of rendering such statements intelligible.

If the grass give a high rent, or if the fodder be dear for the dairy stock, they must be equally so for the other breed. All that is necessary, therefore, is to ascertain how much more grass, fodder, or food of any kind, a dairy cow will consume above one of her own weight, age, and condition, kept to be fattened for the shambles. If that is fairly done, and the average returns of each rightly stated, the comparative profit of these different species of stock will be obvious. The statements here given have been candidly put down on a complete knowledge of the subject, acquired by experience, observation, and minute inquiry, during many years, and after having consulted with hundreds who were best qualified to give correct information on the subject.

It ought likewise to be attended to, that the whole expense of rearing a cow to the grazier till she is three years old (and which, if she is near 25 or 30 stones English of weight, must have cost £10 or so), must all be refunded by one year's return—the price she gives when fat. But a cow reared to the same age and weight to be used for a dairy cow, gives a return in milk from eight to twelve years, and is after all still fit for the grazier and butcher. The cow reared to be merely fattened and sold to the butcher makes but one return; but the dairy cow makes ten or more returns. Supposing the rearing to three years old to cost £10, that sum must, in the cow sold to the grazier, be placed to the debit of one year; while in a dairy cow, which lasts for ten or more years, the expense of rearing may be taken at 20s. per annum.
The value of dairy stock to the grazier and butcher, compared with that of any other breed, forms another important inquiry concerning them.

The dairy cattle are as valuable to the grazier and butcher, as those of any other breed whatever. They are not able indeed to travel so far on the same keeping as some of the wild Highland cows can do; and many of the English graziers being strangers to their superior excellence for beef, will seldom purchase them at half their real worth. From their great value as milkers, too, they are often kept till they are too old for fattening to advantage, or their beef being of the best quality. But it has been well ascertained, and is now perfectly known in all the western districts of Scotland, that when the dairy cows are not milked till they are too old, no other breed of cattle in Britain will either feed faster, or turn out better in the slaughter-house or on the table.

The dairy breed, from their giving so much milk, acquire capacious stomachs and powers of digestion beyond any other species of cattle; and when they are allowed to run yell (dry of milk), they convert to flesh and fat what formerly ran into milk; and from their strong digestive powers they fatten faster, if well fed, than any other cattle.

But what is of still greater importance, the beef of the dairy cows is (notwithstanding the unfavourable opinion of some of the English graziers, who condemn them without a trial) not inferior in any manner of way, and in one respect is far superior to the beef of any other breed of cows. The flesh of the dairy cattle is what the butchers call better marled or marbled, by which they mean the fat is more mixed
with every part of the lean, than the flesh of any other cows in North Britain. This fact, I found, was not generally known beyond the bounds of the dairy district, till I mentioned it in my Survey of Ayrshire, which was published in 1811. But the truth of it was then well known to the butchers and inhabitants of the western counties, and the fact is incontrovertible. The butchers of that district also know, that cows of the dairy breed, when cut up for beef, always turn out much fatter than the most experienced butchers or graziers, who were strangers to that breed, would expect, from handling them when alive, ever so carefully. The bones of their back, hook-bones, &c. are more prominent than those of most of other cattle, which, with their inability to travel so hardily as the Highland cattle do, accounts for the prejudices that English graziers have taken up against that breed. The west country graziers and butchers, however, are not strangers to the superior worth of the dairy breed for the shambles as well as for the pail.

These qualities in the dairy breed were all fairly stated to the Board of Agriculture; but Mr. Brown did not allow them to appear in the General Report. He did not, it seems, chuse to undeceive the English drovers on that subject. He could not then controvert anything that had been stated, nor can he do so now. On making due inquiry on that subject, he would have found the statements in the original draught of that chapter to have been correct, but he did not chuse they should meet the public eye.

How far this was dealing fairly with the district—with the public—with the Board of Agriculture—or with me, I leave him to explain, and the impartial world to judge.
It has been mentioned, that the whole milk of cows kept within about two miles of Glasgow is carried there twice every day, and sold new; and by far the greatest part of that produced from about two, to more than twelve miles from that city, is manufactured into butter and sour milk, and sold in the streets of Glasgow to its inhabitants. But so great is the demand there for milk, that generally from 800 to 1000 milk-cows are kept within the city, where they are fed in the stall, and their milk sold fresh as it is taken from the cow.

As the total number of cows in Glasgow and its neighbourhood, whose milk is sold sweet to the citizens, may probably amount to two thousand,—as these cows are the very best of the dairy breed, collected from all parts of the country, when they are in their best plight,—as they are highly fed, both to procure milk and to render them fat,—and as they are always sold to the butcher whenever they are fatted, and are replaced in a few months with other cows that are lean and newly calved,—it may be reasonable to suppose that each cow will yield, on an average, about twelve Scots pints of milk every day, or that the whole will yield from 24,000 to 30,000 Scots pints of sweet milk per day, which is almost a pint English to each inhabitant of the city, old and young. Such an ample supply of that wholesome food must contribute greatly to the comfort and health of the inhabitants; and the quantity of butter-milk used in that city far exceeds that used in any other town or city in Britain.
The method of feeding the dairy cows kept within the city, is similar to that practised in other towns in Scotland. Rye-grass hay is almost the only fodder given them. Grains or draff from the breweries, burnt ale or other refuse from the distilleries, the refuse of flour, usually termed hen's-meal, oats, beans, &c. are provided for them in abundance. Green clover and rye-grass are supplied to them in summer, with the offals of gardens. Turnips and potatoes are served up to them in winter, both raw and boiled, with grain, chaff, infusions of hay, &c.; but oil-cake, so much used in England, is little known in Glasgow.

These cows have been generally kept in small numbers by many different people in various parts of the city, and frequently without much regard to the accommodation of the cattle in their byres. Of late, however, some cow-feeders have greatly increased the number of their stock, and been at still greater pains to better their condition both as to food and accommodation. Mr. James Hunter generally kept from twenty to forty dairy cows, bought at various prices, from about £16 to near £30; and his byres were much better constructed than those of some other cow-keepers. Several others have begun to make improvements in these respects.

But the most extensive and masterly undertaking of this kind ever known in Scotland, is that of William Harley Esq. at Willowbank, in the vicinity of Glasgow; and as it is conducted in every respect equal or superior to any thing of that nature to be met with in any part of Great Britain, some account of it falls to be given in this Treatise.

Like many other useful establishments, Mr. Harley's
dairy proceeded more from accident than original design. It was begun at first on a very limited scale, and has been gradually extended and improved to its present refinement. Mr. Harley, who had been long engaged in manufacturing cotton goods, and who still carries on that branch on an extensive scale, happening to discover, in a field which he had purchased near Glasgow, a copious spring of excellent water, he not only converted that spring to public use, by supplying the city better than ever it had been before, but he erected cold and hot baths, the first, and still the only thing of the kind, provided for public use in or near that city. Some of the people who took the benefit of these baths having expressed a wish to be provided with warm milk after bathing, Mr. Harley procured a cow for that purpose; and as the baths soon became a place of general resort, he not only increased the number of the cows so as to answer the demand, but perceiving that the city of Glasgow was ill supplied with that valuable article of food, and that much of that which was sold there was of bad quality, he began at first to supply his friends, and afterwards the city, with milk, entire as it was drawn from the cow, and in a state of cleanliness formerly unknown in that department of agricultural produce. His byre is formed to hold ninety-six cows; but he has for some time past had about twenty in out-houses, and purposes to add to the cow-houses.

Mr. Harley has displayed great taste and judgment in the construction of his byres, and in every thing connected with his dairy; and the superior degree of cleanliness with which the byres, cattle, and whole apparatus are kept, do him much honour, and cannot fail to prove exemplary to others in that branch, where it was of late too much neglected.
The byre having been enlarged at different periods, its external figure is not so complete as it might have otherwise been; but in its internal construction, it is the most perfect of any byre in the kingdom. The cattle are placed in double rows across the building, two rows facing each other, with a road or passage between them, from which both rows are fed; each cow having a grip or groove behind, into which they drop their dung and urine, with a road between it and that of the next row. Stalls for two cows are divided from each other by pillars of cast iron, having grooves into which the division-boards called trivises are fixed. Each cow is bound to an upright stake, with an iron chain, connected by a turn-swivel to a ring round the stake; which slides up or down as the cow raises or lowers her head; and when the cows are to be fed with potatoes, a pin, suspended from the trivis by a small chain, is put through a hole in the stake, which, by keeping down the ring, prevents the cow from raising her head, and thereby choking herself with the potatoes. A trough or crib is placed before each cow; and to prevent them from scattering their fodder, a grating of strong wire, suspended on pulleys like the sash of a window, is placed in front of each pair of cows. It is thrown up when food is to be set in, and put down to prevent the straw, &c. being thrown out of the stall to the passage. The grating, while it keeps the fodder from being thrown out of the crib, permits the cow's breath to escape, and does not confine it within the stall, where it would render the food unpalatable, and oblige the cows to breathe in a polluted atmosphere.

The byre is lighted chiefly from the ceiling, and the windows are constructed so as they can be raised in order to give vent to the bad air; and by opening the doors or windows on the sides of the byre, more or less
according to the state of the weather, the ventilation of the house is so completely commanded, that it can be rendered as cool at all times as the surrounding atmosphere. The byre is kept as near as possible at 62 degrees on Fahrenheit's scale; and to enable the keeper to do so, a thermometer is placed within the house.

Besides the roads between the heads of every two rows of cows, and one between the two grips, another runs down the centre of the house, from the one end of it to the other, and all these roads are laid with hewn pavement, and are, with the gratings, division-boards, &c. carefully washed every day, and kept as clean as the lobby of a dwelling-house. The whole cows are curried and brushed daily, and kept as clean as cavalry horses.

The bottom of the grips decline a little towards the centre, to lead the water into the common drain, and also towards the cows, so that the urine may run off when the dung is drawn back. The whole urine and washings of the byre, with the juices of the dunghill, that of a public washing-house connected with the baths, &c. are collected into a proper reservoir, and used as manure. The cribs incline towards the centre, where a stone trough is placed, so that by pouring a small quantity of water at the other end, the grains and refuse of food is washed into the trough, and is from thence carried to the piggery.

That nothing may be lost, Mr. Harley has erected an extensive piggery connected with his byres. Each family has an area in the open air, with an outer and an inner apartment under cover. The front space is subdivided by gates, which can be opened and shut to confine the swine to their respective cells, or to take
out the dung, &c. at pleasure. There is a pipe of water to each division; and a small trough placed at the entrance of the inner chamber, through which the swine must pass, and thereby wash their feet before they go to bed. The water in this trough being changed every day, it washes every offensive matter into the reservoir.

In the construction of his byres, Mr. Harley has made no great sacrifices to external show, but every thing that can contribute to utility has been duly attended to. The interior of these byres is constructed equal or superior to any building of the kind in Britain or Ireland; and in point of cleanliness, they far surpass all other byres. They have not only attracted the notice of the inhabitants of Glasgow, but are beginning to be surveyed by the philanthropist and the lovers of agriculture. Milk, which is one of the most wholesome and nutritive species of food, is too apt to be neglected where luxuries prevail; and many have rejected it from a belief that it was seldom obtained free of impurities. The atmosphere of a byre not duly ventilated, and especially in the stenching lanes of a large town,—the nastiness about the cows,—want of cleanliness of those who fed and milked them, and the nature of the milk itself, so apt to become impregnated with foul air and every impurity,—has often driven people who entertained a due sense of cleanliness, as well as those of delicate constitutions, who most needed that excellent restorative, from the use of milk with disgust. Mr. Harley has done more than any other man ever did to remove the causes from which these aversions proceeded, and to furnish the citizens of Glasgow with milk free of any admixture of water whatever. The milk is clean, and free from every impurity. It is poured immediately from the milking pails through a hair-search into
the milk vessel in which it is carried to town. The sight of the byres, cows, milk-vessels, &c. instead of disgusting those who survey them, and creating an aversion at milk, have the most powerful tendency to reconcile every person who sees them to the use of that most wholesome and valuable food.

The pails into which the cows are milked, and other vessels used, being graduated, and each cow having a running number, the quantity of milk drawn from each, and aggregate of the whole, is ascertained and regularly entered in a book, by the overseer, every time the cows are milked. Part of the milk is sold at the dairy-house near the byres, and part of it is carried through the streets of Glasgow in large cans fixed on carts, each drawn by a pony. A given quantity is put under the charge of the driver, for which he is accountable; and so tenacious is Mr. Harley of supplying the citizens with milk, pure and unadulterated, that he puts it out of the power of those who retail it on the streets, to introduce water or any other impurity. When the milk is placed in the cans, they are locked up so close, that no air is admitted, except as much as will make the milk run at the cock below; and the air-hole is so constructed that it is not in the power of the driver to introduce water or any other liquid by it. The milk-pails, and the whole of the vessels are well washed and scalded in boiling water every time they are used. The cocks for running off the milk are so constructed that they can be opened and cleaned in the inside at pleasure.

Mr. Harley has erected within the byres a very handsome steam engine, which he uses to raise water to supply the byres, drive a straw-cutter and a machine for slicing potatoes and turnips, on the principle of that used in cutting logwood. The steam from the boiler
is used in steaming potatoes and other food for the cows in a large vat, which the work people term "the Cows' Tea-pot."
CHAPTER II.

DAIRY APPARATUS.*

Sect. I.—Dairy House and Accommodation.

1. Byres for dairy cows ought to be high in the side-walls, having no lofts over them, and with proper apertures in the wall, that the cattle may breathe abundance of wholesome air. Animals so large, so well fed, and with lungs so capacious as cows, respire powerfully, and if many of them are put into one apartment, and that place either confined as to space, or without ventilation, the cattle are much injured by respiring pulmoneous air. I have already mentioned, that when crammed too closely in low confined byres, from which a due proportion of fresh air was excluded, the cows would have been all over wet with perspiration. As this could not fail to weaken and injure the cattle, as well as expose them to cold when turned out, it ought to be avoided. Cows are much injured by being kept too warm; and if the byre is kept dry, too much fresh air cannot be given them. Neither are they easily hurt by cold: an open shed, well roofed in, is better than a byre with too little ventilation.

Byres, and the roads to them, ought to be well paved,

* Under this head Dairy Buildings and Dairy Utensils fall to be considered in their order.
and kept clean. If these things are duly attended to, it is of less importance whether cattle be placed in ranges across, or with their heads to the walls of the byre. It is necessary, however, that they be properly secured by the neck, without being too much confined. Where they can be procured, a flag-stone about \(\frac{4}{3}\) feet high, standing up between every pair of the cows, extending about \(3\frac{1}{3}\) feet backwards from the wall, and firmly fixed, forms a proper division. A slider or rod of iron about 20 inches long can be fixed perpendicularly into each side of the flag-stone, and the cows bound to these sliders with a slight iron chain round their necks. The chain moves up and down on the slider as the cow raises or lowers her head. When bound in that manner, the cattle are as effectually secured, and have much more freedom than when their necks are locked between two upright stakes, which confines them by far too much. Stone troughs are now generally placed, one before each cow, and they are the most proper vessels for feeding them in. A road in front of the cows, from which their food can be put into the troughs, is a great convenience. But as these are not more necessary for dairy cows than they are in a feeding byre, and as every one pleases himself in such matters, it is not necessary to dwell on the subject here.

The buildings peculiar to Dairy Husbandry are a Milk-House, Dairy-House, and Cheese-House.

2. A Milk-House ought to be of size to contain one day's milk of all the cows that are kept upon the farm. It should be cool, well-aired, free of damp or bad smells, and always kept dry, clean, and well ventilated. It ought to be as much as possible under the shade of trees or buildings, to cover it from the meridian sun; and it ought not to be roofed with slates or
tiles, but with divots and straw, the better to exclude the heat. It should be at least ten feet from the floor to the ceiling, paved with polished pavement of freestone that is close in the pore; and the seams or joints of the pavement should be carefully filled with putty, that no milk or water may sink between the stones. If milk or dirty water get in between the stones of the floor, they sour and ferment, and create an unwholesome effluvia that soon affects the milk. Two windows, one on the north, and another on a northeasterly direction, should be covered with a sieve of brass-wire, impenetrable to mice, with a covering of gauze-cloth within the wire, to exclude flies, and yet to admit light and a current of air. If only one window can be opened, an air-hole ought to be cut in the door, or in some other part of the house, so that it may be well ventilated; and if windows must be opened in any other direction than towards the north, they ought to be shaded with a board of wood, so placed as to admit a current of air, and at the same time to exclude the rays and heat of the sun.

It is most convenient to have the dairy-house near the byre; but if too near it, the stench of the cattle's breath, their dung, urine, &c. will be apt to poison or give a bad taste to the milk. Great pains should be taken to keep dung, stenching gutters, stagnated water, and every impurity, at a great distance from the dairy-house; and to prevent the growth near to it of nettles, docks, and bulky herbage that create a stagnation of air; and the milk-stands, floor, and walls of the house, should all be so closely constructed as not to admit of the lodgement of milk, dirty water, dampness, or any impurity. The floor and milk-stands ought to be carefully washed and dried every time that milk or water is dropped on them, and the walls and ceiling ought to
be frequently swept, so as neither cobwebs nor dust be allowed to remain.* It is impossible to make good cheese, butter, or butter-milk, unless where the strictest attention is paid to the keeping the milk-house clean, dry, and well-aired.

Every milk-house ought to be so constructed, as that it can be warmed by a stove or otherwise in winter, or whenever the weather is cold; and at the same time kept as cold as possible during hot weather. The proper temperature of a milk-house is from 50 to 55 degrees on Fahrenheit's scale, and if it be either much colder than 50, or much warmer than 55 degrees, it will injure the milk.

3. The Dairy-House requires to be placed near the milk-house, but still at such distance as neither the steam of the boiler, nor damp, nor effluvia from the floor, can reach the milk-house, and communicate a bad taste to the milk. In many small dairy farms, the milk-house is placed on the north side, and the dairy-house on the south side of the building, between the kitchen and the byre; and the passage between them is through the dairy-house. These are locally convenient, but the milk-house in such a situation must be injured by stench from the byre, as well as by the steam of the dairy-house. And though it may be necessary to have these houses near to the byre, yet it is best to have them detached from it. But the milk should not be exposed

* Some of the English writers on this subject recommend to throw cold water on the floor of the milk-house in hot weather, in order to lower the temperature. But when the house is too much damped, an exhalation or effluvia is raised that is injurious to the milk. The floor ought to be so much raised as to be freed of damp; and when the floor is washed, it ought to be rendered completely dry before any milk is placed in the house.
either to rain or to sunshine, when carried from the byre to the milk-house. It would be folly, however, to attempt to point out the proper position in all cases for these buildings, as every one, in fitting them up, must attend to local circumstances; and every prudent farmer, taking into his view what is most likely to hurt the milk, will be best able to fix on the place for erecting such buildings. The dairy-house ought to be also well paved, and the seams properly filled, that no milk or other impurities may sink between the stones. A boiler, of dimensions suited to the extent of the dairy, to warm milk, boil water, whey, &c. must be fixed in one corner of the dairy-house, with room to set the curd-vat, wash the milk-vessels, and perform the other dairy operations. The utmost pains must be taken to make the dairy-house clean and dry after the cheese has been put under the press.

4. The Cheese-House or Store is also necessary in a dairy of any magnitude. In small farms the cheeses are kept in the barn, or, what is still worse, on the floors of garrets over the dwelling-house, where the heat of the fire below, and of the sun through the slates, greatly injures the cheeses. I found in Cheshire many of the stores for keeping the cheese till ready to be carried to market, were above the cow-house or byre, for the benefit of heat; and Mr. Holland, in his Survey of that county, points out an upper story over the byre as a proper place for a cheese store. I cannot, however, join in that opinion. Any heat above that of the common atmosphere, till frost sets in, is not necessary for the right keeping of cheese. Even too much air is injurious to cheese after it is a week or ten days old. But if heat were thought necessary for the store, it would surely be desirable to supply it purer than that which is thrown off from the lungs of cows in respira-
Milk in every stage is easily affected by effluvia; and though cheeses are not so readily hurt as milk or curd, still the stench of the breath, and the dung and urine of cattle, could not fail to injure cheese newly made.

It is much better to fit up a store with shelves of wood for the cheeses in a place that is clean, cool, and dry. Such store ought to be dry, to have a moderate degree of air, and some light, but not too much of either; and never to admit the sun to shine into it, or on the cheese. If the cheeses, when laid up to dry, have not some free air, they will become mouldy, and will not dry and harden properly; and if they are exposed to much drought, heat, or sunshine, they will dry too hastily, with many cracks or fissures; perhaps they will sweat or perspire, and hove like a loaf, which in dairy language is termed fire-fanging. The process of artificial sweating practised in the English dairies will be noticed in course.

I observed that in many of the English dairies a small quantity of dry fog (hymna), or, where that could not be come at, some straw or hay was placed under the cheeses when they were laid up to dry. This appears to me to be an improvement which I would recommend to the dairy farmers in Scotland. When a cheese is newly taken from the press, and laid upon a board, the under side of the cheese is so damp that it is apt to adhere to the board; to which, it also communicates a dampness that hurts the other side of the cheese when turned over. To prevent this, a small quantity of dry moss or fog may be put under the cheese to absorb the damp, and promote its drying. If brown fog cannot be readily come at, the second crop of grass may be dried and used. After the cheeses have
hardened a little, straw may be put under them. But when they are newly taken from the press, the straw would sink into and injure the surface of the cheese.

Sect. II.—Dairy Vessels and Utensils.

These are so simple and so well known, that any minute description of them would be to little purpose.

The wooden dishes into which the milk is drawn from the cow ought to be of sufficient size to contain all the milk that a cow yields at one time or meal. Where the milk-house is distant from the byre, a large dish, provincially called a pail or carrying dish, is generally used. The milk is emptied into it to be carried from the byre to the milk-house, where it is placed into the coolers or stand-vats. But as these different pourings from one dish to another reduces the quantity of froth raised in the operation of milking, and which greatly promotes the rising of the cream to the surface in the coolers, it is better, and now much more common, to lay aside the pail, and to turn the milk at once from the milking dishes into the coolers. Mr. Holland, however, in his survey of Cheshire, recommends not only the use of the pail or carrying-dish, but to draw off the milk from the coolers into pans, and to empty these again into the coolers; and in some English dairies they take up the milk in ladles and pour it again into the coolers. But, with due submission to the intelligent reporter, and deference to our southern neighbours, I am decidedly of opinion that milk ought not to be passed through a sieve nor pail, nor otherwise agitated, till it has been cooled, and has stood till it cast up the cream, as the agitation introduces bad air. Doctor Dickson, in his System of Agriculture, Vol. II, page
536, says, that in England the froth is carefully skimmed off. Now, in Scotland, the greatest pains are taken to increase the froth, and to preserve it from being diminished, which turning the milk from one dish to another, skinking it in ladles, or passing it through a sieve, cannot fail to do. The milk certainly casts up more cream when it is covered with froth in the coolers than when it is void of froth. This is probably of less importance where full-milk cheese is made, as the less cream that rises to the surface of the milk in the cooler, the richer will the milk remain; but in making skim-milk cheese, it is of great importance to recover all the cream to be made into butter. And wherever the milk is agitated, there is great danger of its being injured by the introduction of bad air, which milk takes in faster than any other liquid.

The coolers or stand-vats were generally of stave-wood, from two to two and a half feet in diameter, and about six inches in depth. But of late some use coolers of lead, and others have them cut out of solid free-stone, of a fine grain, and so large as to hold the whole milk drawn at one time from all the cows upon the farm. These lead or stone coolers are raised on stones set on edge, one under each end of the cooler, about two and a half feet above the floor, so as a vat can be placed under the trough, and the milk emptied into the vat through a trap-hole in the centre of the cooler; and which hole is filled with a plug of wood, the end of it rising one foot above the milk, so as it can be drawn out without agitating the milk, or breaking the cream. The milk in that case runs out first, and when it comes to the cream, the plug or stopper can be put in, or another dish can be placed under the trough to receive the cream by itself. When these coolers are of freestone, it must not be open or porous, or have any cracks or
fissures in it, as the milk resting in these would sour, and communicate acidity to that which was afterwards placed in the same trough. Coolers of a similar description, formed of lead, have been found to communicate a bad taste to the milk, and are now seldom used.

Mr. Baird, at Shotts Iron Works, has for some years constructed portable coolers of iron, of the form of the boyns or wooden coolers formerly used, and nearly of the same size; and being well covered with tin, they answer the purpose of milk-vessels remarkably well. They are but a little more costly at first than the wooden boyns, and they cool the milk faster, preserve it as well, are much easier cleaned, and last far longer than the wooden boyns. They are fast coming into general use, and are certainly a great improvement on dairy utensils. Though I have never seen anything of the kind, I am confident that large fixed coolers of iron, tinned in that manner, and having a trap-hole in the centre, might be formed at less expense, and answer the purpose better, than the stone troughs above described.

The boiler for heating the milk, water, &c., the vat in which the curd is set, and the chessarts or vats into which the cheeses are pressed, are all of the dimensions suited to the extent of the dairy; and they are all so well known to the coopers who make them, and to the farmers and their servants, that any minute description of them here would be a waste of time to little purpose.

The cheese-press is the only other implement necessary to be mentioned. These are of various constructions; some of them on the principles of the lever, and others are stones of from ten to twenty hundred-weight,
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placed in a frame of wood, and raised and lowered by a hand screw.

Some place the cheese-press in the dairy-house; but when that is done, the stone under it, on which the chessart rests, ought to be carefully washed every time the cheese is changed in the press, which is generally done every four or five hours. If the whey expelled from the cheese while under pressure be allowed to stagnate under the press, it will sour, and communicate acidity to every thing around it. Some set up the cheese-press in the byre: this is probably a better place, as it is within doors, and the temperature of the byre is not so cold in winter as a shed or house destitute of artificial or animal heat. Still, however, I would be afraid that the breath of the cows, stench of their urine, &c. might be communicated to the cheese, even in the chessart, or when it was changed. I am of opinion that the cheese-press should be set up somewhere near to the dairy-house, so as the cheese, when under pressure, might be kept warmer in winter than even the irregular heat of a cow-byre. One stove or fire might be made to heat both the cheese-press and milk-house in winter; or, if that is not done, a press might be kept in the byre for winter use, and one in a cooler place for summer.

It will be shewn, in course, that when milk is exposed to cold below fifty degrees of Fahrenheit's scale, at any time, from the moment it is drawn from the cow, till the cheese is not only pressed, but so far dried, the cheese will not be good. It is not enough that the milk be again heated; it must never be allowed to become too cold at any time, not even in the press; or if it is, the quality of the cheese will be much injured. For that reason, I would recommend to have one press
for winter use in a situation where artificial heat could be applied, and one in a cool place for summer use; and it would save expense if the milk-house and cheese-press could be kept in proper temperature by the same stove or fire.

When the sour-milk manufacture is pursued, some boyns or vats are necessary, in which the milk can be stored, after it has stood from twelve to twenty-four hours in the coolers, and in which it can stand and coagulate naturally, as will be afterwards described. Churns are also needed for churning the milk, and a tun or barrel to carry it to market; but all these are so much of the common sort as to preclude the necessity of any particular description. Their size and number are governed by the extent of the particular dairy. Plunge churns are almost universally used; and they are of every size, from forty or fifty to one or two hundred Scots pints, when wrought by the hand; and from one hundred and fifty to upwards of three hundred pints, when wrought by the aid of machinery. In some large dairies, where the whole milk is churned, the churn is wrought by a small horse-gin, similar to that which moves a thrashing-mill.
CHAPTER III.

MANAGEMENT OF DAIRY PRODUCE.

As the milk of cows forms the most wholesome, substantial, and nutritious food, and as it can be increased to a vast extent, the right management of it must be a matter of importance, and every improvement that can be made upon it must be interesting. If great improvements have been made in manufacturing it into food in any district, and if these are not generally known over other parts of the kingdom, the diffusion of such improvement must be beneficial, not only to those who are possessed of cattle, or land on which they can be fed, but to all who can use milk in any of the species of food into which it is formed.

The present is a humble attempt to diffuse, as far over Britain and Ireland as possible, the knowledge of a Breed of Cows, that, taking into view all their qualities, have probably never been excelled anywhere, and that, at any rate, have never been equalled in Scotland. It is an attempt to make known to farmers, and to their wives and servants everywhere, how it is that the cheese made in the counties of Ayr, Renfrew, and Lanark, is so far superior to that which is made in any other part of Scotland, and, in some respects, superior to any in Britain;—an attempt to shew by what means the inhabitants of Strathaven, and those of some of the neighbouring parishes, can draw from £5 to £10, and some-
times still higher prices, for their calves, when only a few weeks old; while in all other places they are generally sold for a few shillings;—and it is an attempt to shew how the farmers, for some miles round the city of Glasgow, can render their butter-milk far more profitable to themselves, and more palatable, and better food to the purchaser, than any thing of the same kind to be found in Scotland, or, so far as I know, in England, or even in Ireland, where butter-milk is so much in use.

The attempt is laudable. How far I may be able to do justice, to the subject will be for others to say; and to what extent my labours may be useful, time alone can determine.

I shall advert to the various uses to which milk is applied,—as feeding calves, and as human food, either in its natural state, or in butter, butter-milk, cheese, whey, &c.—describe the modes of making these,—and point out the improvements of which they are susceptible.

**SECT. I. — Of Feeding Calves for Veal.**

The first produce of the dairy cows is their calves. Some of these must be reared to keep up or extend the stock; but more than four-fifths of them are killed for veal; some when newly dropped, and others after being fattened more or less. Calves that are dropped in summer are generally sold to the butcher whenever they are calved, or before they are a week old; but such as are calved in winter or spring, are, in some districts, frequently fed for a longer or shorter period before they are brought to the shambles. In some parts of the Dairy District of Scotland, the method of feeding veal,
to any great extent, is not generally practised, and seems to be but imperfectly understood. In other parts, however, of that district, the art of feeding calves, and making good veal, has been brought to much greater perfection, and improved into a source of considerable gain.

The art of fattening calves for the butcher has long been practised in the parish of Avondale or Strathaven, and of late in those of Stonehouse and Glassford in Lanarkshire, to an extent, and with a degree of success, that has had no parallel in Scotland, and that probably has never been equalled, even in England. The superior excellence of Strathaven veal has long been proverbial in the Glasgow and Edinburgh markets, where Strathaven veal, and that of the best quality, have become synonymous terms.

As the art of feeding calves, practised in Strathaven, is so plain, simple, and easy, that it may be put in practice with equal success in any part of Britain or Ireland, all that is necessary is to make it known.

The mode of feeding them is easy and natural. They are fed on milk, with seldom any admixture, and they are not permitted to suckle their dams, but are taught to drink the milk from a dish. In Galloway, and other pastoral districts, where the calves are allowed to suckle, the people are so much wedded to their own customs, as to argue that suckling is much more nutritive to the calves than any other mode of feeding. That suckling induces a greater secretion of saliva, which by promoting digestion, accelerates the growth and fattening of the young animal, cannot be doubted; but the secretion of that fluid may be likewise promoted, by placing an artificial teat in the mouth of the calf, and giving it the
milk slowly, and at the natural temperature. In the dairy districts of Scotland, the dairy-maid puts one of her fingers into the mouth of the calf when it is fed, which serves the purpose of a teat, and will have nearly the same effect as the natural teat, in inducing the secretion of saliva. If that, or an artificial teat of leather, be used, and the milk given slowly before it is cold, the secretion of saliva may be promoted to all the extent that can be necessary; besides that secretion is not confined to the mere period of eating, but, as in the human body, the saliva is formed, and part of it swallowed at all times.

As part of the saliva is sometimes seen dropping from the mouths of the calves, it might be advisable to give them not only an artificial teat when fed, but to place, as is frequently done, a lump of chalk before them to lick, and thereby swallow the saliva. The chalk would so far supply the want of salt, of which cattle are so improperly deprived, and it would also promote the formation of saliva. Indeed, calves are much disposed to lick and suckle every thing that comes within their reach, which seems to be the way that nature teaches them to supply their stomachs with saliva.

But though suckling their dams may be most advantageous in that respect, yet it has also some disadvantages. The cow is always more injured than the calf is benefited, by that mode of feeding. She becomes so fond of the calf, that she does not, for a long time after, yield her milk freely to the dairy-maid. The calf does not, when young, draw off the milk completely, and when it is taken off by the hand, the cow withholds part of her milk; and whenever a cow's udder is not completely emptied every time she is milked, the lactic secretion is thereby diminished.
Feeding of calves by the hand is in various other respects advantageous. Instead of depending on the uncertain or perhaps precarious supply of the dam, which may be more at first than the young animal can consume or digest, and at other times too little for its supply, its food can, by hand-feeding, be regulated to suit the age, appetite, and purposes for which the calf is intended; other admixtures or substitutes can be introduced into the milk, and the quantity gradually increased or withdrawn at pleasure. This is highly necessary, when the calves are reared for stock. The milk is in that case diminished, and other food introduced so gradually, that the stomach of the young animal is not injured as it is when the food is too suddenly changed. And in the case of feeding of calves for the butcher, the quantity of milk is not limited to that of the dam (for no cow will allow a stranger calf to suckle her), but it can be increased, or the richest or poorest parts of the milk given at pleasure.

Some people about Strathaven, who feed calves for veal, give them their milk sparingly for three or four weeks at first, in order, as they imagine, to render the appetite of the calves keen, and to prevent them from loathing at their milk, when more plentifully supplied. But others, with as good effect, give them a full supply from first to last. For a week or two after they are calved, they will not be able to consume more than one half of a good cow's milk; but, in order to make a fat veal, the quantity ought to be gradually increased to as much as the young animal can be made to drink. By the time the calf is four weeks old, it will consume at least one cow's milk; and in two or three weeks more, it will, if it is of a large growth, and thriving well, take the greatest part of the milk of two cows. It is common to give the young calves, or those that are in-
tended to be reared for stock, the milk that is first drawn from the cow, which is weak, thin, and abounding with serum; and to give the calves that are feeding for veal, and that are farthest advanced, the last drawn milk of two, perhaps of three cows. It requires the richest part of the milk (provincially termed "afterings") of two or three cows for two or three weeks, and after the calf is four, five, or six weeks old, to raise a calf to the greatest size, and to bring it to the greatest pitch of fatness.

Some have mixed eggs, and others have put meal into the milk to be given to the calves, but the best feeders do not approve of these admixtures, as they say it darkens the flesh, web, and lights of the animal. The only art now used in feeding calves in the vicinity of Strathaven, is to give them, after the first two or three weeks, abundance of milk,—to keep plenty of dry litter under them, in a place that is well aired, neither too hot nor too cold,—and to exclude the light, as they are apt to become too sportive when they are exposed to much light.

If a calf becomes constive, a little bacon or mutton broth will give it ease, and if it begins to purge, a small quantity of the rennet used in coagulating milk will cure the disease. In some parts of England, they remove the scour by making the calf swallow small balls of flour mixed with gin. In the county of Essex, balls of two ounces weight, composed of the powder of fennugreek, flour, powdered chalk, and strong ale, are made up, and one of them given to the calf before it begins to suckle. These are intended to prevent scouring, and to promote torpor and quick feeding. But Mr. Parkinson, the intelligent reporter of Buckinghamshire, mentions, on the authority of a Mr. Dodd of Chynies, that
the scouring of calves is cured by sprinkling cold water on their loins;—a very simple process, indeed, if it proves effectual. If a lump of chalk is laid before the calf, it will lick up a great deal of it;—a proof that the animal wants salt.

The practice of bleeding calves, to expedite their fattening, as is frequently done in England, is not approved of or ever practised at Strathaven, or in the western districts of Scotland. And though that practice has been recommended by some English writers, it seems to me to be an absurdity. Neither infusions of hay, oil-cake, linseed, nor any other food, except pure milk, is now generally given them in the Scots Dairy Districts.

Calves fed in this manner are sold in all parts of the dairy districts at from £3 to £6 or £7 sterling; but in Strathaven, and the neighbouring parishes of Stonehouse, Kilbride, Glasford, &c. in Lanarkshire, fat calves were sometimes sold, before the end of last century, (about 1790), at from £6 to £9; and some few as high as £10 sterling each: And as the price of veal, in the Glasgow and Edinburgh markets, has been, within these last fifteen years (prior to 1815), almost doubled, from what it was before 1790, calves of the same fatness and weight would have given, about the years 1810, 1812, &c. almost double the price they gave in 1790 or 1795. Thomas Hamilton of Great-hill, near Strathaven, fed, about the year 1765, a calf to such a degree that he sold it at the price of £5. I have not been able to discover the price of veal at that period, but I know that the best of new-made butter was then sold at 4½d. per pound of 24 oz.; and I believe that neither mutton nor veal then sold higher than 3d. per pound, county weight. If so, that calf, or one of similar weight
and fatness, would have sold, during the greatest part of this century, at four times the price it then gave; and in different seasons it would have brought five times that price. James Alston, Esq. of Muirburn, about the year 1798, fed a calf that weighed four stones per quarter, or sixteen stone, county weight, of saleable veal in the carcase. I have not been able to ascertain the price of the best veal that year; but in 1814, and for several years about that time, such veal would sometimes have sold at 1s. 4d. per pound, or £1 : 1 : 4 per stone, in the Glasgow market. At that rate, the four quarters of that calf would have yielded to the butcher £17 : 2 : 4, and the hide, head, and intestines, about 30s. more.

James Granger of Nethersfield, Esq.; Thomas White of Tweedehall, Esq. and the late William Young of Newton, all near Strathaven, fed calves, prior to the end of last century, to nearly the same weight of that fed by Mr. Alston; and which, like his, brought £10 each to the feeder; and at a period, too, when the best of veal was sold in the market at from 7d. to 8d. per pound of 22½ oz. Calves of that weight, and equally fat, would have sold, about the years 1810, 1814, &c. at double the price they gave about 1790 or 1794. In 1815, William Strang in Shawton, near Strathaven, fed a calf to the weight of thirty-five stones English, or nearly twenty-five stones Lanarkshire gross living weight. Had this calf been killed at that time, its four quarters would have weighed nearly twenty stones, county weight; and Mr. Strang was then offered for it 14s. per stone. This would have brought £14, and the hide, head, and intestines 30s. or 40s. more. And if this calf had been sold at 1s. 4d. per pound, as it would have brought some years before, the four quarters of that beast would have yielded to the butcher £21 : 6 : 8; or with the hide, &c.
about £23. Mr. Strang did not accept of the price offered for this calf, and ultimately lost it. But that was his own fault: the calf was at that time worth £15, and in some stages of the market, it would have brought in the shambles about £23 in retail.

Mr. William Granger of Dykehead, in the parish of Kilbride, fed a calf in 1819 to the weight of twenty-two stones nine lb. of marketable veal in the four quarters. This, at tenpence per pound, the price of best veal that year, would have yielded the butcher £15:1s. and 30s. at least for hide, &c. And at the high price of former years, the whole calf would have given in the shambles upwards of £25.

Other instances might be given of calves being fed to the weight of from fifteen to twenty stones, county weight, in the four quarters; but those that have been mentioned are sufficient to shew that feeding to that extraordinary weight is practicable, and has sometimes been accomplished.

Perhaps feeding to these weights, however, proceeds more from ostentation than from prudence. A calf well fed, till it is from four to six weeks old, will, if it is ordinarily thriving, and when the market is not very low, sell at from £4 to £6. But when a calf is brought to that pitch, the milk may be turned to better account by feeding a young one, than by forcing one already sufficiently fed to a size and weight above nature.

When prudently conducted, milk cannot be disposed of to greater advantage than by feeding healthy thriving calves, till they attain about six weeks of age.

As fed veal is a wholesome and palatable food, and
as the veal of calves slaughtered a day or two after they are dropped scarcely deserves the name of food, and ought not to be eaten; it is much to be desired that the farmers in this and other districts would adopt the practice of feeding more or less all their veals, at least till they are two or three weeks old, instead of selling them, or part of them, when they are new dropped, as is generally done. The mode of feeding is extremely simple and easy. Nobody that has a young calf can be in want of milk, and there is no way whatever by which that milk can be turned to such good account as in feeding the calf. Neither is it possible to make a greater improvement on human food by means so simple and easy as by feeding a calf for two or three weeks before it is killed. A calf newly dropped,—carried a good many miles to market,—kept some days by the butcher without food,—and hung some time in the market before it can be used,—cannot be ranked among human food, and ought not to be eaten. Veal at that age, and conducted in that manner, especially in the summer months, is more calculated to induce disease than to support nature. But when the calf is fed for two or three weeks with its mother's milk, its flesh makes a wholesome and palatable aliment; and the milk cannot be converted to such an account in any other way whatever.

It does not appear that feeding of veal has ever been brought to such a degree of perfection in any part of Scotland, nor even in England, as it has attained in the parishes of Avondale, Glasford, and Stonehouse. No such veal as theirs has ever been sold in the Edinburgh or Glasgow markets. I never saw in London, nor in any part of England, calves nearly so weighty, their flesh so white in colour, and of so good quality, as the Strathaven veal. At any rate, such well-fed veal is not by
any means common in any other part of Britain. The feeding of veal to supply the London market, as described by Doctor Dickson, on the authority of the Annals of Agriculture, Synopsis of Husbandry, &c. seems far from being so well conducted as it is about Strathaven. The calves, he says, are bought in at from 20s. to 30s. and kept till they fetch from £4 or £5 to £7 or £8. These prices in the London market, where every species of butcher meat is sold much higher, and where the breeds of cattle are larger than in Scotland, and about the year 1807, when the Doctor wrote, do not equal those obtained for the Strathaven calves ten years before that period, when prices were far lower. The Doctor says, that "the business of suckling was formerly reckoned to turn to good advantage, when each calf, throughout its fattening, brought a profit to the farmer of 3s. a-week; but at present the profit on suckling is much greater." Three shillings per week for six weeks, the longest period that calves are usually fed, in either Scotland or England, would be considered to be a poor return in Lanarkshire. It is true, the Doctor says the profit was, when he wrote, "much greater." The surveyor of the county of Middlesex says, that suckling calves is far more profitable than grazing or fattening cows on pasture; but not so profitable as the dairy. And the surveyor of Essex says, that calves suckled for twelve weeks pay at the rate of 4s. 6d. per calf per week. But these profits, even in the vicinity of London, are far short of those realized in the moorish district of Avondale, near twenty miles from the Glasgow, and forty or fifty miles from the Edinburgh markets. Even supposing these returns doubled, they would still fall short of those realized in Lanarkshire. A thriving calf, which can be got new dropped at from 6s. to 8s., may be raised on the milk of one cow to the price of 50s. or 60s. by the time it is four or five weeks old; and to £4 or more when six or seven
weeks of age. If it be kept much longer, it would be proper to give it more than the milk of one cow; and by the time it is nine or ten weeks old, it will, in ordinary cases, and when in proper season, sell at from £5 to £7. An Avondale farmer would reckon himself affronted, if he did not realize a profit of 10s. per week from a thriving veal, fed for the first five or six weeks on its mother's milk; and in the course of a few weeks more, with the addition of some part of another cow's milk. And if such a market as that of London were within twenty or thirty miles, the profit would be still greater. The ordinary calculation among farmers skilled in that branch of dairy husbandry, is, that milk is worth, at the proper season, and when a thriving calf is fed, from 3½d. to 4d. per pint. Many have used their milk in feeding veal when they could have sold it at these prices. Now, if a cow gives eight pints of milk per day, that at 3d. per pint is 14s. per week; or three times the profit realized in the county of Essex. The profits generally realized in England are therefore less than one third of what the Strathaven feeders of veal have often experienced.

An unhealthy calf, a cow out of plight, or some extraordinary stagnation in the market, as we have experienced from 1815 to 1820, may alter the case; but with such exceptions as these, no skilful feeder of calves in that district would expect less profit than from 10s. or 12s. to 16s. or upwards per week, from a thriving calf duly fed at the proper season of the year; at least till the calf is upwards of six weeks old. Milk sells in towns, in winter and spring, at 4d. per Scots pint, and in Glasgow and Edinburgh still higher. But it will, in these seasons, when the calf is healthy, and the market ordinarily brisk, bring a greater profit in feeding calves, than when sold at from 3d. to 4d. per pint. Now, if a cow gives ten or
twelve pints of milk per day, that milk, properly used in feeding calves for the butcher, will bring nearly as much every day, as seems to be drawn in the vicinity of London in a week. It is true, indeed, that every cow does not yield ten or twelve pints of milk per day; but it is equally true that some yield almost double these quantities; and no farmer in the dairy district, who understands his business, would keep a cow in his byre that did not yield ten pints of milk per day for some time after calving, and when she was in good plight and rightly fed. So much for the superior mode of feeding veal in Avondale, and the greater profit it is made to yield there than in the vicinity of London, where the prices of the veal in the shambles must be a good deal higher than at Strathaven, or even in Glasgow or Edinburgh.

The greater profit in the county of Lanark, than that of a district on the borders of London, arises partly from the breed, and partly from the more masterly and skilful feeding of the cows and calves. No other breed of cows in Scotland, and probably none in Britain, yield so much milk as the properly improved breeds of the county of Ayr; neither will the calves of any other breed grow and fatten so fast as theirs. But the chief advantage is in the mode of feeding. In England, the calves are suckled, which puts it out of the power of the feeder to regulate the quantity of milk given, and greatly injures the cow. Hence the calves, Doctor Dickson says, "are often affected with a looseness or scouring." The English calves are bled, and fed with balls of flour, linseed cakes, pounded chalk, gin, fennugreek, tincture of opium, hartshorn, cassia, and other prescriptions. Some of these are given to fatten the calves; some to impoverish them, so as their flesh may be white; and others to make them sleep. To a Strathaven feeder, all these preparations would appear to be so many nostrums.
With them, milk, and nothing but milk, unless it were some salt, is trusted to. Milk is the natural food of all young animals, and the more they are fed on it, the better will they thrive; and vice versa. Flour in balls, or linseed in cakes, are too heavy and strong for the stomachs of the young calves. Shavings of hartshorn, cassia, boiled chalk, gin, fennugreek, laudanum, &c. are still more preposterous: some of these drugs might be administered to an old woman in particular situations; but nothing is less likely to fatten a calf.

Instead of bleeding calves, where suspicions are entertained of their flesh or lights being of a dark colour, that evil may be remedied by gradually withdrawing the milk, and feeding the calf on gruel (broth of meal and water) for a few days before it is killed.

The feeding of calves is far better conducted in the dairy district of Scotland than in any other part of Britain, except it be in the county of Cheshire. That branch of industry is, in the western shires of Scotland, conducted by the farmers' wives and daughters, or by female servants that have been bred up to that duty, and who are assisted and superintended in it by their mistresses. If it be true that "a master's eye makes a fat horse," it is still more certain that the labours or superintendence of the farmers' wives and daughters will contribute to make fat calves. But the surveyor of Middlesex says, the farmers' wives and daughters in that county, have neither industry, inclination, nor skill in the management of the dairy. Even female servants will not enter a dirty cow-house, or milk cows. All that sort of labour must be performed by men. The farmers' wives and daughters in the Lothians, and some of those in the southern pastoral districts of Scotland,
and generally those in England (except in Cheshire and Lancashire), consider it beneath their rank to perform, or even to superintend, the labours of the byre or dairy-house. Of this sort of refinement (as some may term it) I most unequivocally disapprove. I do not repine at ever so many of these, or any other class in society, rising above the drudgery of manual labour; on the contrary, I rejoice at their prosperity. But whenever the occupiers of land in either Scotland or England, or their wives or children, relax in their industry, and pretend to be so refined as to despise or neglect the necessary labours of their farms, it is high time they should yield up their possessions to others who have virtue and industry to perform every necessary operation of husbandry. I rejoice to see farmers improving in education, in dress, and in every comfort and useful refinement suited to their stations in life. But when they relax in industry, or conceive any operation of husbandry below their attention, it is time they were turned out of their farms.

It did not appear to me, when in Cheshire, and some of the neighbouring counties to it, that feeding of veal was duly understood and attended to in that country. And Mr. Holland, in his Survey of Cheshire, says, that in a dairy of twenty cows, the first ten dropped calves will, when suckled about six weeks, bring from 20s. to 25s. each, and the rest from 8s. to 12s. These are poor prices for calves in a dairy county that is populous, and that lies only the breadth of the river Erwell from the populous towns of Liverpool, Warrington, and others in the county of Lancashire, where butcher meat is more relished, and sells higher than in Scotland.

If the superior management of calves in the vicinity
of Strathaven, proceeded from any local advantages that place might possess, it would be needless to enter so minutely into particulars, or to recommend the practice so strongly; but calves might be fattened anywhere else, where the same breed of cows could be fed, as well as in these four parishes that have been named. In some remote parts of the country, calves might be too far from market; but where they can be transported by water, they might be carried to a considerable distance. The calves may be kept alive on board ship for a week, on gruel or broth; and they could be killed, the blood and intestines taken out, and the carcase hung up in a ship for nearly another week, without much trouble, and still be in good condition for sale. By these means, they may be transported from the Moray Frith to Aberdeen, Dundee, Perth, or Edinburgh, or from the coasts of Ayrshire, Bute, or Argyll, to Glasgow, at less expense than they are carried on carts from the western confines of Lanarkshire to either of these cities.

Butchers and others who purchase young calves in the country, and carry them to towns to be slaughtered, do not in Scotland transport them standing on their feet in carts, tied so as to prevent them from falling by the jolting of the cart, as is done in England; but they hang such of them as cannot travel, in pairs by the feet, over a horse’s back, with their backs and heads hanging downwards, three or four pairs of them on one horse; while the butcher sits upon the top of the group, deaf to their agonizing cries. Others heap as many living calves into a cart, above each other, all tied by the feet, as a horse can draw. It would be worthy of the magistrates of the district to extend their commiseration to these animals, so cruelly and so unnecessarily tortured; and to compel the butchers, or others who deal
in that species of stock, to treat them with a proper degree of humanity. A merciful man is merciful even to brutes; and those who practise cruelty towards animals, will not long act mercifully toward the human race.

Sect. II.—Of Pure Milk used as Food.

Milk, which is the principal, and, besides the calf, the only other produce of dairy cattle, while they remain alive, is used as food as it comes from the cow, and under various preparations.

The milk obtained from cows kept in or near towns, is consumed in its natural state by the inhabitants, or used in cookery. New milk is highly valuable to the labouring classes, and is the cheapest and the most wholesome and nutritive food with which they can be supplied. That is also the most profitable mode in which milk can be used. A pint of milk in its natural state, or in curd, will go farther as food than two, perhaps than four, times that quantity can do when made into cheese. Our brethren in England, who eat more animal food than is commonly eaten in Scotland, may reckon milk a homely and meagre food. Accordingly, we find that Doctor Dickson, Vol. II, page 458, of his System of Agriculture, and the author of the Annals of Agriculture, Vol. XXXII, mention skim-milk, butter-milk, and whey, as only fit to become the food of swine. The Secretary for the Board of Agriculture may dispose of the milk of his cows as he pleases, and so may Doctor Dickson. If the Secretary has been paid, as we may readily suppose he has, for the endless compilations he has issued into the world, he may well afford to treat his pigs with the food that the labourers in many parts of the kingdoms of Scotland and Ireland would con-
SIDER (and justly too) a wholesome, nutritive, and palatable food; and what thousands and tens of thousands of mechanics and their children would for some years past have grasped at as a luxury. But it betrays no great portion of wisdom in either of these celebrated book-makers, to point out, as food for swine only, what is, and ought to be, a large portion of the food of the lower orders, not only of the poor, but of all the labouring classes. When labourers and mechanics in Scotland, or their children, are well supplied with abundance of good milk, oat-meal, potatoes, and vegetables, with an occasional morsel of butcher meat, and a few groceries by way of luxury, they will be more healthy and happy than if they were fed daily on animal food. The working classes in the country and their children, who use much milk, are generally more healthy than the inhabitants of towns, who consume the largest quantity of animal food. But it is as unnecessary to descant on the value of the milk of cows, as a species of food, in its natural state, as it would be to point out the uses of farinaceous matter, of water, or of wholesome air.

When milk is used with pottage, potatoes, &c. without cookery, it is termed *kitchen* by the lower orders of people in Scotland. Butcher meat, cheese, flesh, eggs, &c. are also denominated kitchen. The term may be laughed at by our southern neighbours, and by some in North Britain, who pique themselves on the purity of their English style; but whether the term has found a place in Johnson's Dictionary, or whether our brethren on the other side the Tweed, who must be allowed the merit of being much greater connoisseurs in every thing that regards the palate, than we are in Scotland, make a similar distinction between bread, pottage, potatoes, &c., and the richer food eaten along with them; such of them as are acquainted with the writings of
Xenophon will easily see that a similar distinction prevailed in his time. He says, in his Cyropædia, that the youths at the National School instituted by the Persians, had obstode (obsoncum or kitchen, in the above sense) whatever they could procure by hunting; and that if they took no beast in the chase, they had only nasturtium (nasturtium, their substitute for bread), which constituted their daily food. Since the term is derived from the Greek classics, it ought not to be laughed at by over-refined Englishmen.

The quantity of milk used in Scotland as it comes from the cow is immense. In all the western counties, milk is not only used as kitchen to the pottage of the farmers, and their families and servants, but it is also eaten with bread after them every morning, and in general at every meal. Even in towns, sweet-milk, or when it cannot be found, butter-milk, is used in all these ways, and the inhabitants are eager to procure it, even at the high price which they are obliged to pay; and it had been happy for our English neighbours, so far as regards their health, pecuniary interest, and morals, that they had continued to live more on milk, and indulged less than they have done in concentrated food. The vast increase of the poor's rates in England proceeds more from their refined cookery, in which they so much indulge, than from any other cause.

It is therefore the duty of proprietors and occupiers of land, and even of the state, in so far as it may be practicable, to promote the use of milk as food for the labouring class of people; and even to abridge the use of animal or concentrated food, and expensive cookery, as much as possible, among the higher ranks. The best way to promote the use of milk, is to provide it in abundance, and of course at reasonable prices. The
vast increase of the price of milk, and of every species of food into which it is made, being six times more within the last thirty years, than grain had risen during a century, shews that that wholesome beverage is not sufficiently supplied. That circumstance should teach, and (in spite of the prejudices of a few who claim to themselves all the knowledge of agriculture) will soon teach, many to turn their attention to Dairy Husbandry.

It would tend much to national advantage, and contribute to the health and comfort of the labouring classes, were the Board of Agriculture, and all others acting in national concerns, to expend the funds intrusted to them in teaching the people, and especially those of England, to relinquish their over-attachment to animal food and expensive cookery, and to be contented with milk, meal, and vegetables, as their chief food. That unbounded attachment to luxuries, and particularly to concentrated food, and that contempt for milk and other food that is plain and wholesome, is the great cause of pauperism, and the vast increase of the poors' rates, now become so alarming. And when I see the Secretary to the Board of Agriculture publishing, at the national expense, books condemning milk as food only for swine, I must say that I consider it injudicious and highly improper conduct. The labouring classes ought to be instructed that milk, in every shape into which it is formed, and particularly skim-milk, butter-milk, and even whey, are all wholesome aliment, not only for swine, but for labouring people; and that, though it would be desirable to see even the poorest provided with something better at times by way of luxury, yet these ought not to be despised, nor the people taught to throw any of them, except the overplus of the whey, to the swine.
The dairy was the earliest, and it is now the most profitable and useful branch of husbandry. Herbage is converted into human food, either in the form of flesh or of milk; but a much greater quantity of the food of man is produced from the same quantity of herbage when formed into milk, than when converted into flesh. It has been stated by the Right Honourable Sir John Sinclair, and others, on correct principles, that the herbage that is necessary to add 112 pounds to the weight of an ox, would, if used in feeding dairy cows, yield 450 English gallons, or 900 Scots pints of milk. The 112 pounds of flesh, is only worth, at the rate of 8s. per stone of 14 pounds, £3 : 4s. But the 900 pints of milk, if sold at 6d. as it does in towns, would bring £22 : 10s; if used in feeding veal, it would, at the rate of 4d. per pint, yield £15; if made into butter and butter-milk, it would give nearly as much; and if made into cheese, about £10 : 10s. The superior advantages of the dairy system, to that of forming flesh, is, at the lowest calculation, more than three to one; and when disposed of to the greatest advantage, about seven to one, whatever Mr. Brown may say on the subject.

Sect. III.—Making Butter-Milk and Butter.

Milk, as it comes from the cow, consists of Butteraceous or oily matter,—Caseous matter, from which cheese is formed,—and Serum or whey, all blended together in one common mass. In the operations of the dairy, these substances are separated by various processes, and each of them formed, separately or in compound, into different species of food, of which cheese and butter are the most interesting. The art of making butter from the milk of cows seems to have been known to the inhabitants of Britain before the Romans conquered this
island; but it was that brave people who first taught our ancestors to make cheese.* These processes require to be described, and the improvements that have been made in them pointed out.

It has long been customary for those who kept cows, to throw the milk that was not used fresh, or made into cheese, into a churn, till as much was collected as might be convenient for churning, and by that operation to reduce it into butter and butter-milk, which form important articles of food to the labouring part of the community in all parts of Scotland; and this is still the general practice, except in the dairy district. But when the milk is thrown in that manner into the churn or other vat irregularly, just as it can be spared, and without any regard to the condition it is in,—part of it warm as it came from the cow, and part of it cold, as it may happen,—that which is first collected soon becomes sour and clotted; and when additions are made of new, perhaps of warm milk, the coagulum of the the first is broken, it runs into curds and whey, and the new milk does not acidify naturally of its own accord, but is forced into it by the milk formerly in the churn; the two run into a state of fermentation which in time becomes putrid, and both the butter and milk acquire a bitter and acrid taste. The lactic and serous parts of the milk are separated, and the butteraceous part injured, and rendered unpalatable, by the putrid fermentation of the lactic and serous parts before churning. When the mass is formed into curds and whey, and fermentation excited in the milk before churning, these parts are not again united by that operation, and the fermentation previously begun continues in the milk,

* Pliny, in his Natural History, b 28, c. 9, § 35, says, "Of milk, butter was made, which was the most delicious food of barbarous nations."
and soon renders it unwholesome and unpalatable. The butter acquires an acrid pungent taste, an ill colour, and unpleasant smell; and the butter-milk becomes acrid, unpalatable, and unwholesome.

Slovenly and improper as this method is, it was, till lately, the only mode of managing that branch of the dairy in all parts of Scotland; and it is still the method pursued in by far the greatest part of the kingdom.

In the dairy districts, however, and particularly round Glasgow, where the greatest part of the milk is formed into butter and butter-milk to supply the inhabitants of that city, a very interesting improvement has been recently made in that branch of dairy husbandry, and which ought to be described, and practised everywhere.

The milk, whenever drawn from the cow, is placed in coolers or shallow vats, from three to six inches deep, and set on the floor of a clean, cool, and well aired milk-house, from twelve to twenty-four hours, till it has cooled to the temperature of the milk-house, and the cream risen to the surface.

These coolers are next emptied, while the milk is yet free of acidity, into a clean well-scalded vat, of size to contain the whole milking, or two milkings, if both are sufficiently cooled, where it remains till churned. If another milking, or meal of milk, comes to be ready to be placed in the stand-vat, before that which was formerly put there has begun to acidify, that second meal may be put into the same vat. But if the first has soured, or is approaching to acidity, before the second quantity has completely cooled, any further admixture into the vat would break the coagulum, lead to fer-
mentation, and injure the milk. It is necessary that the whole milk become sour before it be churned; but the whole of it must be allowed to become so of its own accord, and by no means forced into acidity by admixtures of sour-milk among that which is sweet; and the utmost care is always taken not to allow the coagulum of the milk in the stand-vat to be broken till the milk is about to be churned. If it is not agitated, or the coagulum (lapper, as it is termed in dairy language) broken, till it is turned into the churn, it may stand (where the milk-house is of a proper temperature) from a day to a week without injury, till as much can be collected as may be convenient to churn at one time; and no part of it is churned till it has acidified, and run into a coagulum or lapper.

If the coagulum or lapper of the milk in the stand-vat has not been broken, nor any sort of fermentation excited, till the milk is emptied into the churn, and if the milk-house is cool, free from damp, and well aired, the butter will be rich, sound, and of the best taste; and the butter-milk will have a pleasant, palatable, acid taste, no way acrid, bitter, nor unwholesome. It will remain for a long time (if not placed in too high a temperature), of a pleasant acid taste, and free from fermentation, or of any separation of the lactic and serous parts. But wherever fermentation has been excited, or the coagulum broken, and the milk run into curds and whey before churning, fermentation so begun will continue in the butter-milk after that operation. The lactic parts will separate from the serum, and instead of being of a uniform consistence, it will be formed into curds and whey, and soon become unpalatable and unwholesome. When duly prepared and manufactured, the milk will be better with a fifth or fourth part of water mixed into it, than milk that has been fermented
before being churned, would be without a drop of water mixed with it.

The Operation of Churning is generally performed in plunge-churns, some of which, in large dairies, are of considerable size; some of them that are churned by a single person, containing upwards of 120 Scots pints; and those that are wrought by machinery churn 150 or 200 pints at a time. After the operation has been carried on for a few minutes, merely to break the lapper or coagulum of the milk, as much hot water is emptied into the churn as raises the temperature of the milk from 50 or 55 degrees, being that of the dairy-house, to 70 or 75 degrees, or upwards, on Fahrenheit's thermometer; one person always churning, while another pours in the water slowly, that no part of the butteraceous matter may be melted. The water mixed into the milk before it is carried to market varies in different dairies and seasons of the year. If the milk is at a higher temperature than 50 or 55 when begun to be churned, less warm water will be required to raise it to that of churning. It must, however, be raised to about 70 or 75 during that operation. Some, indeed, do not raise it so high by means of hot water, but do it in part by the agitation of the churn, which is truly labour lost. The temperature of milk must be raised by some means or other to 70 degrees or so, before the butter can be rightly separated from the milk; and it is surely better to warm it with an admixture of hot water than by agitation in the churn.

The milk will admit of a greater proportion of water in autumn, when it is rich, than it can bear in the spring, when it abounds much more with serum. Probably one pint of water may in general be added, one way or other, to every five or six pints of milk in the
early part of the summer, and one pint to four or five pints in the harvest and winter seasons.

Some of the inhabitants of Glasgow have complained loudly, and probably not without some cause, of the butter-milk sold in the streets of that city being too much adulterated with water; but from the necessity there is of throwing in a small quantity of cold water when it is placed in the coolers, to make it cool and cast up the cream, and what has been shewn to be necessary to raise the temperature from that of the milk-house to churning heat, it is evident that a considerable quantity of water must necessarily be put into the milk. This, however, cannot justify undue adulteration from rapacious motives. But, as has been already hinted, the quality of the butter-milk does not depend so much on the admixture of water, as on the proper treatment before being churned.

In the manufacture of sour-milk, as in all the other operations of dairy husbandry, the thermometer ought to be constantly used; but very few of the people engaged in that branch of agriculture, either in Scotland or England, know anything about, or pay the smallest attention to that valuable philosophical instrument. Indeed, the farmers' wives and servants are, from long habit, able to estimate with surprising exactness the degree of heat proper for churning milk. When the operation is carried on in a temperature too low, the milk swells when agitated in the churn,—appears of a white colour,—throws up air-bubbles,—and makes, when agitated or churned, a rattling noise. But when it is in proper temperature, the milk does not swell or rise in the churn,—it is of a straw or cream colour,—emits a much softer sound,—and does not cast up air-bubbles so plentifully as when colder.
When milk is either over heated or churned too hastily, the butter is always soft, and of a white colour. From two to three hours is a proper time for performing the operation of churning. In the manufacture of sour-milk, and in every branch of Dairy Husbandry, the utmost attention to cleanliness is indispensably necessary. The milk must no doubt become sour, and even coagulate before it is churned; but if that souring is not natural, but brought on by any foulness on the vessels through which the milk passes, or by any sort of admixture, or even by the milk being kept in a damp place, in one too hot or too cold, or even by exposure to an impure atmosphere, the acidity will not be a natural one, nor the taste of the milk or butter agreeable, but acrid and unpalatable. Every vessel through which the milk passes must be as clean, and every part where it is kept before being churned, must be as free from dampness, and every species of impurity or bad air, as if it were intended to keep the milk long sweet for skim-milk cheese. Cleanliness in every possible respect is the life and soul of every branch of Dairy Husbandry; and the slightest deviation from it is highly injurious.

Butter-milk is used to a great extent by the labouring classes in all parts of Scotland, and in particular in the city of Glasgow. The milk of the cows kept in and near Glasgow, is generally used in its natural state, or in cookery. But the milk of by far the greatest number of cows that are kept at more than two, and within twelve miles of Glasgow, is manufactured into sour-milk, and used by the inhabitants of that city. As almost the whole of that extensive tract of ground is occupied with dairy stock, and generally not more than one third of the land under grain crops, the quantity of milk manufactured in that way, and consumed by the inhabitants of Glasgow, must be immense.
The method of making butter and butter-milk in Holland is somewhat different from the mode in the vicinity of Glasgow. After the milk is cold, it is put into a pan or vat, and well stirred, with a wooden spoon or ladle, two or three times a-day, to prevent the cream from separating from the milk; and this sort of stirring or partial churning is continued till the milk becomes so thick and clotted, that the ladle or spoon stands erect in the milk; after which it is put into the churn, and beat or churned for one hour or so. Cold water is poured in, to help to collect the butter, and separate the milk from it; after which the butter is washed in cold water. By this method the Hollanders imagine they obtain more butter from the milk than they can do any other way: They also say, that both the butter and butter-milk are better when made in that way than when churned as is done in England.

The mode of washing the butter is so simple and familiar to every housewife and dairy-maid, that it would be a waste of time to dwell on it. The butter must be beat in cold water with a large wooden spoon or the bare hand till every particle of the milk is washed out, and the water comes off pure. After that it is injured and rendered tough and gluey by being further beat or kneaded. If the butter be salted, the salt must be well mixed into it, otherwise the butter acquires two mixed colours,—yellow a little where the salt has fallen, and whiter where it has not reached. This, in dairy language, is termed "pyety butter."

The butter-milk is, on the authority of the Secretary to the Board of Agriculture, adjudged to the pigs. But it is, in the western counties of Scotland, as well as in Ireland, used to a vast extent as human food. It is used as drink, and is certainly far superior to the miser-
able table beer generally drank in England. It serves as kitchen to pottage, bread, potatoes, &c. And when a linen bag like a pillow-slip is filled with it, and hung up till the serum drop out, and a small quantity of sweet cream is mixed with what remains in the bag, and a little sugar, where the milk is too sour, it forms a dish that might be placed on the table of a peer of the realm.

The Section on Butter, originally drawn up to have been inserted here, has been placed after those on Cheese, so as the printing might go on, while the Author was making further inquiry into the best mode of making Butter.

Sect. IV.—Full-Milk Cheese.

When milk is not needed as food in its natural condition, and when it cannot be got sold in butter or buttermilk, it is made into cheese, a species of food so well known, as not to require to be here particularly described. It would appear that we are indebted to the Romans for that improvement. Strabo, lib. iv, p. 200, says, "Some of the ancient Britons were so ignorant, that though they had abundance of milk, they did not understand the art of making cheese."

It would seem that our ancestors were, when invaded by the Romans, less conversant in the uses of milk than the inhabitants of any other country, even the most ancient of which we have any record. Job complains (chap. x. 10), "Hast thou not poured me out as milk, and curdled me like cheese?" David was sent by his father Jesse, to "carry these ten cheeses to the captain of their thousand, and look how thy brethren fare."
SECT. IV.

FULL-MILK CHEESE.

1 Sam. chap. xvii, 18. "Cheese of kine" formed also part of the supplies of David's army at Mahanaim, during the civil war with Absalom, 2 Sam. xvii, 29. Homer (B. c. 907) mentions cheese as forming a part of the ample stores of provisions found by Ulysses and his companions in the cave of the Cyclops Polyphemus:

"The bending shelves, with loads of cheeses prest,
The folded flocks, each separate from the rest."

Euripides, Theocritus, and others of the early poets, also mention cheese, Ludolphus says, that excellent cheese and butter were made by the ancient Ethiopians. And it is well attested that the Romans understood the art of making cheese, and taught our ancestors that art. It is not certain, however, that any of these nations knew how to coagulate sweet-milk with rennet or any such substance. They seem to have merely allowed the milk to sour, and to have formed cheese of the caseous part of the milk, after separating the whey or serum. If so, the cheese could not be of good quality; neither could the cheeses be of great size, when David, then unable to bear arms, was able to "run to the camp" with ten of them, ten loaves, and an ephah of parched corn.

It does not appear that any improvement was made in Scotland on that species of manufacture, from the time the Romans held dominion in Britain, till about the middle of the eighth century. The mode of making full-milk cheese instead of that of skim-milk, was first begun to be practised in the district of Cunningham, Ayrshire; and has since been extended over the greatest part of that county as well as the counties of Renfrew and Lanark; and is fast coming to be
known in Galloway, Dumbartonshire, Buteshire, and in districts still more remote.

As this species of cheese has obtained the name of "Dunlop Cheese," it has been alleged by some that it was first begun to be made in that parish. But from the best information I have been able to procure, it seems to have been so named from its being first brought to the Glasgow market by a carrier who lived in the parish of Dunlop, and who carried to Glasgow much of the cheese of that and the neighbouring parishes.

The Reverend Mr. Brisbane, in his Statistical Account of Dunlop Parish, repeats a traditionary story of a woman of the name of Gilmour having imported that improvement from Ireland, where she had fled in the troublesome times prior to the Revolution in 1688, but nobody ever heard of that sort of cheese being made in Ireland more than in Scotland. The adage given above shews that the making of butter and cheese of a superior quality was the chief excellence and particular boast of the inhabitants of Cunningham, many ages before the existence of the woman referred to. The making of cheese had been practised in Scotland ever since it was introduced by the Romans; and none who could make good cheese of skim-milk could be ignorant, that the more cream that was left to be made into the cheese, the richer and more palatable it would be; and vice versa. For these reasons, I am not inclined to believe that the practice of making sweet-milk cheese, whoever it may have been that introduced it, could be of Irish origin. Neither was that species of cheese heard of in Scotland till more than half a century after the Revolution in 1688.

I had access to know, that John Reid, tenant in
Silverwood, in the parish of Kilmarnock, made full-milk cheese on that farm as early as the year 1750. It was made by John Love in Monkland, in that neighbourhood, about the same period. But it was not till the year 1770 that any considerable number of the farmers, in that or neighbouring parishes, began to make full-milk cheese.

But in whatever quarter of the country, or by whomsoever that species of cheese was first made, it has now become general over the counties of Ayr, Renfrew, and Lanark; and it is not altogether unknown in many other counties. It was introduced into Galloway, in the year 1802, by Mr. James Ralston in Fineview, parish of Kirkum; and besides his own, which was the largest dairy in Scotland, there were about fifty other dairies of various dimensions introduced into that parish prior to the year 1810.

Making of sweet-milk cheese has been brought to a degree of perfection in the counties of Ayr, Renfrew, and Lanark, that has not been equalled in North Britain, and scarcely surpassed in England. The Ayrshire cheese is certainly milder in its taste, and fatter than any English cheese whatever. From the greater accommodation in the English than in the Scots dairies, the cheeses, and particularly those of Cheshire, are generally more uniform in taste, and more solid and adhesive; and the Glo'ster cheese has often a more smart and spicy taste than the cheese made in Scotland; but no English cheese whatever is so fat, so mild and sweet in the taste, as the generality of that which is made in the counties of Ayr and Lanark. The greatest defect in the Scotch cheese is, that much of it is too soft, and wants firmness and adhesion. This proceeds from the milk being allowed to become too cold before it is made into cheese, or during that operation.
But, leaving the diversity in the taste, flavour, and consistency of cheese, and the manner in which these qualities are acquired, to become the subject of after inquiry, I shall proceed to detail the operation of cheese-making, as it is now practised in the dairy districts of Scotland. And, as my object is to diffuse a general knowledge of that branch of rural economy among the farmers, their wives, and servants, I shall not enter deeply into the peculiarities of taste in cheese, and I shall study the greatest perspicuity and plainness of style.

When as many cows are kept on one farm as that their milk will form a cheese of any tolerable size every time they are milked (twice a-day), the milk, as it comes from the cows, is passed through a sieve (provincially termed a milsey) to remove impurities, into a boyn (vat), and when the whole is collected, it is formed into curd by a mixture of rennet. As milk requires to be coagulated as nearly as possible at the temperature of animal heat, and as it must cool considerably during the operation of milking from several cows, and in passing through the sieve, it is necessary for those who set their curd in the natural heat to make up some part of that which is lost, by mixing a quantity of hot water into the curd-vat.

Where the cows on a farm are not so numerous as to yield milk sufficient to make a cheese every time they are milked, the milk is stored about six or eight inches deep in the coolers that have been described, and placed in the milk-house till as much is collected as will form a cheese of a proper size. When the cheese is to be made, the cream is skimmed from the milk in the coolers, and, without being heated, is, with the milk that is drawn from the cows at the time, passed through the sieve into the curd-vat; and the cold milk
from which the cream has been taken is heated, so as to raise the temperature of the whole mass to near blood heat; and the whole is coagulated by means of rennet carefully mixed with the milk. The cream is put into the curd-vat, that its oily parts may not be melted, and the skimmed milk is heated as much as to raise the whole to near animal heat. The utmost care is always taken to keep the milk, in all stages of the operation, free, not only from every admixture or impurity, but also from being hurt by foul air arising from acidity in any milky substance, putrid water, the stench of the byre, dunghill, or any other substance; and likewise to prevent the milk from becoming sour, which, when it happens, greatly injures the cheese.

I was much surprised to find, that in Cheshire, and I understand also in other parts of England, it is customary to heat the cream, so as to melt its oily parts before it is mixed with the milk in the curd-vat, and before applying the rennet. But in Scotland the cream is carefully separated from the milk that is to be warmed, and put into the curd-vat cold, and brought, by the admixture of warm milk, to the general warmth of the mass at setting the curd. Experience must decide which is the best method, and to that experience I cannot lay claim. I have not kept a cheese-dairy of my own of sufficient extent for experiments since I discovered the English practice, and I have not been able to prevail on any of my acquaintances to venture on the experiment of melting the cream. In so far, however, as I can judge, I am decidedly partial to the Scotch mode of procedure—carefully to prevent any of the butteraceous or oily matter in the cream from being melted in any stage of the process. If the fat is melted into oil, it will not coagulate with the milk, and must remain in the curd and cheese, and have the same effect,
as if so much oil or animal fat had been mixed with the milk, or into the curd; and I would expect that it would much more, readily separate from the curd or cheese after being melted, than if that had not been done. It must be chiefly from that circumstance that so much butter is extracted from whey in England. The tenth part could not be collected from fair made Scots whey. Mr. Holland says, that in Cheshire the meal of milk that stands over-night is not heated at all when the curd is set; only the cream is heated or melted.' If one meal, or half of the milk, is cold, and the other half in the natural heat, as milked, the curd must be set at a very low temperature even when the cream is melted.

The temperature at which the milk is kept from the time it is drawn from the cows till it is formed into cheese, and the cheese ready to be put up to dry, is a matter of great importance, and should be carefully attended to.

The milk, when taken from the cow, ought to be, as soon as possible, cooled to below 55, or between that and 50 degrees on Fahrenheit's scale. To cool it speedily, and to facilitate the separation or rising of the cream, a small quantity of clean cold water is generally mixed with the milk in each cooler. And when the stone or iron coolers that have been described are used, the milk will cool in them much sooner than in the wooden dishes formerly in use. If the milk is kept warmer than 55 degrees of temperature, it will not properly cast up the cream which it is thought necessary it should do, even when the whole is to be formed into cheese, and the milk will soon become sour, and acquire a bad taste, if it is not brought to near that degree of temperature; but if it gets into a
lower temperature than about 50 degrees, the milk acquires an insipid and unpleasant taste, of which it cannot be again divested; it does not coagulate nearly so well, and the cheese made from it is soft and inadhesive,—the curd difficult to be separated from the whey,—and the milk and cheese are never well tasted. It is not enough that the temperature be raised to the proper degree at coagulating; for if it has prior to that become too cold, the heat at setting the curd will not altogether do away the bad effects of the previous cold. It is owing to the milk being allowed to cool too much before it is coagulated, that it is found so difficult to get it formed into cheese in winter; and that the cheese made at that season of the year is so soft, inadhesive, and insipid in taste. The milk given by cows in the autumn and winter is much richer, especially in caseous matter, than that which they yield in spring and summer. But as no fire is kept in the milk-house, the nipping cold at that season renders the milk unfit for being made into cheese. It is therefore of the utmost importance in dairy husbandry to keep the milk-house and dairy-house at all times as nearly as possible at from 55 to 50 degrees of temperature.

Milk ought to be coagulated at nearly its natural heat when drawn from the cow, or from 90 to 95 degrees of temperature, and for that purpose a thermometer ought to be used in the milk-house. If coagulated much warmer, the curd is tough, harsh, and too adhesive; much of the butteraceous matter is melted, and goes off with the whey, and the cheese becomes hard, dry, tough, and tasteless; and if the milk is too cold when coagulated, the curd is soft, does not part with the serum, and the cheese continues to be so soft that it is with difficulty that it can be kept together. Even when the utmost pains are taken to extract the
whey, and to give it solidity and firmness, putrifying holes, which in dairy language are termed "eyes," whey-drops, or springs, frequently break out on the cheese, and it is always soft, tough, and of an insipid taste.

It is customary in some of the English dairies to set the curd at a much lower temperature than animal heat, in order, as they say, to prevent the melting of the butteraceous substance; and whenever the curd is broken, and the whey begins to be separated, the temperature is raised, either by throwing in boiling water, or coagulating the milk in a boiler, to which fire is applied to heat the curd. It has been found that the oily matter in the milk does not so easily melt after the milk and cream have been coagulated as it does before they are formed together into curd. But this practice is neither generally known nor practised in Scotland. It appears to me to be more proper than melting the cream; at any rate, it is the most proper course when milk has been coagulated too cold.

As the right temperature of milk at all stages, from the time it is taken from the cow till the cheese is formed and laid up to dry, is a matter of such importance, and as the slightest deviation from it is so injurious or fatal, the thermometer ought to be carefully used in every stage of the dairy operations. It is to be lamented, however, that this simple and accurate gauge of heat and cold is still almost unknown in the Scotch dairies,—a clear proof that dairy operations have not yet been brought to the greatest perfection in Scotland.

The only gauge generally used for ascertaining the temperature of the milk at the time the curd is set (for no attention whatever is paid to the heat of the milk, curd, or cheese, at any other period), is the finger's end
of the dairy-maid. Every chemical operation requires to be executed with the exactest attention to temperature, and especially at the critical moment of the union or separation of different substances. In cookery, the relish, and often the value of the dish, is materially affected by the temperature of its component parts at the time they are put together. In brewing, baking, and every operation of a chemical nature, the most rigid attention to temperature becomes necessary; and the slightest deviation from the proper standard of heat is generally injurious, and often fatal to the operation.

That circumstance is not, in any one thing, more important than it is in the operations of the dairy; yet the finger's end of the maid is made to serve as a thermometer, both with regard to the temperature of the weather, the dairy-house, and the milk. This is certainly a blameable neglect in the dairy husbandry of Scotland. If the dairy-maid's hands have happened to be in cold water immediately before she employs them to gauge the milk, it will appear to her much warmer than it would do if her hand had come immediately from hot water. The temperature of the milk-house and dairy-house cannot be correctly ascertained without a thermometer.

It is owing chiefly to that inattention to temperature, that such a diversity prevails in the consistence, adhesion, and taste of the Scotch cheese. You may break up twenty, fifty, or one hundred Scotch cheeses, made of the milk of the same cows,—these cows pastured upon the same field,—fed in the same manner,—the milk taken from them and manufactured by the same persons, in the same house, and with the same apparatus,—yet you will scarcely find two of these cheeses to be exactly the same in firmness, adhesion, flavour, and taste. The truth is, that every change of the weather, and many other local and accidental circumstances, lead to a di-
versity in the taste, flavour, and cohesion of the cheese; but if every thing about the milk, from the time it is drawn from the cow till the cheese is ready to be laid up to dry in the store, were to be duly regulated by the thermometer, a much greater conformity would be found in the taste, flavour, and consistency of the different cheeses.

The same inattention to the use of the thermometer in the dairy prevails in Cheshire. I did not find, in any of the dairies which I visited, that either the thermometer was used, or that the people were at all sensible of its value, or willing to use it in any stage of the dairy operations. Even the intelligent Mr. Holland, though he argues for the use of that instrument in the dairy-house, yet he does not seem to think that the quality or texture of the cheese depends on the degree of temperature; but imputes it in a great measure to the time the milk takes to coagulate after the rennet is mixed with it; and that again, he thinks, is governed by the quality of the rennet, as well as by the state of the atmosphere and the temperature of the milk when coagulated. He says,* "It is, we believe, generally admitted, that not only the quantity, but the quality of the curd, as to texture (viz. toughness or otherwise), depends in a great measure upon the length of time the cheese is in coming, and that the time again depends on the quantity and strength of the coagulum used, the state of the atmosphere, and the heat of the milk when put together. In this stage of the art, where a degree of accurate certainty seems to be required, there is no other guide but the hand, and the external feelings. The thermometer of a Cheshire dairy-woman is constantly at her finger-ends. Accord-

* Survey of Cheshire, p. 270.
ingly, the heat of the milk when set is endeavoured to be regulated by the supposed warmth of the room, and the heat of the external air (having reference also to the quantity and strength of the steep), so as that the milk may be the proper length of time in sufficiently coagulating, which is generally thought to be about an hour and a half. The evening's milk (of suppose twenty cows) having stood all the night in the cooler and brass pans, the cheese-maker (in summer), about six o'clock in the morning, carefully skims off the cream from the whole of it, observing first to take off all the froth and bubbles, which may amount to about a pint: this, not being thought proper to put into the cheese, goes to the cream-mug to be churned for butter, and the rest of the cream is put into a brass pan. While the dairy-woman is thus employed, the servants are milking the cows, having previously lighted a fire under the furnace, which is half full of water. As soon as the night's milk is skimmed, it is all carried into the cheese tub, except about three fourths of a brass pan full (three or four gallons), which is immediately placed in the furnace of hot water in the pan, and is made scalding hot; then half of the milk thus heated in the pan is poured to the cream, which, as before observed,* was skimmed into another brass pan. By this means all the cream is liquefied and dissolved, so as apparently to form one homogeneous or uniform fluid, and in that state it is poured into the cheese-tub. But before this is done, several bowls or vessels full of new milk will generally have been poured into the cheese-tub, or perhaps the whole morning's milk. Care is taken to skim off all the air-bubbles which may have formed in pouring the new milk into the cheese-tub."

"Variations.—In many celebrated dairies, during the whole summer they do not heat a drop of the night's
milk; only dissolve the cream in a brass pan, floated or suspended in a furnace of hot water; and this (we are credibly informed) was the practice of a person who made more than five hundred-weight of cheese of the very best quality per cow (of 120 pounds each hundred) in one season. In other dairies they heat one third, one half, and even more than that, of the previous night’s milk. In all dairies they are careful to liquefy or melt the cream well before it is mixed with the milk in the tub. But whatever may be the custom of heating or not heating milk, in any given dairy, the practice of that dairy varies as the weather becomes hot, cold, gleamy, or sultry, &c. We have sometimes cold chilly mornings even in July, which compel the heating of milk in dairies where the custom is not to heat it. Again, in the heat of summer, milk, put cool together, from the warmth of the weather heats in the tub, so as to render the process difficult; and this in dairies where the usual practice is to heat half the night’s milk. It is generally on poor clay lands that the milk most requires warming; on good rich soils the milk will not bear much heating; at least by so doing, the process of cheese-making is rendered more difficult. The lowest degree of heat on setting together, viz. putting the milk into the cheese-tub, is one half cooler than milk from a cow; the highest about twice the warmth of that animal’s milk; and this is meant as the practice in summer, speaking generally. But whatever may be the degree of heat supposed most proper for any particular dairy, the night’s and morning’s milk, and melted cream, being all put into the cheese-tub, it is then ready to receive the rennet and colouring, or, in the terms of the art, to be set together.”

Having given the Cheshire *modus operandi* in the words of the intelligent surveyor of that county, and
which is agreeable to what I found when there, I shall offer a few remarks on the passage I have copied, and on the practices therein described.

With all manner of deference to the superior intelligence of Mr. Holland, I cannot perceive how the strength of the rennet used, and the time it takes to coagulate the milk, should have any effect whatever on the quality or texture of the cheese, except in so far as the rennet may have acquired some bad taste or quality, from impurity or mismanagement, or that the delay in coagulating may affect the heat of the milk. Milk in all its stages through the dairy, is no doubt readily affected, not only by the slightest admixture of any impurity or foreign matter, and also by any of the dishes or implements used, or any thing coming in contact with the milk or curd, but also by the atmosphere in which the milk is drawn from the cow, or where it is kept, or where any of the operations upon the milk or curd are carried on. But there is nothing that affects the cheese so much, as to texture, quality, or taste, as the temperature or degree of heat at which the curd is set, and the operation of separating the whey is performed. And unless there is some impurity in the rennet, it can have no effect on the texture of the cheese, except in so far as it relates to the temperature of the milk when it is coagulated.

It appears to me, however, that the English dairy farmers do not pay due attention to the quality of the rennet which they use in coagulating the milk; for they say it does not generally operate till one hour and a half, and from that to three hours, after it is mixed with the milk. Mr. Holland and Dr. Dickson mention one hour and a half as the ordinary or proper period for the milk to coagulate after the rennet is applied. Mr. Marshall gives a variety of experiments in setting the
curd. The shortest period in forming the coagulum in these experiments was three quarters of an hour, and in other cases it was from two to near three hours in taking effect. And he concludes his experiments by fixing from one hour to two hours as the proper time for the milk to thicken after the rennet is applied.

So far the English practice and ideas on that subject; but that operation is very differently conducted in the Scots dairies. The coagulum is generally formed there in from ten to fifteen minutes, and nobody would use rennet twice that required more than twenty minutes or half an hour to form a coagulum.

It is highly necessary it should be so, otherwise it would be impossible to say at what degree of heat the milk was coagulated. This is admitted by these authors, as well as by me; and it is well known to all who have the least experience in dairy operations, that of all things the cheese is most affected by the degree of temperature at which the curd is set and the whey drawn off. Now, how can that be regulated if the rennet requires from one hour to three hours to operate? In all dairies of any magnitude, the greatest part of the milk is coagulated in the natural heat; but if it is allowed to stand in the curd-vat from one to three hours, with uncertainty as to which of these periods, or perhaps longer than either, before the coagulum is formed, it is impossible to say what degree of heat may remain in the milk at the time it comes into curd. Even the uncertainty of whether the rennet may operate in three quarters of an hour, or not till three hours, puts an end to all calculations as to the temperature of the milk when the coagulation takes place, which is by far the most important operation of cheese-making.

All this uncertainty may be done away by duly pre-
paring the rennet, and keeping it in proper plight—a subject to be considered in course.

Mr. Holland certainly speaks rather vaguely as to the important question of the right heat for coagulating. In the first description he says, "The milk, of say twenty cows, drawn off at night, remains in coolers till next morning. The cream is then separated, and (what I cannot see any reason for) the froth is separated from both the milk and the cream. Of the whole twenty cows' milk and cream for one meal, only three or four gallons is warmed to the heat of scalding. One half of this (that is, from one and a half to two gallons) is mixed with the cold milk,—as much is applied to melt the cream,—and all these, with another meal of milk as drawn from the twenty cows in the morning, forms one homogeneous mass, into which the rennet is mixed, and the coagulation is effected, sometimes in about an hour and a half, and at other times two or three hours after."

It is not easy to draw from this the exact temperature of the mass when the coagulum is formed in the Cheshire dairies. Supposing the three or four gallons (six or eight Scots pints) heated to scalding should make up the heat lost in milking the second meal, and that lost from the mass before the coagulation is effected (and I would think it would scarcely do so much), then we have the one half of the milk at nearly animal heat, and the other half at that of the milk-house, probably about 55 degrees. The medium would be rather under than above 75 degrees on Fahrenheit's scale, which is about 15 degrees below the proper temperature for that operation.

In an after part of the passage quoted, Mr. Holland says, "In many celebrated dairies, during the whole
summer, they do not heat a drop of the night's milk,—only dissolve the cream.” In that case, the milk cannot be above 70 degrees of temperature when it is coagulated.

He goes on to say, that in other dairies one third, one half, or more, of the first meal is heated; and he sums up all by saying, that the lowest degree of putting the milk into the cheese tub is one half cooler than milk from a cow; the highest about twice the warmth of that animal's milk; and this, he adds, is meant as the practice in summer, speaking generally.

Milk drawn from several cows, however speedily and carefully managed, and even the rennet of the best quality, must be far below 90 degrees—perhaps nearly as low as 85 or 80 degrees of temperature, before the coagulation is effected. Now if Mr. Holland means the temperature to be as low as the half of any of these numbers of degrees, then the milk would be coagulated at the heat of from 40 to 45 degrees, which I conceive to be impossible to be done. But if he means half-way between animal heat and the common temperature of the milk-house, it must be somewhere between 70 and 75 degrees. The highest pitch of heat for coagulating, he says, “is about twice the warmth of that animal’s (a cow's) "milk." This cannot be less than 180 degrees on Fahrenheit’s scale, which would destroy the quality of the cheese.

I cannot understand why the milk of cows, fed on poor clay lands, needs to be heated more than that of cows pastured on good rich soil; as is stated by Dr. Dickson, Mr. Holland, Mr. Marshall, &c. In Scotland, much good milk is drawn from cows, fed not only on poor clay soil, but from those that are pastured, for
three fourth parts of the year, upon moss, and wild waste land that has never been cultivated or cropped. But I never understood that the milk of cows so fed required to be heated, more than that of cows fed on the warmest valleys or richest haughs in our best cultivated districts.

Neither can I view in any other light than a freak, what is stated by Mr. Holland, page 272, that "a few smart strokes on different sides of the tub with the cheese-ladder, &c. will forward the coagulation (of the milk) if it has been long in forming." The only effect perceptible to me, of such strokes, would be to create a slight agitation in the milk. Now, of all things, this appears to be hostile to coagulation. I am certain it is so in Scotland, and that the utmost care is taken on this side the Tweed, to prevent any thing from touching the cheese-vat or the milk at that period, or even to allow a breath of air to ruffle its surface. And if milk is much agitated, it will not coagulate so readily as when it is not in the least moved. If either of these opinions had been broached in the north, they would have been condemned as spells or second-sight.

Whenever the milk is completely coagulated, the curd is broken, in order to let the serum or whey be separated and taken off. Some break the curd slightly at first, by making cross-scores with a knife or a thin piece of wood, at about one or two inches distance, and intersecting each other at right angles; and these are renewed, still more closely, after some of the whey has been discharged. But others break the whole curd rather more minutely at once with the skimming dish, the hand, or any thing convenient; but they do not break or churn it, as is done in England. When this last me-
thod is pursued, the whey comes off rather too white and rich, or with too much of the cream at first; but it comes most copiously, and it is only for a few minutes at first that the whey is too rich. By the method first mentioned, the whey does not come off so copiously, nor so rich at first, as when the curd is more minutely broken.

When the coagulum has been formed at a proper temperature, neither too cold nor too hot, breaking the curd minutely, but gently and softly, seems to be most proper. For though the whey is a little too white at first, that is soon over; it comes off abundantly pure in a few minutes after; and it flows much more copiously, than when the curd is but slightly broken at first. The advantage of a speedy discharge of the whey, as it saves time, and prevents the curd from becoming too cold or acquiring any bad taste or flavour (which it often contracts when neglected at that stage of the operation) is an ample compensation for any small quantity of the oily parts that may come off at first breaking.

But if the milk has been either too cold or too hot when coagulated, I would recommend breaking the curd as slightly and easily as possible at first. If too hot, the whey naturally comes off copiously, but it is too white, and contains a portion of the butteraceous matter in the curd; and the complete breaking at first adds to that evil, and brings off still more of the oily substance from the curd, to the impoverishment of the cheese. Such quick agitation, too, tends to render the warm curd still more tough and adhesive. When the milk has been too cold at the time the curd was formed, it will be by far too soft to be minutely broken at first; and when that is done, some of the curd will come off with the whey. In that case, the curd should be dealt with as gently
SECT. IV.  FULL-MILK CHEESE.

(or cannily, as the country people usually express it) as possible.

I cannot understand how the Chesire cheese maker, and two assistants, should be employed for forty minutes in breaking the curd, in the best and largest curd-vat in the county, as Mr. Holland mentions in page 274. I am confident that any one of them might break, to the utmost pitch that could in any case be wished for, the largest store of curd ever made in any one vat, and that in the space of less than three minutes. In the few instances which I witnessed in Cheshire, the people seemed to proceed in the way they had been taught, plashing arms-length into the curd, and agitating it far more than appeared to me to be proper. But I did not imagine that they wrought at it more than ten or fifteen minutes. Such a mode of breaking the curd accounts for the large quantities of butter obtained from whey in the English dairies: but it must certainly be obtained at the expense of the cheese.

Neither can I subscribe to the method of allowing the curd and whey to stand covered up for half an hour after that breaking, and before any of the whey is drawn off; as that gentleman says, and as I saw was done in Cheshire. Indeed if the milk for one day, of twenty, or say of thirty or forty cows, is beat almost to atoms, and agitated by three persons for forty minutes, it will require some little time for the curd to settle at the bottom, and the whey to rise over it. But if the largest making of curd in Scotland were so beat by the labour of three people for forty or even five minutes, and left to stand unseparated from the whey for half an hour more, especially after having been from one to three hours in coagulating, and at the ill-regulated temperatures that Mr. Holland has mentioned; I am per-
suaded that both the curds and whey would have begun to acidify, or have acquired some bad taste, before they could be separated on that plan.

Mr. Marshall, in his Rural Economy of Norfolk, describes how his dairy-woman violently agitates the whole curd, carefully breaking every part of it, so that no piece of curd remains unbroken larger than a hazel-nut. This he says is done to prevent what is called curd-slip, or pieces of curd remaining unbroken, which do not press uniformly with the other curd, but turn livid and jelly-like, and soon become faulty and rotten in the cheese. This to me seems to be the most extravagant idea that I have heard advanced by a person who had ever seen cheese made. If ever so many pieces of curd, of not only the size of a hazel-nut, but of the size of a man's head, should escape unbroken at the first violent agitation he so much recommends, they could not fail to be broken on the after turning up of the curd, and the cutting and pressing it undergoes in the curd-boyn and dripper over it, before the curd is ready for the chesert, and to be put under heavy pressure. It would not be possible, were it even wished for, to preserve any piece of curd of the size Mr. Marshall mentions, or of any dimensions, more or less unbroken during the course of the necessary operations of taking off the whey; and that altogether independent of the original agitation he mentions. I have seen thousands of cheeses made, and in Scotland I never saw or heard of the curd so minute-ly broken at first as he recommends: and yet I never saw any of the "livid and jelly-like spots" in the cheese on that account. The idea seems fanciful in the extreme. If a spoonful or two of the softest unbroken curd were to be put into the cheese at the time it is about to be put under the press, that curd would break, yield its whey, and do no harm whatever to the cheese;
though it is proper to take off as much as possible of the whey before the cheese is finally made up.

After the curd has been broken, the whey ought to be taken off as speedily as it can be done, and with as little further breaking or handling the curd as possible. It is still necessary, however, to turn it up, cut it with a knife, or break it gently with the hand, in order to facilitate the separation of the whey from the curd.

When the curd has consolidated a little, it is cut with the cheese knife, gently at first, and more minutely as it hardens, so as to bring off the whey. When the whey has been mostly extracted, the curd is taken up from the curd-boyn, and being cut into pieces of about two inches in thickness, it is placed into a sort of vat or sieve with many holes; a lid is placed over it, and a slight pressure, say from three to four stones avoidu-poiss; and the curd is turned up and cut small every ten or fifteen minutes, and occasionally pressed with the hand so long as it continues to discharge serum. When no more whey can be drawn off by these means, the curd is cut as small as possible with the knife, the proper quantity of salt minutely mixed into it in the curd-boyn, and placed in the chessart within a shift of thin canvas, and put under the press.

All these operations ought to be carried on and completed with the least possible delay, and yet without precipitation. The sooner the whey is removed, after the coagulation of the milk, so much the better. But if the curd is soft, from being set too cold, it requires more time, and to be more gently dealt with; as otherwise much of the curd and of the fat would go off with the whey. And when the curd has been formed too hot, the same caution is necessary. Precipitation, or handling
the curd too roughly, would add to its toughness, and expel still more of the oily matter. And, as has been already mentioned, hot water or whey should be put on the curd when it is soft and cold; and cold water put on when the curd is set too hot.

Undue delay, however, in any of these operations, from the time the milk is taken out of the coolers, till the curd is under the press in the shape of a cheese, is most improper; as the curd in all these stages is, when neglected for even a few minutes, very apt to acquire some acrid or pungent taste, ill flavour, or other bad quality. If it is allowed to remain too long in the curd-vat, or in the dripper over it, before the whey is completely extracted, the curd becomes too cold, and acquires some pungent or acrid taste; or it softens so much, that the cheese is not sufficiently adhesive, and does not easily part with the serum. Whenever the curd is completely set, the whey should be taken off, without delay, and the dairy-maid should never leave the curd-boat till the curd is ready for the dripper or cheese-vat. In small dairies, however, when the farmer's wife or dairy-maid is frequently looking after the family, attending to the children, or other house work, at the same time that she is conducting the operations of the dairy, the curd is too frequently neglected, and is thereby injured in its taste or flavour before it is formed into a cheese.

After the cheese is put into the press, it remains for the first time about an hour, or less than two hours, till it is taken out, turned up-side down in the cheese-vat, and a new cloth put round it every four or six hours, till the cheese is completed; which is generally done in the course of a day and a half, two, or at most in three days after it was first put under the press.
Some have shortened the process of pressing, by placing the cheese (after it has been under the press for two hours or so, for the first time) into water, heated to about 100 or 110 degrees, and allowing the cheese to remain in the water about the space of half an hour, and thereafter drying it with a cloth, and putting it again under the press. This practice, however, has been but recently introduced into the Scots dairies, and is not yet so general as it seems to be in England.

The process of Salting is very differently conducted in the Scots dairies from what it is in England. In Scotland, the salt is minutely mixed into the curd after it has been rendered as dry as possible, and cut very small by means of the cheese knife, as has been already mentioned. This seems to answer the purpose just as well as the mode pursued in England, to be afterwards described, which is far more troublesome, and must be much more expensive, both in waste of salt, in apparatus, and in labour. The greatest defect I can perceive in the salting in Scotland is, that the salt is generally applied to the cheese merely by guess, whereas it ought to be more carefully regulated. Half an ounce of salt to every English pound of cheese, or at most thirteen ounces to twenty-four pounds English, is a sufficient quantity. Too much salt renders the cheese dry, tough, and hard; and if a sufficient quantity is not given, the cheese will become putrid.

But in the English dairies, the cheese gets no salt till the operation of pressing is finished, and it is then cured or salted in nearly the same way as we do kipper or bacon. Mr. Holland says (page 280), "At noon the cheese is taken from the press, (after having been there for about 48 hours); a cloth is put under it, which serves as a lining to the vat, but it is not turned over the up-
per surface of the cheese, as hitherto. The cheese is then placed mid-side up in brine, in a salting tunnel or tub, the upper surface of the cheese being covered all over with salt. It stands generally about three days in the salting tunnel, is turned daily, and each turning well salted: the cloth being twice changed in the time. When taken out of the brine, the cheese is put on the salting benches with a wooden girth round it, the thickness nearly of the cheese, where it stands about eight days, being well salted over and turned each day. The cheese is next washed and dried, and after remaining on the drying benches about seven days, it is again washed in warm water with a brush, and wiped dry with a cloth; and in two hours after, it is smeared all over with about two ounces of sweet whey-butter; and then placed in the warmest place of the cheese-room, to come under the sweating process."

Mr. Holland also mentions some variations on this process, which fall to be noticed. He says, "On the cheese coming into the salting-house, it is, in some dairies, taken out of the vat, and after its sides are well rubbed with salt, is returned into the vat, with a clean fresh cloth under it: the top being covered with salt, it is placed on the salting benches, turned and salted twice a-day, and the cloth changed every second day. On the salting benches it is continued seven or eight days, when it is taken out of the vat, and with a wooden hoop round it, or cheese fillet, is put into the salting tunnel, and managed therein as before described. When cheese is salted on the benches before it goes into the tunnel, it is only washed once, viz. before it is smeared with butter."

This mode of salting was unknown to me till I saw it in Cheshire; when I naturally inquired what good purpose was attained by so much labour and expense, in
salt wasted, and in houses, tuns, shelving, hoops, &c. The answer was, that when salted in that manner, the cheese takes in of the salt just what is necessary to preserve it, and no more. But when the salt is mixed with the curd, as in Scotland, the cheese is sometimes too salt, and sometimes the reverse. These reasons may be good, though I could not see how the cheese might not be too little or too much salted the one way as readily as the other; and to this day I cannot perceive any advantage whatever by the great labour and expense of the one method, more than by the simple and momentary operation of the other. If the quantum of salt used were regulated in Cheshire, I would consider that as an improvement, but it seems to be entirely left to the aptitude of the cheese to take in the salt. All the improvement I can yet perceive possible to be made on the Scots mode of salting cheese, is, to regulate the quantity of salt to that of curd salted, and to apply it by weight, and not by mere guess, as at present. By the English mode of rubbing salt on the surface of the cheeses after they are taken from the press, they are kept several days in a soft damp state, which is apt to put them out of shape, if they are not very hard; and which renders hoops and belts necessary to keep them together.

Cheeses made in Scotland are never washed or greased with butter, as is done in Cheshire. The Scots cheeses contain the grease internally, and not on the outside.

In the English dairies, a vast deal more labour is bestowed upon the curd after the greatest part of the whey has been drawn off, and before it is so dry as to be formed into a cheese, and put to press. This Mr. Holland describes under the title of "thrusting or hand pressing the cheese in the vat." Three women perform part of that labour, by jointly pressing the cheese with their hands, "gently, but forcibly," and shifting their hands
to where the curd is highest. Next, a board is laid over the curd, and about 60 lbs. placed on the board. In some dairies a lever, and in others screws are used, to thrust the curd; and while under these operations, the women are employed in putting into the curd and drawing out skewers, and thrusting and keeping in such parts of the curd as the pressure forces out. When the whey is sufficiently discharged, one of the women takes up the corners of the cloth, while the other two break the upper half of the curd; after which the operations of pressure, or thrusting and skewering, are resumed. The curd is next inverted, or turned upside down, rinsed in warm whey, and a clean cloth applied, the curd again broken as before; and these operations of thrusting or pressure, skewering, &c. are repeated, and continued from two to four hours.

This tedious and laborious operation, in which three women are employed during from two to four hours, and all the preparations of skewers, levers, screws, &c. is managed in Scotland in about one fourth of the time, and with not more than fifteen minutes labour of one person, in cutting and turning up the curd, and replacing the weight every fifteen minutes or so, and without either lever, hand-screw, or skewers.

Mr. Holland (p. 278) mentions, that when no more whey can be extracted, by the thrusting and skewering processes, the curd is turned into the vat, and rinsed in warm whey, gets a finer cloth, a tin hoop or binder of strong coarse cloth round it, raised higher than the edge of the vat, and is put under a press of 14 or 15 cwt. He continues—"As soon as the cheese is put into the press, it is immediately well skewered. The skewers are of strong iron wire, 18 or 20 inches long, sharp at the point, with a bow at the end, and the vat and tin binders have holes within one inch of each other, to receive the skew-
ers; and the two sides of the cheese are skewered alternately, and the operation of turning and skewering the cheese under the press is continued till six o'clock next morning. And at the different turnings in the press, some dairy-women prick the upper surface of the cheese all over, an inch or two deep, to prevent its blistering.

This labour is greatly curtailed in Scotland, where neither wooden hoops, tin binders, nor swaddling belts, are so much as known; and where I believe a skewer was never put into a cheese. In the Scots dairies, the cheese remains in the press about an hour or two the first time, and is turned over, and a dry cloth applied, twice or thrice every day for two or three days, till it is ready to be laid up to dry. Sometimes it is laid up to dry for an hour or so between the turnings in the press, and sometimes not.

When the cheeses in Scotland are ultimately taken from the press, and which is generally after two or three days from the time they were first placed under it, they are exposed for a week or so to the drought and heat of the farmer's kitchen; not to excite sweating, but merely to dry them a little before they are placed in the store, where a smaller portion of heat or drought is admitted. While they remain in the kitchen, they are turned over three or four times every day; and whenever they begin to harden a little on the outside, they are laid up on the shelves of the store, where they are turned over once every day or two days for a week or so, till they are dry; and twice every week afterwards.

The Store-houses for cheese in Scotland are in proportion to the size of the dairy, generally a small place adjoining the milk-house, or in the end of the barn or other buildings, where racks are placed, with as many shelves
as hold the cheeses made for the season. Where no particular place is prepared, the racks are placed in the barn, which is generally empty during summer. Or some lay the cheeses on the floor of a garret over some part of their dwelling-house.

Wherever the cheeses are stored, they are not sweated or put into a warm place, but kept cool, in a place in a medium state between damp and dry, without the sun being allowed to shine on them, or yet a great current of air admitted. Too much air, or the rays of the sun, would dry the cheeses too fast, diminish their weight, and make them crack; and heat would make them sweat or perspire, which extracts the fat, and tends to induce hoving. But when they are kept in a temperature nearly similar to that of a barn, the doors of which are not much open, and but a moderate current of air admitted, the cheeses are kept in proper shape, neither so dry as to rend their skin, nor so damp as to render them mouldy on the outside, and no partial fermentation is excited, but the cheese preserved sound and good.

Mr. Holland wishes the cheese-room or store to be over the byre, for the advantage of the heat. But in Scotland, heat is carefully excluded from the store; and if heat were necessary, I should like to have it purer than what is thrown off from the lungs of cows by respiration. He thinks the process of sweating, which he admits to be a fermentation, is necessary to prevent hoving; and on that account he wishes every dairy to have a regular sweating-room. I do not know what effect the sweating or fermentation may have in bringing on the degree of putridity which renders cheese agreeable to some palates, but I am far mistaken if it can have the effect of preventing hoving. On the contrary, I am confident that when cheeses in Scotland are exposed to
much heat, they more readily hove than when they are kept cool and dry. The sweating must extract and exhaust a portion of the fat of the cheese. But without arguing further on the advantages of sweating in England, no such thing is known in the Scots dairies. And in so far as I understand dairy husbandry, I would not recommend the use of it any where.

Cracks in cheese, Mr. Holland and other English authors think, proceed from the use of lime as a manure. Lime, unless when it comes into contact with the cheese, has no such effect, however, in Scotland. There has been more lime applied to the soil in the county of Ayr within the last fifty years, than to as much land in any other part of Scotland, and I believe far more than in any part of England; and you will not generally find a cheese in a hundred, in any well managed dairy in that county, that is cracked in the skin; and when that happens, it proceeds either from the milk having soured, or the cheese being exposed, before it was dry, to too much drought. I have heard of many effects imputed to lime, but that of cracking cheese is one that would not have been soon discovered in Scotland. If unslaked lime, or lime in its most caustic state, were to be applied to cheese, it might crack its skin; but lime applied to the land can have no such effect.

Blistering of cheese is nearly unknown in Scotland. I do not remember ever to have seen a cheese blistered.

Whey-springs, or running out at the sides, is not often met with among the Scots cheeses, though the immense labour in thrusting and skewering, bestowed on the English cheeses, is altogether neglected in Scotland.

Hoving is occasionally, though not much, known in
the Scots cheeses, and when it is met with, it is not well ascertained from what it proceeds. Probably it is the effects of electricity while the cheese is making, the infusion of impure air into the milk or curd or rennet, or of the cheese being too much heated before it is completely dry. I do not imagine, however, that feeding the cows on clover has that effect, as Mr. Holland supposes. Clover will heave so much in the cow's belly as to kill such as are not accustomed to feed on it. But if it caused the cheeses to hove, few cheeses in the Ayrshire dairies would be free of hoving; as the cows in Scotland are much fed on clover when it can be obtained. Neither can I agree with Mr. Holland that any variety in the herbage can have that effect. If diversity of herbage caused hoving, the whole Scots cheeses would heave; for the cows are fed on almost all the variety of plants that grow on pasture land in Britain. He says, "Perhaps cheese would be less subject to heave, if it were made of all cold or of all warm milk." Now, it is of a mixture of cold and warm milk that almost all the cheeses in Scotland are made, and heaving is little known in the Scots dairies. I would rather be inclined to suspect that the skewering of the cheese so much may let in some fermenting or flatulent air into the English cheese, and occasion the heaving.

Pungency, or rankness of taste, may proceed from putrid ill preserved rennet, or any fermenting, acrid, or putrid matter getting into the milk; or even from putrid air coming into contact with either the milk or curd; or it may proceed from any of the dishes being nasty, or from the whey not being duly extracted in proper time.

Mr. Holland says (page 281), "That the cheese is, during the first seven days, every day well rubbed all
over, and generally immersed with sweet whey butter; afterwards a circular space of four inches diameter is left unrubbed in the centre of each side of the cheese." And he adds, "The cheese is afterwards rubbed three times a-week in summer, and twice in winter." All this rubbing is unknown and altogether unnecessary in the Scots dairies. If it were necessary, it would be difficult for a Scotsman to discover the propriety of not rubbing certain parts, four inches diameter on both sides of the cheese. If Dr. Johnson had found such a practice in Scotland, he would have condemned it as a charm or freak. Mr. Arthur Young might probably have been able to shew, as clearly as he has done some other things, that are laughed at in Scotland, that this mode of rubbing one part and not another, is a great improvement, and that it is owing to the ignorance of the Caledonians, that they do not comprehend such a nice and salutary practice; though it can only excite laughter in Scotland.

Colouring Cheese with an infusion of annatto is not unknown in Scotland; but the practice is now in a great measure abandoned. It seems to be still much in vogue in Cheshire, where it is stated, that from five to six thousand pounds sterling per annum are expended on annatto, to be infused into the cheese, merely for colouring.

On the comparative taste of the Scots and English cheese it is difficult to offer any opinion. There is not only such a diversity in the taste, not only of cheeses made in different dairies, at the different seasons of the year, stages of the cows' milk, state of the weather, and many slighter accidents; but there is also such a diversity in the taste of the consumers, that it is impossible to speak with any degree of precision as to the standard of per-
fection of the taste of cheese. The taste of mankind as to cheese varies so much, that it is found necessary to bring forward both Scots and English cheeses, of different sorts and ages, some sound and others unsound or putrid, and to ask each lady and gentleman at table, which they prefer. Do you eat Scots or English?—coloured or white?—old or new?—sound or unsound? &c. The taste of some is so vitiated, as to like best the putrid parts, which abound with animalculi, and touch the olfactory nerves before they reach the mouth. Others prefer that which is sound.

The Scots cheese is generally less smart, acrid, and pungent in the taste than the English cheese. It is not so high flavoured, owing probably to the inferiority of the pasture and climate, or partly to the mode of manufacturing it. It is milder in the taste, and generally fatter than the English cheese. A small morsel of English cheese, after a good dinner, may be better felt in the mouth than the milder and softer cheese of Scotland; but if any considerable quantity is to be eaten, the latter will not be felt so hot and heavy in the stomach as the same quantity of English cheese.

Sect. V.—Of Skim-Milk Cheese.

As the making of skim-milk cheese has been practised in all parts of Britain ever since the Romans taught our ancestors to make cheese, it will not be necessary to enlarge here upon that species of dairy produce.

When milk is to be formed into skim-milk cheese, it is placed about three or four inches deep in coolers, and allowed to stand till it cast up the cream, not less than twenty-four, nor more than forty-eight hours. The ad-
vantage of a small quantity of cold clean water being put into every one of the coolers, to make the milk cast up the cream—of preserving the froth on the milk—and of the milk-house being clean, dry, well aired, and kept at the temperature of from fifty to fifty-five degrees,—have already been pointed out.

When the cheese is to be made, the cream is separated from the milk, and churned as soon as a sufficient quantity is collected. The milk is heated to about animal heat, passed through a sieve into the curd vat, rennet applied, the whey drawn off, and the curd formed into cheese; all nearly in the manner that has been described.

All these operations, however, are more easily performed on the curd of skim-milk than on the full-milk. The skim-milk more readily coagulates, the whey is much easier separated, and the cheese needs less of the press than full-milk cheese.

The principal thing in the skim-milk cheese operations, is to keep all the vessels and utensils clean and well seasoned. Cleanliness is the life and soul of dairy husbandry, and the least deviation from it is injurious. But where the milk has to stand so long in the coolers to cast up the cream, the most rigid attention to cleanliness is still more necessary.

It is only of late years that due attention began to be paid in Scotland to that virtue, and the necessity of attending to it in what regards the dairy has had powerful effects in banishing dirty habits from among that class of the inhabitants. Till of late, the operations of the dairy were carried on in the sooty and dirty hovels which were then inhabited by the tenants,—and the house-wife, while she was sinking her arms to the el-
bows in the milk or curd, was alternately cooking for the family, performing the duties of the nursery, and aiding in the removal of the dung from the byre. But a separate dairy-house is now common in the generality of farms, and the person who sets the curd, &c. does nothing else till the cheese is put under pressure. Having seen the necessity of cleanliness in the dairy, they have begun to it in cookery, and will, I trust, continue to extend it still farther, in their houses, furniture, beds, and clothes; in all which there is still room for considerable improvement in point of cleanliness.

When once milk has soured in any wooden dish, that dish ought to be washed with water, into which some potash or lime has been thrown, and filled with water for a day or so; the water being changed every hour; after which it ought to be repeatedly scalded, and well dried at the fire, before the milk be again put into it.

Sect. VI.—Of Whey.

The whey or serum is partly used as drink, or made into porridge with oatmeal; which forms a wholesome, palatable, and nutritious food; and it is given as drink, or rather as food, to cows, horses, and swine. Much fine pork is now raised, chiefly from whey. That from the milk of three, or at most four cows, will, with a very small supply of other food, raise a pig of ten shillings value, from the month of April till December, to the weight of twelve or fifteen, and sometimes to that of twenty or twenty-five stones English.

Some have extracted butter from whey; but there must first be a gross mismanagement in making the cheese, before any butter worth collecting can be ob-
tained from the whey. If the curd is set, and the whey taken off at the proper temperature, the butter that can be extracted from the whey will not indemnify the labour in collecting it. But if the milk is too hot when it is coagulated, or the curd too roughly handled, such a portion of the butteraceous matter will go off with the whey or serum as it may be proper to collect. This is considered in Scotland as bad economy, as well as doing great injustice to the cheese. Whatever butter is found in the whey is robbed from the cheese, by some species of mismanagement in the operation. Dunlop, or sweet-milk cheese, is understood to contain the whole of the butteraceous substance originally in the milk of which it is made. It has been alleged, and probably not without cause, that in some dairies a part of the cream is abstracted, to be made into butter for family use or for sale, which is a fraud wherever it is practised. If another part of the butteraceous matter is dissipated, from mismanagement in the operation, the injury to the cheese must be still greater. The one privation is a direct fraud, and the other a gross misconduct.

When I complained to the English dairy farmers, of the injury they did to their cheese by extracting so much of the butteraceous matter with the whey, and thereby impoverishing the cheese; they told me, that with the supposed privations of which I complained, the English cheese was as fat, and still more relished, even in Scotland, than the native made cheese. I am not disposed to admit that the English cheese is generally fatter than that made in Scotland; but if it were so, it must proceed from the superior quality of the milk in England. Surely drawing off much of the oily matter from the curd, along with the whey, cannot add to the fatness of the cheese; but the reverse. And however much the English dairy farmers may boast of the quan-
tum or excellence of the butter they extract from whey, it is but a clumsy way of making butter, and whatever is so made must be robbed from the cheese.

I am rather inclined to be of opinion, however, that the cows in Cheshire yield richer milk than the generality of those in the Scots dairy district; and that if the cheese were made in both countries with an equal degree of economy, that of the south would be richest. The generality of English cows give less milk per day than is yielded by the Scots dairy cows; and of course the former would make fatter cheese than the latter. This is so far the case everywhere. The Highland and Galloway cows, for instance, give far less milk than those of the Ayrshire breed; but I believe any given quantity of the milk of the former will yield more butter than that of the latter. Besides, both the quantity and quality of milk is governed in part by that of the individual animals, as well as by their pasture and mode of feeding. Some breeds, and some individual cows of every breed, it has been shewn, give more milk than others; and the quality of milk is in all cases affected by the mode of feeding. The dry rich pastures of Cheshire will surely yield more butter than the cold clays, mosses, and benty land in this northern country.

It is well known to every intelligent farmer, that cattle fed on dry wild ground, that has never been broken up, will yield richer butter than when fed on clover, turnip, or artificial grasses. Cows, when fed on hay, with a portion of corn, beans, or other substantial food, will give richer milk than when fed on draff, turnips, clover, cabbages, and other flummeries. But whatever may be the quality of the milk, there can be no propriety in extracting its butter among the whey.
CHAPTER IV.

MISCELLANEOUS SUBJECTS CONNECTED WITH DAIRY HUSBANDRY.

Sect. I.—Of Rennet.

It has been mentioned that milk, as it comes from the cow, consists of three parts, viz. the butteraceous or oily parts, the caseous or cheesy parts, and the serum. The first of these is separated from the two last by the process of churning, which has been already noticed, and will be again referred to in this chapter; and the serum is removed from the caseous parts by coagulation, either naturally or artificially brought on.

When milk is exposed to atmospheric air for two days or so, it acidifies, and soon after coagulates; and when that coagulum (or lapper, as it is termed in the dairy districts of Scotland) is broken, the serum, or whey, separates from the caseous parts, which, when entirely relieved from the serum, may be formed, by pressure, into cheese. It is probable that in the rudest stages of society, milk was turned into curd, and the curd into cheese, by merely allowing the milk to coagulate by acidifying. But as cheese made from soured milk is always hard, acrid in the taste, brittle, and ill-flavoured, means have been devised of forming it artificially into curd while sweet. When, or by whom, the coagulating ingredients were first discovered, cannot now be traced; but it has been ascertained that various
substances may be used to advantage in forming milk into curd, so as the whey and caseous matter may be separated.

Milk may be coagulated by the application of acids, neutral salts containing acid, alcohol, sugar, the juices of various vegetables, &c. But the most proper and powerful coagulum yet known is the gastric juice of animals, particularly that found in the stomachs of calves, hares, poultry, &c.; but that from the maw or stomach of calves is most commonly used in forming the coagulating substance usually termed rennet or runnet. And as it can be obtained to all the extent that is necessary, and as it does not, like acid, sour the milk, or give it any bad taste or flavour, as is done by alcohol or herbs, it is needless to enquire after any other coagulating matter.

Rennet is prepared for use in various ways, by different people. Mr. Marshall, the great English agricultural writer, directs that the maw or stomach, when taken from the body of the calf, should be well cleaned of milk, curd, chyle, &c. and then the clean bag should be salted, and put into an earthen jar for three or four days, till it form with the salt a juice called pickle. When that is formed, he says, the bag should be taken from the jar, and hung up for two or three days, to let the pickle drain off; after which the bag should be again placed in the jar, the mouth of which should be covered with a paper, into which some pin-holes should be pierced to admit air; and the bag remain there till it is to be used, a year or so after that preparation.

When the rennet is wanted, the bag is taken from the jar, and a handful of the leaves of sweet-briar, as much of the leaves of the dog-rose, and a handful of the leaves
of bramble, being all boiled together, for fifteen minutes, in a gallon of water, with three or four handfuls of salt; and the liquid being strained off and allowed to cool, the maw is put into that liquid, with a sound lemon, stuck round with one fourth part of an ounce of cloves, to improve the flavour of the rennet. The longer, he says, the bag remains in the liquid, the stronger and better will the rennet become. A wine half-pint (two gills) of this liquor, will, Mr. Marshall says, coagulate fifty gallons of milk. And in Gloucestershire, one third of an English pint is found to coagulate fifty gallons of milk.

Mr. Marshall says milk is coagulated at from 92 to 103 degrees of heat; and that it requires from one hour to two hours and a half, and sometimes three hours, to form the milk into curd, after the rennet is mixed into the milk. The whey, he says, is from 88 to 97 degrees of temperature when drawn off; but he thinks from 85 to 90 degrees the proper heat for coagulating. Mr. Marshall thinks acid is the coagulating power, though alcohol also forms milk into curd; and vegetable acid, he says, produces more curd than is obtained when the milk is coagulated by mineral acid. This seems to me rather mysterious.*

Mr. Marshall says, if the milk, food, chyle, &c. were not removed from the maw of the calf, they would communicate a harsh taste to the cheese. He recommends

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* Scheele thinks the coagulum of milk, white of eggs, and lymph or serum of the blood, are produced from the combination of caloric with these substances. However this may be, alkalies, when in their caustic state, and aided by heat, dissolve cheese; and ammonia does so more readily than potash or soda. A very few drops of pure ammonia put into curdled milk dissolves the coagulum. The fixed alkalies also dissolve and decompose curd, and form it into a black fat substance resembling oil.
to put a part of the bag into the milk, to accelerate the coagulum, and wonders how cream and milk can be churned together.

These accounts given by Mr. Marshall correspond with what was shewn and described to me when I inspected the dairies in Cheshire, Lancashire, &c.; and I believe they may be held to be the general practice in preparing and using rennet in England. Rennet is prepared very differently, and in my opinion to much better purpose, in Scotland. So far from throwing aside the curdled milk found in the stomach of the calves when killed, or washing away the chyle, both are in Scotland carefully preserved; and are found to tend much to strengthen and enrich the rennet. The curdled milk and chyle in the stomach of the calf form more powerful rennet than can be drawn from the bag alone when these substances are removed. It is the chyle formed from the gastric juice, mixed with the food in the stomach of the animal, that forms the coagulating power; and it is only from that chyle, so formed in the stomach, that the bag comes to be impregnated with coagulating matter, more than any of the other intestines of the animal. Of course, when that milk is put aside, and the chyle washed from the bag, the one half, and more, of the coagulating matter is lost by that unskilful treatment.

In Scotland, the curdled milk found in the stomach, and the chyle adhering to it, are not only preserved and formed with the bag into rennet, but pains are taken to increase as much as possible that curdled milk in the maw of the calves when they are to be killed, by giving them, where it can be done, as much milk as they can be made to swallow, about two or three hours before they are killed, so that the stomach may be as full as
possible of curdled milk, to augment the coagulating quality of the rennet made from that bag; the quantity of gastric juice thrown into the stomach being generally in proportion to the amount of food taken.

When the stomach or bag (usually termed the yirning in dairy language) is taken from the calf's body, its contents are examined; and if any straw or other food be found among the curdled milk, such impurity is carefully removed; but all the curdled milk found in the bag is as carefully preserved, and no part of the chyle is washed out, or suffered to be lost. A considerable quantity of salt (at least two handfuls) is put into the bag, and upon its outside, after which it is rolled up in salt, and hung near a fire to dry like bacon. It is always allowed to hang till it is well dried, and is understood to be improved by hanging a year or longer before being infused.

When rennet is wanted, a yirning, with its contents, is cut small, and put into a jar or can with a handful or two of salt; and a quantity of soft water that has been boiled, and cooled to about 65 degrees, or of new whey taken off the curd, is put upon the bag in the jar. The quantity of water or whey to infuse the bag is more or less according to the quality of the yirning. If it is that of a new-dropped calf, that has not been fed, a Scots choppin, or at most three English pints, will be enough. But if the calf has been fed for four or five weeks, a Scots pint or more of water may be put on the bag in mash. The yirning of a calf four weeks old yields more rennet than that of one twice that age. After the infusion has remained in the jar from one to three days, the liquid is drawn off, and a small quantity (say an English pint) more of water or whey put on the bag in the jar; and that, after standing in mash one or two
days, is also drawn off, and, with that of the first infusion, strained, if any impurities appear in the liquor; and the whole put up in bottles for use as rennet,—the bag thrown to the dunghill, and no part of it is ever put into the milk. Some put a dram-glassfull of good whisky into each choppin bottle of the rennet. When prepared in that way, the rennet may either be used immediately, or kept for as many months as may be convenient.

If the rennet is made from the maw of a well-fed calf of about five weeks old, and managed and preserved as has been mentioned, one table-spoonfull of it will coagulate in a few minutes 60 Scots pints of milk, which will yield more than 24 lbs. avoirdupois of cheese. I have known 30 stones of cheese coagulated by the rennet made from one good yirning, including the curdled milk and chyle found in the bag when taken from the calf.

But the great superiority of the Scots above the English rennet is, that the former will coagulate milk in from five to ten minntes, whereas the English rennet requires from one to sometimes three hours to form the milk into curd. No person in Scotland would use rennet twice that did not coagulate the milk into which it was put in from ten to fifteen minutes.

That defect in the English rennet is owing chiefly to the removal of the curdled milk, and washing away the chyle from the maw of the calves; and in part to the practice of hanging up the bag for two or three days after it has lain in steep in the jar, in order, as Mr. Marshall says, to let the pickle formed by the infusion drain off. Now as that pickle is nothing else but the best of the rennet, it ought not to be drained off, but to be carefully preserved. In the Scots dairies, if drops begin to fall from the yirnings, when hung up to dry,
even before being laid in steep, pains are taken to place a bowl to catch the drops that fall, which is nothing but rennet. And when the bag has lain sometime in steep, and a pickle formed before it is hung up, a considerable portion of the coagulating matter must be drawn from the bag by the partial infusion, and lost.

Such are the different modes of preparing rennet on the opposite sides of the Tweed; and the superiority of the Scottish mode over that of the English is proved by the much greater quantity of rennet obtained from the bag and its contents, and by that rennet coagulating milk in from five to ten minutes; while that prepared in England does not form the curd till from one to three hours, even when aided by several smart strokes on the side of the vat, or by taking up part of the milk in ladles and letting it fall from the height of two feet or so into the tub, in order, as they say, to expedite coagulation, but which a Scots dairy-maid would consider as calculated to retard the coagulation.

Mr. Marshall thinks, that when the curdled milk, found in the stomach of the calves when killed, is used in making rennet, it communicates a harsh taste to the cheese; but the reverse is proved by the soft taste of the Scots cheese. Where that curdled milk and chyle are used in forming rennet, the cheese is always far milder in taste and flavour than the English cheese, where these ingredients are excluded from the rennet. The Cheshire cheese is much harsher in taste and flavour than the Scots cheese.

**Sect. II.—Of the Quality of Cheese.**

Such is the diversity of the taste, flavour, and consistency of the cheese made in Scotland, that even when
it is the production of the same dairy and the milk of the same cows, these cows fed in the same way, and their milk formed into cheese by the same persons, in the same place, and nearly in one uniform manner; yet almost every cheese will differ from another in taste, flavour, or consistency. One is hard and another soft; one tough and another brittle. Some are mild, and others have an acrid taste; one sweet and another pungent. Many of them have scarcely any perceptible flavour; while others touch the olfactory nerves before they reach the mouth. That diversity is so great, that if it were not met with a corresponding diversity in the taste of the consumers, only a small portion of the cheese made in Scotland would be relished. But fortunately some people prefer cheese that is mild, and others that which is more acrid. Some like that which is soft, and others that which is harder and more solid. Many prefer that which is sound, and of a uniform taste and consistency; while others like that on which putrefaction has made the greatest progress, and animalculi begun to nestle. So that the variety of quality in cheese is met by a corresponding diversity in the taste of those by whom it is consumed.

But what is most to be regretted on that subject is, that almost all the diversity of the taste and flavour of the Scots cheese proceeds from accident, and for which it is not easy to assign satisfactory reasons. And until the causes of that diversity of quality in cheese be better known, it will not be easy to apply any proper remedy. In so far as these diversities can be traced, they fall to be noticed.

The solidity and adhesion of cheese, proceed either from the milk or curd having become sour before the cheese was put under pressure; or from the improper
temperature at which the milk has been kept, the curd set, and the cheese formed. When the cheese is made from milk that has been kept in a temperature below 50 degrees—when it is coagulated much below animal heat—or even if it cool too much and be neglected after the curd is set, and before the cheese is ready for the press,—the cheese will infallibly be too soft, and of an insipid taste. And if the curd is formed at much above animal heat, or if it is much handled or heated in taking off the whey, the cheese will certainly be hard and adhesive. The adhesiveness and solidity of the cheese depend chiefly upon the temperature at which the milk is kept while in the coolers, and that at which the curd is set. That quality may therefore be in a great measure regulated at pleasure.

But the diversity of taste and flavour in cheese is more difficult to regulate, or even to be accounted for. They are no doubt so far influenced by the food on which the cows are kept, and the state of the weather after the milk is taken from the cow and before it is formed into cheese; but the diversity in these qualities also proceeds in part from the manner in which the milk is treated, and from the quality of the air to which it is exposed, either in the milk-house or while forming into cheese in the dairy-house.

The manner in which cows are fed cannot fail to influence the taste of their milk, and of course that of the cheese and butter into which that milk is formed. When cows are fed on turnip, for instance, their milk, and every thing made from it, tastes strongly of that root;*

* The taste of turnip is removed from milk by mixing into it a small quantity of nitre; and, in some parts of England, nitre is put into milk to make it more easy to churn.
and it cannot be doubted that various other herbs and roots will, when eaten by cows, so far influence the taste and flavour of milk, and of course the cheese into which it is made. Cows, when pastured on brae or steep ground, and dry land that yields wild herbs, give butter of a richer quality and better colour than when the same cows are fed on pasture abounding with artificial grasses. By a due attention to the feeding of cows, the taste and flavour of their produce might be in part regulated.

The weather has also a powerful effect on the milk of cows, both by altering the quality of the herbage and by its influence on the cows. Heat and cold affect milk, and electricity still more; the least blink of that fluid will render nearly useless all the milk it reaches.

But the great diversity in the taste and flavour of cheese made in Scotland proceeds more from the milk being exposed to impure air than from all other causes. The English dairy-houses and apparatus are better constructed than those in Scotland, and the making of cheese is carried on more methodically in England than it is on the north side of the Tweed. Many of the dairies in Scotland are too small to afford proper houses and accommodation to that department: the milk is kept in the barn, the curd is set and the cheese formed in the kitchen of the farm-house. The dairy-maid, while setting the curd and forming the cheese, is often obliged to perform other labour, as cooking for the family, attending to children, &c.; while in the English dairies a proper number of persons are uniformly and exclusively employed in the dairy; and no other operation carried on, or substance introduced, to influence the atmosphere of the place or the quality of the cheese. All things there are the same yesterday, to-day, and continually.
But when milk is exposed to every variation of heat or cold, and to many changes and impurities of air, and when the curd is set in a farmer's kitchen, where other work is going on at the time, and wrought up by a person who is alternately performing other labour—where the greatest diversity of air prevails, and of course contaminates the milk—where the dishes and apparatus are occasionally used for other purposes,—it is not possible that anything like such uniformity of taste or flavour can be maintained in the cheese as we meet with in that made in England, where every thing is far more regularly and uniformly conducted. Hence it is that such diversity of taste and flavour prevails in much of the cheese made in Scotland; and as it proceeds from the accidental circumstances that have been mentioned, and others of a similar nature, the quality of any particular cheese is not perceptible, even to those by whom it was made, till it comes to be cut up, when too late to ascertain from what the peculiarity of the taste or flavour of that individual cheese has proceeded.

To make cheese sound, and keep it free from bad taste or flavour, no impurity must ever be allowed to remain near the milk, or any bad air to reach it at any time after it is drawn from the cow, till the cheese is completed. The milk must be kept and the curd formed in due temperature; and the making up the curd into cheese must neither be too much hurried, nor yet delayed beyond the proper period. If any particular taste or flavour were wanted to be given to the cheese, the proper ingredients to give that quality should be selected, and applied methodically, and never left to blind chance. For the making of good cheese and butter is much more the work of art in their formation, than of any thing about the milk, soil, cattle, or situation.
We know that cheese cracks when it is too soon or too much exposed to drought; and it is equally clear that it becomes rank and pungent by the application of bad rennet or other impurity, as well as when the milk is exposed to any stenching effluvia, or when the cheese is not properly salted. And when once rankness of taste and flavour is communicated to milk or to cheese, they soon lead to partial putridity; and from the evolution of an empyreumatic oil, the cheese becomes more acrid and more stimulant, till colonies of insects come to settle in its fissures and crevices. Some people prefer these unsound parts of cheese, which abound most with animalculi, rottenness, and stench; but to many it must appear to be a perversion of taste to eat or relish such cheese.

Good sound cheese is of a close even texture and firm consistency—unctuous to the touch, and of a mild taste and flavour when new; it improves in richness of taste and mellowness, and acquires a more agreeable fragrance as it grows older. But harshness of taste, austerity of flavour, looseness of texture, dryness, partial discolouring, rottenness, pungency or rancidity, are all bad qualities in cheese. To avoid these, and to give the cheese the good qualities that have been mentioned, ought to be the anxious care of the dairy farmer.

Sect. III.—Of various Sorts of Cheese.

Dunlop Cheese, which may more properly be termed Scots cheese, is not so uniform in taste and flavour as some of the English and foreign-made cheese; but it is generally as fat as either the Gloucester or Cheshire-made cheese. Part of it is too soft, and of course rather insipid in taste; but much of it is as solid, firm, and sound
SECT. III. VARIOUS SORTS OF CHEESE.

as any cheese ought to be. It is close in its texture like soap, mild in taste, and neither hoved nor open in its pores; without fissures or cracks; and no cheese made of complete milk, as it is given by the cow, is fatter than the Dunlop cheese. It is eaten when from one to ten months old, and not one twentieth part of it is kept beyond one year after it is made. When it is allowed to acquire greater age, it becomes stronger in the taste, though still mild, and acquires a fine rich flavour. The best made Dunlop cheese resembles the Gloucester more than it does the Cheshire cheese.

Cheshire cheese is of a dry loose texture, with many small open pores; has an austere flavour, and a rough sharp taste; but is remarkably uniform, and generally free from cracks or fissures, or putrid parts. But it is not so fat as either the Gloucester or the Dunlop cheese. The uniformity of the Cheshire cheese proceeds from its being always attentively made, by the same persons, in well-constructed dairies, and always in one uniform way. The harshness of taste and strong flavour proceed from setting the curd too warm—employing three people to break, or rather churn the curd, for about forty minutes before any of the whey is drawn off—thrusting or bruising the dried curd, by three or four people, for two or three hours before it is put into the press—and skewering the cheese for some hours after it is under pressure. These operations introduce too much atmospheric air, with the impurities it may happen to contain, into the cheese. The poverty of the Cheshire cheese must proceed from treatment. The cows in Cheshire give far less milk, but of a richer quality, than what is yielded by the Scots dairy-breed; and if the cheese was made with equal care, the Cheshire cheese would be fatter than that made in Scotland, where the pasture is worse, and the cows give more milk, but not
so rich. But owing to the Cheshire milk being coagulated too hot, and the violent breaking and thrusting of the curd, a large portion of the butteraceous matter comes off with the whey, which impoverishes the cheese. They procure some butter from the whey, which could not be obtained from Scots whey.

**Gloucester cheese** is close in the texture like wax, and far milder and richer in taste than the Cheshire cheese. This must proceed from the milk being coagulated at a more proper temperature, and less injured in the curd. But as I have not been able to see the Gloucestershire dairies, I shall not enter further into the description of their modes of making cheese.

**Stilton cheese** is made from the cream of two meals of milk, with the skim-milk of one of these meals removed; and of course, it contains a double portion of fat to that of other cheese. The curd of this cheese is not much broken, but the whey is removed gently. Some of these cheeses are formed in a net, and they are generally kept till two or three years old. They are rich and mild in taste.

**Parmesan cheese** is made of one meal of milk that has stood 16 hours, and another meal that has stood about eight hours. The cream is taken from both, and the milk is heated over a slow fire for an hour, and often stirred, till it come to 82 degrees of heat, when the rennet is applied, and the curd is generally formed in about an hour after. The curd is much broken, and after being allowed to subside, part of the whey is removed, and the curd, with the rest of the whey, are heated to near boiling, and some saffron added to colour the cheese. In about half an hour it is taken off the fire, three fourths of the whey is removed, and as much cold water put in as
enables the cheese-maker to handle the curd. A cloth is next put round the curd, and after being dried a little, it is put into a hoop, and laid on a shelf for two days. It is next sprinkled with salt for 30 days in summer, and 40 days in winter. After being salted in that way, one cheese is laid above another, to make them take in and keep the salt. The cheeses are scraped and cleaned every day, and rubbed with lintseed oil, to prevent injury from insects; and they are sold when six months old.

Such is in substance the account given of the mode of making Parmesan cheese, which does not exactly tally with our modes of making cheese in Scotland. The breaking the curd so much, and then heating, or rather boiling it for half an hour, do not appear to be proper measures. The breaking must expel some of the oily matter that should be preserved in the cheese; and the boiling process must harden the cheese too much. Accordingly, the Parmesan cheese is so hard that it cannot be cut without a saw; yet it is retailed in Edinburgh at half-a-crown per English pound. They are the fattest, most pungent, and acrid-flavoured cheeses to be found in Britain. The fat they contain has more the appearance of oil, or of hog's-lard, than that of rich milk; and many are of opinion that the greatest part of the fat in that species of cheese is the one or other of these substances. Their strong flavour, harsh taste, and high price, render these cheeses acceptable to some. They are generally of a great size, from 80 to 120 pounds in weight.

Dutch cheese is hard, poor, and cheap, beyond all others, and is only eaten by the lower orders.

Several of the modes of operation that have been mentioned,—as giving the curd-vat so many strokes on the side, in order to accelerate the coagulation of the milk,—lifting part of the milk in ladles, and pouring it again into the vat, to promote the formation of the curd after the rennet has been mixed into the milk,—employing three people, for the space of forty minutes, to break and churn the soft curd,—three or four persons, for some hours, to thrust or break the curd after the whey has been taken off,—one or two to skewer the cheese for several hours after it is in the press, as have been mentioned,—will all appear to those who are conversant with Scots dairy husbandry to be singular, and most of them improper practices or conceits. The whole process of making Parmesan cheese, as above described, must appear singular. Some of the admixtures put into the curd or rennet seem to be injurious. In some dairies the leaves of sage, marigold, parsley, &c. are infused into the cheese to give it a green colour. In other dairies, part of the gurth (curd that is ready to be formed into cheese) is kept in a sieve, exposed to the air that it may become oxygenated, and render the cheese, into which it is mixed with gurth that is newly formed, of a diversified colour, and bring on putridity. And others mix a few beaten potatoes with the gurth, to accomplish the same purpose of bringing on putridity.

In the county of Ross, the cheeses are buried separately, within the sea-mark, for several days, to give them a blue colour and a rich taste. And in France, fenugreek is mixed into the cheese, which gives it the smell of a pig-stye.
Sect. V.—Of the Quality of Butter.

Butter, or the fat of milk, is separated from the caseous part and serum, by the process of churning or agitation. This may be done by churning either the whole mass, or by separating the cream, and churning it alone. Experience has shown that butter of excellent quality may, when the operation is rightly conducted, be obtained by either of these modes of proceeding. The process of making butter from entire milk has been detailed in the section on butter and butter-milk. Making butter from cream only, falls now to be noticed.

When butter is to be extracted from cream, the milk is placed from three to five inches deep in coolers, where it remains from 24 to 36 hours, till the cream has become afloat on the surface of the milk. The cream is next separated, and churned, whenever as much is collected as can be conveniently churned together.

When taken off the milk, the cream is stored in jars, or wooden vats, till churned. In some dairies the cream is stirred every day with a wooden spurtle; if the cream is churned in three days or so after being separated from the milk, the stirring may be dispensed with; but if kept longer, the stirring is necessary to prevent the cream from going into curds and whey, and too much fermentation. If every different meal of cream were to be put into a dish by itself, and allowed to acidify or lapper undisturbed, it might remain a week in that state without being injured. But if several meals of cream are put into the same jar or dish, and sweet cream mixed with that which has become sour, that cream does not acidify naturally, but is forced into it by the admixture of sour cream; in that case the stirring is
proper to prevent fermentation. It would be better if every meal of cream were to be allowed to sour of its own accord; for when sour and sweet are put together they instantly ferment, a bad state is acquired, and putridity soon follows.

The operation of churning, the temperature at which milk or cream should be churned, washing of the butter, &c. having all been mentioned, need not be repeated. But too much cannot be said to enforce the necessity of cleanliness in this and every operation of the dairy. The least impurity getting into the milk, or it or the cream being exposed to putrid air, injures the butter or cheese made from such milk or cream.

The quality of butter is affected by the mode in which the cows from whose milk it is made are fed—the state of the weather, and management in the dairy.

When cows are fed on grass in the summer quarter, the butter they yield is stronger and better flavoured than that obtained at any other season of the year. At all seasons, the milk is richer when the cows are fed on hay, potatoes, or grain, than when nothing but straw, cabbages, draft, and turnips are given them. The milk of some cows yields, under every diversity of food, more and richer butter than that of others. All cows give richer milk in good fair weather, than when their food is blasted, and themselves injured by storms. But above all these considerations, the quality of all butter is most affected by management in the dairy-house.

To procure butter of superior quality, some skim off the cream from the milk twice or three times. When that is done, the butter from the cream that rises first is richer than what is got from that which comes up after
the first skimming. This is seldom done in Scotland, however. Butter from the whole cream is, when properly made, sufficiently strong and agreeable to the palate of a Scotsman.

When I had finished my remarks on this subject, a respectable gentleman in Lanarkshire, who had some years ago resided for a short time in the county of Cumberland, informed me that he considered the butter made in that county, and on the borders of the Esk in Dumfries-shire, to be superior, of a richer taste, and finer flavour than the generality of butter he had ever found any where else. This appeared to me to be a matter of such importance, that I made a trip to these counties in June 1824, and examined for some days the dairies on both sides of the English border.

On the Cheviot hills, in the county of Northumberland, I found that making of butter was not much attended to; and I pursued my course and inquiries towards Carlisle. Mr. Little, a dealer in butter in Langholm, gave me much information, and furnished me with a list of farmers who he thought made the best butter in that part of the country. And Mr. John Yuils, factor to Sir James Graham of Netherby, also furnished me with a list of farmers on Sir James's estate, some of them in the county of Dumfries and others in that of Cumberland, who were esteemed the most correct in making butter. I spent several days among these and other farmers in both kingdoms, chiefly between Langholm and Carlisle, saw their dairies, tasted their butter, and made every possible inquiry into their modes of making it. These I found to be uniformly as follows.

The butter in these districts is made from cream only, and no part of the milk is churned. The milk is,
when drawn from the cow, placed into earthen or wooden coolers, and allowed to stand, not less than 24, nor more than 48 hours, generally about 36 hours, to cast up the cream. The cream, when taken off the milk, is placed in earthen jars, till as much is collected as may be convenient to be churned at one time; generally once in five or six days. The different meals of cream are not kept separate, but thrown into the same vat as taken from the milk, and stirred once a-day with a wooden spurtle. The operation of churning is performed in about the space of one hour, without much regard to temperature. No thermometer is used. The butter is well washed when it is taken from the churn, and left in a lump till next day, when it is broken down and salted, and then placed in a firkin for sale. The salt is given by guess as to quantity.

The cows kept in that district are mostly of the Galloway breed, and generally yield from 8 to 16 quarts of milk per day. About six pints Scots measure is probably a fair average of the returns of these cows. Their return in butter is from two to two and a half firkins, of half a hundred weight per firkin, each cow, during the year.

The butter made in that district is certainly of the best flavour, colour, and taste; and as the cows are well fed, and give their milk rather of a rich quality than in copious measure; and as the dairy-houses, vessels, and whole utensils are well constructed, and kept clean and in good order; and as the milk is not long kept, it may naturally be expected that the butter will be rich and of good flavour and quality. I have never seen milk or dairy-houses better constructed, or kept cleaner, than those I surveyed on the banks of the Esk, in both kingdoms; and every thing about these dairies being kept
as clean as human hands can make them, and the butter made secundum artem, it cannot fail to be of the very best quality. I was so much pleased with the manner in which the dairies in that quarter are conducted, as well as with the general decency and intelligence of the farmers and their wives, that I wish every person who keeps a dairy were to visit them, as I have done, and endeavour to imitate their example. They all agreed in opinion with me, that the cream ought not to be churned till it has become sour of its own accord, and that the sooner it is churned after it has acidified, the better will the butter be. They admit that the butter is injured by the cream being allowed to ferment and throw off the serum before churning; and they stir the cream, when stored in the jars, to prevent fermentation. It would be better, however, in my opinion, to keep the cream of every day's milk in a separate jar, so as it might become sour of its own accord, and lapper or coagulate, as the milk does in the sour-milk dairies that have been described. Where that is done, the cream never ferments, and the butter is of a most agreeable taste. The expense of five or six small jars, each capable of holding one day's cream, would probably be nearly the same that a large one to hold the whole would cost. This is the only improvement I could suggest in the Cumberland and Eskdale mode of making butter. They generally throw cold water, once a-day, on the pavement of their milk-houses, to keep them cool in hot weather. This will have the effect they intend; but I would suspect that the exhalations from the wet floor of the milk-house might injure the taste of the milk.

Sect. VI.—On ascertaining the Quality of Milk.

Mrs. Lovi has published directions how to ascertain
the quality of milk by the use of beads. She places beads, first into the full milk, as taken from the cow, and put into a glass vessel, at the heat of sixty degrees; and by repeating the operation on the skimmed milk, after the cream has cast up and been removed, the difference of the specific gravity of the milk in these different states shows its quality. The full milk containing the cream is lighter than the skimmed milk after the cream is removed; and the difference of the weight of the milk, in these different states, determines its quality. If that difference is small, the milk is but of meagre quality; and the greater the diversity of the weight of the milk at these trials, the richer will it be found. The milk must be at exactly the same temperature at both trials; and one bead after another may be thrown into the milk, till one is found that reaches neither to surface nor bottom, but hangs suspended in the middle of the vessel.

The quality of the milk of a particular cow may be determined by this process, provided that the trial is made on the whole milk she has given at one meal, or on a fair specimen of that meal. For every person who is conversant in the management of cows knows, that the first-drawn milk at every meal is poor, and that which is last in coming is ten times richer than the first. The surest test, however, of the quality of milk, is to form it into cheese and butter by the ordinary processes of the dairy, and ascertaining the quantity of produce from that of the milk manufactured at the time. To render Mrs. Lovi's experiment complete, she ought to ascertain how much cream and how much cheesy substance the skimmed milk contains. The proper value of milk does not depend on the quantity of butter merely which it contains, but also on the proportion of caseous matter. Milk yields the greatest quantity of butter, and least cheese, in the spring and summer months, and far
more cheese, but less butter, in the harvest quarter. The milk is upon the whole far richer in harvest than it is in the early part of the season, and yet it does not then yield so much butter as it does in the months of May or June. So that Mrs. Lovi has only discovered how to measure the quantity of butter in milk, but she has given no directions how to ascertain that of the cheese.


This subject has been treated of in the introductory part of this Treatise, and is only resumed to mention some things that have been there omitted.

It has been ascertained, and stated on the best authority, that the herbage which will add 112 lbs. to the weight of an ox, will enable a dairy-cow to yield 450 gallons, or 900 Scots pints of milk. This simple and well-attested fact speaks volumes in favour of dairy-husbandry. The current price of 112 lbs. English of beef does not exceed £2: 10s. or thereby, while 900 pints of ordinary milk will yield at least 16 stones of cheese of 16 lbs. per stone and 22½ ounces per lb. And that cheese will bring the farmer 10s. per stone, or at least £8 sterling, being fully three times the value of the 112 lbs. of beef. And even when a fair allowance is made for the additional expense of the dairy to that of the grazier, the return of the former will be far more than double that of the latter.

The superior value of the Scottish breed of dairy-cows over those in many of the English counties will appear from comparing the rent paid for both when set to a bower, as explained in a former part of this Trea-
tise. The price or rent paid by the undertaker or bower to the farmer in the county of Wilts, is from £5 to £6; in the county of Somerset, from £7 to £8; in Dorsetshire, from £2: 10s. to £3 on poor land, and from £6 to £7 on that which is richer; and in Hampshire from £7 to £9. While in the Scottish dairy district the bower pays from £10 to £12 in ordinary land or cattle, and from £14 to £15 where these are superior. In some instances £17: 10s. has been paid for the milk of each cow on a farm for one year, besides the dung, which goes to the owner of the cows.

These prices, while they show the superior value of the Scots dairy-cows, most completely refute the averments in the Farmer's Magazine and the General Report for Scotland, that these cows yielded only £1: 2s. of clear profit per annum. If farther refutation of these statements were necessary, the formation of one or more joint-stock companies for setting up the dairy in the city of Edinburgh, not only to supply the inhabitants with milk, but also to make cheese and butter, would show that the subscribers to that scheme calculate on a much larger return, beyond the expense of feeding, than £2s. per cow.

To supply the citizens of Edinburgh with a greater abundance of milk, and that of a better quality, is praiseworthy, and, if well conducted, may answer the end proposed; but to set up a cheese or butter-dairy in a large city seems rather visionary, and cannot, in my opinion, answer any good purpose.
CONCLUSION.

Having stated all that seems to me to be interesting respecting the Dairy-husbandry carried on in Scotland, and refuted some of the errors that have gone abroad to the prejudice of that branch of rural industry, I now lay my remarks, the result of long experience and much reflection, before the public, anxiously solicitous that they may promote equally the interest of the husbandman and that of the consumer of butter, cheese, and milk. If my labours can do so in any degree, I shall consider my time and pains to have been well bestowed; and if my wishes should not be realised, I shall still have the consolation of having once more exerted myself for the public good, where I had no interest beyond that of any other individual of the commonwealth.

As the Author had not the previous parts of this Treatise before him when he drew up Chapter Fourth, the reader must not be surprised if it should contain something like a repetition of what had been stated in the former chapters.
APPENDIX.

AN ACCOUNT OF THE LANARKSHIRE BREED OF HORSES.

The horse, from his many excellent qualities and vast utility, may well be considered as the most valuable of the domesticated animals. His stately and dignified aspect, symmetry of parts, great strength, and sweetness of temper, give him the fairest claim to our notice and peculiar care.

Like some others of the domesticated animals, the horse has a great versatility, by which he is capable of being formed into many different varieties of breeds, suited to the taste and convenience of man. If horses for the draught, the road, and the turf, have already been formed from the original stock, and each species so much varied by the diversity of soil, climate, or adventitious circumstances,—it must be obvious that still greater changes might yet be effected by skilful breeding, rearing, and feeding.

To enumerate the varieties or breeds that are already known, and trace out the time, place, or means by which they have been formed, would as far exceed the bounds of this communication, as it would be above my power to accomplish. I shall only at present attempt to give a concise account of that celebrated race of
draught horses, now known by the name of the Lanarkshire breed. In doing so the following arrangement will be observed:—

I. Give an account of the condition of horses in the western counties of Scotland prior to the introduction of improvements in agriculture.

II. Enquire into the time and means by which that animal has been so much improved.

III. Describe the size, shape, colour, qualities, and price of the Lanarkshire breed.

IV. Show from whence they are procured, how reared and treated, till they attain full growth.

V. Point out how they are fed, and the loads they draw.

VI. Show the period of their endurance when no accident happens. And,

VII. Compare the Lanarkshire with other breeds;—with some miscellaneous particulars, not discussed under the former heads.

I.—An Account of the Condition of Horses, in the Western Counties of Scotland, before the Commencement of Agricultural Improvements.

It would be impossible now to ascertain at what period horses were first introduced into Britain. They were found in such numbers, and had attained such a
APPENDIX.

state of discipline, when the Romans first invaded Britain, as to strike Julius Cæsar and his army with terror. That the Romans, Saxons, Danes, and Normans, would all import horses into Britain from the Continent, and that the Scandinavians and Danes would carry many of their horses into Scotland, cannot be doubted.

Some of the Kings of England, as early as the ninth and tenth centuries, and our Scottish Kings, at very remote periods, endeavoured to improve British horses by importing the most active breeds for the saddle from Hungary, Spain, Barbary, &c. and those that were of greater weight from Germany and Flanders. But as the climate, soil, and the mode of feeding, have more powerful influence on the size and qualities of horses than probably was then well understood, it is not likely that the breed was so much improved in Britain, by the introduction of a few horses from abroad, as the patriotic importers may have expected.

The climate of Britain, and especially the cold and moist atmosphere of the western counties of Scotland, is far less favourable than some of the southern regions for rearing horses of a high temper. Neither will the coarse and scanty subsistence to be collected from our muirs and mosses, raise horses, or any species of stock, to the size they will naturally attain on the meadows of Lincoln or of Flanders. So long as the mode of feeding and treatment was merely calculated to keep them alive, very little improvement could be expected, even from the most skilful crossing with the most improved breeds, but rather the reverse. When any species of stock are crossed with breeds that are far different from them in size, shape, and qualities, the progeny is generally inferior to both the parents. Nature may be made, by
cautious and proper means, to yield a little; but must not be too much or too suddenly crossed.

Scarcely anything meriting the name of improvement was effected in the breed of horses in Scotland till after the middle of the 18th century. The natural fertility of particular districts, and the superior attention paid by some more than others to their rearing, feeding, and treatment, would no doubt render some horses superior to others, even prior to that period. The dry, light, warm soil, and better climate in the lower ranges of Galloway, would produce a richer and sweeter herbage than could be expected to grow on the cold mosses and sterile clay soils in the more rainy and less sheltered districts of Ayrshire and Strathclyde. And a still greater diversity might be expected between the horses reared and fed in the marshes of Lincoln, and those on the mountains of Lochaber.

Until the art of improving them by judicious crossing and superior feeding was discovered, horses, like every other species of live stock, were in a great measure the creatures of soil and climate. Hence those that were reared and fed in the fens of England or meadows of Flanders were large and fleshy; those of Galloway were of a medium size, but remarkably nimble and spirited; while those reared on the Grampian hills were small and hardy, but ill-shaped.

While these diversities in the size, shape, and qualities of horses, continued to be governed by the qualities of climate and soil, all that could be done by such as wished for those of a particular sort was to make their selection accordingly. But when animal economy came to be better understood, these matters were not left to be governed by accident.
Though many draught-horses, some for the road, and a few for the turf, were brought to the county of Lanark, and to those of Ayr and Renfrew, before the middle of last century; yet it was not till after the year 1760 that any material improvement was introduced into that species of farm stock in any of these counties. At that period the ordinary farm horses in that district were one third, and many of them one half lighter, and worse shaped, than those of the present day. In regard to size, the horses then in the western counties were not unlike those now reared and kept in the Island of Arran, the peninsula of KINTyre, and other Highland districts; and in their shapes and qualities they were still more inferior.

By far too many horses were then kept on every farm, and very little attention was paid to crossing, rearing, or feeding. Some stallions, of an improved size and better shape, were kept prior to that period; but from economical motives, many mares were coupled with colts or horses of a very inferior cast; and still less regard was had to the mares from which horses were reared. Any mare used on the farm was allowed to bring foals; and few even of the best mares were kept in a proper habit of body, or otherwise treated, so as secure an improved progeny.

Horses were then so ill-fed, that they could neither attain great size, nor acquire good shapes or qualities. Their only food in winter and spring was oat-straw, with very little corn, unless when they were drawing in the plough, or carrying grain to or from the mill or to market. Except in time of frost, they were generally turned out to pasture in the day-time, even in winter; and got but a small supply of straw during the night. They had some oats when engaged in hard labour; and on som
farms they had a tasting of pease or bean straw, by way of luxury, in seed-time.

About the middle of May, the whole horses, young and old, were turned out to grass, along with the cows, and some sheep, all in one flock; and the pasture was generally so much overstocked, that the cattle were merely kept alive. The horses were put up in the stables during the night, and fed chiefly on thistles, drawn from among the growing corn. The intelligent Colonel Fullerton observes, "As there were few or no inclosures, the horses and cattle were either tethered during the summer months, or trusted to the direction of a herd and cur dog; by whom the poor starved animals were kept in constant agitation; being impelled through famine, to fly from their bare leys, and commit continual depredations on the adjacent crops." Survey of Ayrshire, page 72.

About the year 1740, Robert Woodburn in Mains of Loudoun, Ayrshire, sold, what was then considered the best stallion in that county, at the price of five guineas. The common prices of ordinary draught-horses, in the western counties, did not then average more than from two to three pounds sterling each. Their prices, between 1760 and 1770, were from five to ten, and few of them upwards of twelve pounds sterling. Till after the year 1775, it was rather uncommon for any farmer to have a horse of the value of £20.

Till about the year 1780, the work usually done by farm horses was not more than the one half of what they now perform. Four horses were then yoked to every plough, while as much is now turned over by two horses. Ten hundred-weight was then considered as an extraordinary draught for a farm horse on the very
best roads, while at present a ton, or 24 cwt., is not thought an extraordinary load. It was not uncommon, as late as 1785, to allow farmers to take as many limestones from a quarry, for the price of half a ton, as they could carry on one cart for a mile or so, on a good toll road. They would not now be charged less than 30 or 40 cwt. for what they would transport on one cart on the same road.

II. An Enquiry as to the Time when Horses were begun to be improved, and by what means accomplished.

Whenever improvements began to be made in agriculture, and in proportion as these advanced, the condition of draught-horses began to be meliorated, and of course the breed to be improved. The dawn of improvements in husbandry cannot be traced, even in the eastern counties, beyond the year 1760; they made but small progress any where till after 1770; and it was not till after the termination of the American war that any material improvement was made on the soil in any of the western shires. The revival of commerce, the introduction of the cotton manufactories, buildings, and other improvements which followed the peace with America,—all had the most powerful effects in increasing the demand for, and raising the prices of draught-horses, and of course bettering their condition.

While these improvements were confined to the eastern counties, the increased demand for horses was supplied from England and Ireland; for the Lothians have never been breeding districts, either of horses or cattle. But the increased demand there having tended greatly to raise the prices of horses, induced the farmers on the western side of the kingdom, to rear more and better
horses; and as the demand increased and prices advanced, the crossing and rearing of horses was still more attended to, till it has of late made astonishing progress.

The means by which the breed of draught-horses in Scotland, and particularly in the western lowland counties, has been raised to near double the weight, and rendered capable of performing more than twice the quantity of work that they did forty years ago, have been greater attention to breeding, and much better feeding.

Stallions, of the most approved shape and size, have long been kept in all the breeding districts; and no mare is now coupled with any other. Much greater attention is now also paid to the mares from which foals are reared, than was done only a few years ago. It has been found, that when a large stallion is coupled with a small jaded mare, the progeny is generally inferior in shape to its parents. Colts of a poor shabby mare that has been covered by a large stallion, have generally large bones, but are ill-shaped clumsy mongrels. But when the mare is of a right size, in good habit, and the stallion not too large, and of a proper breed, the progeny is of the best quality. Much injury was long sustained by coupling large males with puny females; but now that the evil is come to be known, it is avoided by all intelligent breeders.

Good feeding has also had the most powerful effects in improving the breed of horses, and of every species of farm stock. While the mares were only half fed, and the colts almost starved, the breed could not be improved, but the reverse. Starvelings are never shapely or high spirited. When well fed, they attain to much greater weight, acquire finer shapes and much more spirit; and bring much higher prices than when half starved and puny.
III. An Account of the Size, Shape, Colour, Qualities, and Prices of the Lanarkshire Breed of Horses.

This valuable breed of horses cannot be fixed to any particular size, but, like those of every other race, they vary considerably in the height and weight of their carcases. Some of them are not more than twelve, and others are about eighteen hands high. The greater part are from fourteen to sixteen hands in height, which is considered to be the most proper size. If below fourteen hands, they are too light for the draught; and if they rise much above sixteen hands, they are generally unshapely mongrels, and greatly deficient in spirit; the effects of crossing small jaded mares, with too large stallions.

The general aspect of the Clydesdale horse is stately, handsome, and dignified. He is round, fleshy, well proportioned, strong, and heavy, without being coarse or clumsy. His countenance is sweet and agreeable, yet lively and spirited; and his motions are steady and firm, but nimble and alert. His head is in due proportion to his body, rather small than large, no way clumsy, and not so full and prominent below the eyes as some of the English breeds. His nostrils are wide, his eyes full and animated, and his ears erect. His neck is neither long nor slender, but strong, thick, and fleshy, with a good curvature, and the mane strong and bushy. He is broad in the breast, thick in the shoulders, the blades nearly as high as the chine, and not so much stretched backwards as those of road horses. The arm tapers to the knee. The leg rather short, bone oval and strong, but solid and clean. The hoof round, of a black colour, tough and firm, with the heels wide, and no long hair on the
legs, except a tuft at the heel. The body round and heavy; the belly of a proportional size, neither small nor large, and the flank full. The back straight and broad, but not too long; the loin broad, and raised a little. Hucks visible, but not prominent, and but a short space between them and the ribs. The sides from the shoulders to the hip nearly straight. The thighs thick, and meeting each other so close under the fundament, as to leave only a small groove for the tail to rest on. The tail strong, stiff, heavy to lift, and well haired. A large sheath (vagina) is considered to be one of the marks of a good horse, and a small one the reverse.

These are the principal and most approved marks of the true Lanarkshire draught-horse; though it is not to be understood that every horse and mare of that breed have all these marks in perfection.

The colours of the Lanarkshire horses, are black, brown, or grey. A star or some spot of white on the forehead, and a small patch of white on one or two of the legs, near the hoof, are esteemed beauties. But when these patches of white are too large, they are considered as blemishes; and when any part of the hoof is white, it is not so firm, tough, and solid, as those that are of a black colour.

The Lanarkshire breed of horses is docile and tractable, without being dull and grovelling. They are constant and regular in their motions, powerful and steady in their draught, remarkably strong in proportion to their size, and when regularly fed and well treated, they can undergo great fatigue. No breed of horses in Britain can excel them in either plough or cart.

The prices at which the Lanarkshire horses are bought
varies according to the perfection of the individual animal, its age, condition, state of markets, &c. Foals, at from six to ten months old, were sold, prior to 1815, at from £15 to £25, some at £30, and those that were fit to be reared up for stallions, at £40 or more. When about 14 or 15 months old, they generally sell at from £20 to £35; remarkably good ones bring £50, and in some instances still higher prices. One colt, of 15 months old, was sold at Lanark fair, August 1815, at £50; and Mr. Wilson of Gillies lately sold a pair of gelded colts, two years old, as high as £150, or £75 each. When five or six years old, they are frequently sold in the Beltan market at Rutherglen, and Whitsunday fair at Glasgow, at from £40 to £50, and many as high as £70 or £80. When fit for carriages, they were sometimes sold as high as from 100 to 120 guineas each. All these prices are meant to apply to colts and horses of the best sort. Those that are inferior are sold at lower prices, according to their size and quality.*

IV.—*An Account where the Lanarkshire Breed of Horses are procured, and how they are reared and treated, till they attain full growth.*

This celebrated breed of horses has been for some time past frequently represented to have been the progeny of four stallions, said to have been brought from Flanders by one of the ancestors of the Duke of Hamilton, and kept at Strathaven Castle for the use of his Grace's tenants and vassals. But this story, which first

* Horses, like every other species of farm produce, sunk greatly in price between the year 1815, when this paper was drawn up, and 1820; since which latter period their prices have been gradually advancing, and are now as high as ever, compared with the rates of farm produce and stock.
appeared in the History in Rutherglen and Kilbride, drawn up by the Rev. Mr. Ure, does not seem to be well founded. It was not till the year 1612 that that noble family acquired the estate of Avondale, of which Strathaven Castle is the mansion; and except that Dutchess Ann, when persecuted by Cromwell, made it one of her occasional hiding-places, it was never occupied by any of the noble family, nor any establishment kept by them at Strathaven Castle. Though many things are known in that neighbourhood respecting the noble proprietors since they acquired that estate, and even of the family from whom they obtained it, (Sir James Hamilton, of whom Daniel Hamilton, Esq. of Gilkerscleugh is the representative,) yet there never was any traditionary account of these stallions heard of about Strathaven, till it appeared in the writings of Mr. Ure. Natives of that place, who were born in the beginning of the last, and some of them in the preceding century, at whom I made enquiry respecting them, never heard of any such improved stallions being kept for general use there, or by that noble family any where else. Neither is Strathaven nor the estates of the Duke of Hamilton the district from which the Lanarkshire horses are procured.

That celebrated race of horses, though they have acquired the name of the Lanarkshire breed, (probably from there being immense numbers of them sold every year, when about one or two years old, at a fair in the town of Lanark, and at another at Carnwath near Lanark, both in the month of August,) are not exclusively reared in that county, but partly in it and partly in the neighbouring shires. Many of these horses are reared, till they are one or two years old, in the higher parts of Lanarkshire, and others in the adjacent counties situated between the Forth and the Tweed; and some of them come from the north side of the Forth.
An extensive range of the higher and most inland parts of the counties of Lanark, Edinburgh, Linlithgow, and almost the whole of Peebles and Selkirk, are either muirish, or in a medium state between muir and dale; where the chief branch of husbandry is the rearing of one or other species of live stock. As in all such lands, a portion of crop is required to supply winter fodder, it becomes necessary to keep some horses to till the land in crop, carry home fuel, &c.; and as they are only wrought occasionally, and as land of that description affords a full bite of coarse herbage, sufficient to support a rearing stock; mares, as they can perform the occasional farm work and rear foals at the same time, are preferred to horses. Two mares, when pregnant, can easily draw the plough and harrow, through twenty or even thirty acres of land in the course of the winter and spring; and the carriage of peats from the hill to the farm stead, and dragging the hay and crop from the field to the barn-yard, can be done while their foals are at their foot. And as the farmers on that species of land can get their farm work executed by breeding-mares, whose colts bring them the high prices that have been mentioned, they cannot fail to give these a preference to horses; though some of the latter are no doubt necessary as a sort of demi-saddle horses, even in such situations.

The colts so reared are, some of them when one year and three months, and others when a year older, carried to the fair in Lanark, and some of them to that of Carnwath, both in the month of August, where part of them are purchased by the farmers in the lower parts of Lanarkshire, but chiefly by those in Ayrshire and Renfrewshire, who rear them till four or five years of age, and then sell them at the Rutherglen and Glasgow fairs in the month of May, to farmers in the grain districts,
or to carters from other parts of Scotland; and many hundreds of them are every year carried to England.

The mode of farming hitherto most general in the counties of Ayr and Renfrew, of ploughing only a fourth, or at most one third of the arable lands in their possession, and occupying the pasture with a dairy-stock, enables the farmers to keep horses of from two or three to five years old, to great advantage. Horses of these ages plough and harrow the small portions of land in crop, and execute the other farm-work, without being in the least oppressed or impaired in their growth; and the increase of price, from the time they purchase them in colts at Lanark and sell them at five years old in the Glasgow or Rutherglen fairs, forms an item in the profits of their farms. While farmers or others who use only full-grown horses, and work them hard all the year round, are sinking their value every year (especially after they are about eight years old), those of the western districts, who purchase colts and rear them into horses in maturity, gain in price in the course of three or four years (besides having their work performed) from £20 to £40 on each horse of good quality.

Thus it is that one description of land is rendered subservient to another. In the muirish districts, where horses are but little wrought, and yet cannot be wanted, breeding is the most proper and profitable plan. And where the mode of farming requires more labour, but far from affording constant employment for the horses, rearing colts into full-grown horses is equally advisable, and affords considerable profit; while from these districts the grain farmers, carters, and others who need horses in perfection, and have not the opportunity of rearing them, are well supplied.
It is not therefore from the progeny of Flemish stallions kept by the noble house of Hamilton, or by any other family at Strathaven, or in any particular place, nor even from the county of Lanark alone, that Scotland and England have so long been supplied with a race of draught-horses so far superior to all others. Though that most valuable race of horses have obtained the name of the Lanarkshire breed from so many of them being sold when colts at Lanark, they are by no means the exclusive produce of that county; but part of them are natives of the higher ranges of all the neighbouring counties, from the Forth to the Tweed, and nearly as far east as Edinburgh.

The mode of rearing and treatment of this breed does not differ materially from that observed in other districts, or where good draught-horses are reared. Though the mares are kept at work till within a few days of the time that they drop their foals, yet they are treated gently, and neither overheated nor harshly used. They are not generally much in yoke while suckling, and when they are so employed it is only at easy work, which does not overheat them, and but for a short period at a time; and that the foals may not be hurt, they are locked up while their dams are working. The mares are generally turned to pasture whenever they drop their foals, and remain at grass till the end of October or beginning of November, when the foals are weaned, and they and the mares fed on dry fodder in the stable.

As the foals are deprived of grass and the milk of their dams at the same period, care should be taken to change their food by degrees, and to supply them with a part of grass or green food through the winter. If that is not attended to, the foal will not at first eat a due
portion of dry fodder, and that which it eats will not rightly digest on its stomach. The safest course is to accustom the foal to eat some dry fodder before the teat is altogether withdrawn; to do so by degrees, and to give them occasionally malted grain, or some slices of turnip during the first winter, care should be taken not to confine them too suddenly to the stable, but to let them out a few hours daily, and to groom them well, that their legs may not swell. Too much heat is injurious to colts, and they ought to be kept clean, and in a stable that is dry and well aired.

The colts are turned to grass during their second summer; and from that time till they attain a full growth and perfection they are treated nearly the same as horses. Care is taken to treat them well and work them moderately. They are neither starved nor pampered; and though they perform a good deal of work, they are not overloaded or put to labour that is too severe, or for too many hours at a time.

V.—Of their Food, and the Work they can perform.

The mode of feeding horses has been greatly improved within the last forty years. Prior to that time they were allowed three fourth parts of a peck of oats daily when in yoke, with oat-straw or hog-hay for fodder; but when idle, they were merely kept alive on fodder, with very little corn in winter, and bare ley grass in summer, as has been already mentioned.

But as improvements on the soil advanced, the condition of that valuable animal began to be meliorated. When turned to grass they are now provided with a full bite of much better quality than in former times. On many
farms they are now fed a considerable part of the summer and harvest on rye-grass and clover, cut and carried to their stalls, usually termed soiling; and though many farmers still feed their horses with oat-straw in winter, the greatest part of them on the grain farms are now mostly supplied with good hay during winter and spring.

The quantity of grain allowed to horses is in proportion to the extent of the work they perform. Young horses, when at pasture, get no corn except when they are put to work. When carting manure or fuel, carrying grain to the mill or market, &c. the farmers allow their horses from three fourths of a peck to a peck of oats per day, according to the severity of their work. If they are wrought hard in the plough or cart daily, they get one and a half pecks of oats per day, or beans in proportion. Coal drivers, and those who ply about towns or public works for common hire, feed their horses at the rate of from a peck to a peck and a half of oats per day; but those that travel long stages with merchant goods, coals to the shore, pig-iron, or other heavy carriages, feed their horses at the rate of a bushel of oats, or with beans or meal to that value, every day.

If the grain were malted, it would be much more nutritious; or if it were bruised between the rollers of a malt-mill, it would not pass entire through the intestines of the animal, as it often does, without operating as food.

Many farmers, and even some carters, feed their horses (at least in part) on potatoes; and some give them yams or turnip. Carrots are also known to be a valuable food for horses, and are beginning to be used by many farmers. They might be raised to great ex-
tent on moss ground. Mr. Wilkinson of Castlehead in Lancashire raised a crop of carrots on deep flow moss, worth £70 per acre; many of them were ten or eleven inches round at the neck, and upwards of two, some nearly three feet in length; and Lord Glenlee raised them of that size in a moss near Barskimming House in Ayrshire.

The extent of work these horses perform, and weight of their loading, vary greatly according to the size, age, and condition of the animal, and the roads on which they travel. The labour of horses on the breeding farms or districts is very moderate. That of the young horses, in the western counties to which they are carried, is far from being severe. They are indeed pretty hard wrought in the spring; but their labour is very moderate during the rest of the year. The extent of land that any given number of horses can labour must be in part governed by the quality of the soil and mode of husbandry pursued. But on good friable soil, a pair of Lanarkshire horses will plough one acre per day for weeks together.

The severest labour which horses perform in Scotland, or in the world, is in carting about Glasgow, and other western districts, where from twenty to thirty hundredweight is considered no more than an ordinary load for a single-horse cart; and where two tons weight and upwards is often put on a cart drawn by one horse; and the horses so loaded are kept in yoke from ten to twelve hours every lawful day.

The carriers from Glasgow, to Greenock, Paisley, and Edinburgh, load at the rate of from twenty to thirty cwt., and many of them carry two tons on a single-horse cart. Those from Glasgow to Carlisle, where
much of the road is uncommonly steep and in very bad condition, load at the rate of from sixteen to eighteen hundred, and sometimes upwards of twenty hundred-weight per horse, and travel from 25 to 50 miles per day. The drivers of pig-iron from Muirkirk to Glasgow travel 15 miles empty, or half loaded, and 15 miles miles loaded, at the rate of from sixteen to twenty-four cwt. on each single-horse cart, and upon a road that rises and falls very much, and is generally in bad repair. The drivers of stones for building about country towns, generally load at the rate of a ton or upwards on each single-horse cart. Of upwards of 100 horses and carts, sent a few days ago, by the farmers in that neighbourhood, to assist for one day Thomas Semple in carting stones to the new inn now building in Strathaven, the lightest of them carried from 18 to 24, and many of them upwards of 30 hundred-weight; though much of the road they had to travel rises a foot in 15, and some of it one in ten.

VI.—Of the Period of their Endurance.

Many of these valuable animals no doubt meet a premature death, or are by maltreatment rendered unfit for work at an early period of their lives. But when they are properly used they attain the age of other horses, and continue to perform much work for many years. In the hands of farmers they often attain 20, and sometimes from 24 to 30 years of age; and when they have not been rendered lame or otherwise broken down, they continue capable of working moderately to the last.
VII.—Compared with other Breeds.

The Lanarkshire horses are equalled by few and excelled by none as draught-horses. They are certainly the most handsome, most spirited, stoutest, most kindly, and most durable of draught-horses to be found in Britain, or probably in the world. No other breed of horses bring such prices, perform such labour, and endure so long as the Lanarkshire horses.

Many things might be stated regarding that valuable breed which the limits of this paper cannot admit.

They are seldom duly trained. There are no fixed rules for their management, or fixed language to address them in. Every new master, or every servant under whose charge they come, manages them in his own way,—requires or expects they shall conform to his plans of operation, however peculiar, and in whatever way communicated; and too often the poor animal is beaten wantonly, for not being able to comprehend the wishes of his driver, when expressed in terms altogether different from those used by his predecessor.

Beating of horses is a mean and cruel practice. Few animals are so tractable as the horse; and none are more disposed to obey, and even anticipate the will of their master. It must therefore be inhuman to beat and abuse an animal so gentle, docile, and useful. Galloping draught-horses at country weddings, or returning home from markets, is equally cruel towards them, and dangerous to the foolish rider. The numerous accidents that happen in that way ought long ago to have put an end to the practice; yet it is not uncommon to see several
horses lamed, and many more materially injured, at one single wedding. The practice is not confined to the lowest classes of farmers; for country lairds in the western shires, and even some of those who are looking forward to the rank of magistrates, are not ashamed to ride their horses almost to death at a penny wedding; or if not invited to it, to gallop some miles to see those who attend it, and waste their horses at the hazard of their lives.

The practice of selling old horses to cruel carters for a few shillings, cannot be too much reprobated. It is most inhuman to sell off for 20s. or 40s. a horse that has wrought many years on a farm, knowing that it will be afterwards starved and oppressed. It would be much more humane to kill them than to sell them to be both starved and over driven.

September 30, 1815.

FINIS.