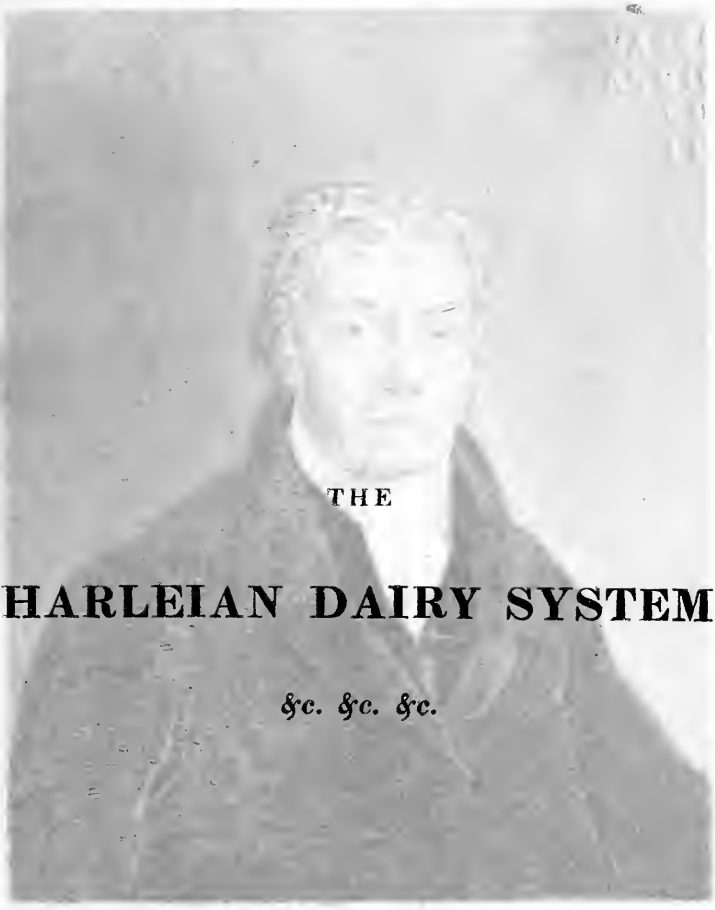
Engd by R. Scott

WILLIAM HARLEY ESQR.



THE

HARLEIAN DAIRY SYSTEM,

&c. &c. &c.

THE Selina Heathcote

HARLEIAN DAIRY SYSTEM;

AND AN ACCOUNT OF

THE VARIOUS METHODS

OF

DAIRY HUSBANDRY

PURSUED BY THE DUTCH.

ALSO,

A NEW AND IMPROVED MODE OF VENTILATING STABLES.

WITH

AN APPENDIX,

CONTAINING

USEFUL HINTS (FOUNDED ON THE AUTHOR'S EXPERIENCE) FOR THE MANAGEMENT OF HEDGE-ROW FENCES, FRUIT TREES, &c.; AND THE MEANS OF RENDERING BARREN LAND FRUITFUL.

By WILLIAM HARLEY.

"Be thou diligent to know the state of thy flocks; and look well to thy herds."

"A merciful man regardeth the life of his beast."

LONDON:

JAMES RIDGWAY, PICCADILLY;

BELL AND BRADFUTE, AND BLACKWOOD, EDINBURGH; SMITH AND SON, AND OGLE, GLASGOW;

AND TO BE HAD OF ALL BOOKSELLERS IN GREAT BRITAIN.

M.DCCCXXIX.

TILLING, PRINTER, CHELSEA.

or pre-conceived plan for its formation. Each succeeding project grew out of the experience of the former, till the town, which in early life he visited as a stranger, was, eventually, acknowledged by its citizens to have been permanently benefited and improved by the unremitting industry and perseverance of one humble individual.

To those who have expressed a desire to know more of the Author's early associations than he would otherwise have had the presumption to disclose, it may suffice to state, that he is a native of Glendovan, in the Ochills of Perthshire. Deprived at a very early age of his parents, he had the good fortune to have the bitterness of such bereavement assuaged by the affectionate attentions and parental kindnesses of an excellent woman, his paternal grandmother, who was better known to the community of which she was the ornament, as the *Lady of Whiteridge*, that being the name of the property whence she derived her income. To a strong natural understand-

ing she added the advantages of a well cultivated mind, and all the estimable qualities of a heart fraught with an unceasing desire to do good. With these attainments she undertook the grateful task of "teaching the young idea," and of so employing every maternal effort for the improvement of her adopted charge, as to impress upon his mind by precepts pointed out to him from the Bible, the Pilgrims' Progress, and similar sacred and instructive sources, the great duty he owed to his God, to his neighbour, and to himself. This mental discipline was alternately relieved by recreative diversities, in which this much esteemed woman would delight to participate; but in none, perhaps, was there more reciprocal enjoyment than in the anecdotes which she occasionally related, of the Rebellion of 1745; one of these was so indelibly impressed upon the Author's mind, from its family application, that he may be excused for narrating it.

As it was known that the property en-

joyed by the Lady of Whiteridge was held of the Crown, the Pretender claimed, as his right, the feu duty; and, in order to enforce the payment thereof, he sent a party with instructions either to obtain the money or bring away the cattle. Previous intimation of this hostile visit having been communicated, all the Establishment was put in requisition to transport the horses and black cattle to a distant part of the Ochill Hills. When the Pretender's party arrived, the "Lady," (as she was called,) received them courteously, and entertained them with liberal hospitality; but peremptorily refused to pay the feu duty. This extraordinary firmness, coupled with such unexpected kindness to the intruders, (for, on their departure, she furnished each man with a supply in his plaid,) caused the persons and property of Whiteridge to be thenceforth generally respected by all parties who happened to be marching or countermarching past the pre-

mises, which were situated by the way-side.

With such scenes as were ever before his eye, it was to be expected the Author's early habits should introduce him to a familiarity with, and an attachment for, Rural affairs, and particularly for those healthful and invigorating sports of the field which can only be truly relished by the lovers of a country life. About this time his maternal uncle, (Mr. Blyth, of Perth,) who had commenced a manufactory at Kinross for weaving *sattinets*, endeavoured to prevail upon the Author to learn that business. The proposal was, at first, but coldly received; country weavers at that time of day did not rank very high in the estimation of society; indeed, so deep-rooted was the Author's prejudice as to the respectability of the pursuit, that he considered the distinction to be but a shade between a weaver and a "finisher of the law." A little time, however, mingled with

TO

HER GRACE THE DUCHESS OF LEEDS;

THE

MEMBERS OF BOTH HOUSES OF THE BRITISH PARLIAMENT;

AND OTHER

NOBLEMEN AND GENTLEMEN,

THE AUTHOR'S PATRONS.

May it please your Grace,

My Lords and Gentlemen,

TO you—and especially to that exalted Patroness who has conferred upon me most distinguished marks of kindness and condescension—I respectfully dedicate the following Pages illustrative of an attempt (I hope I

may call it a successful one) to benefit the Public.

The imperfect system of Dairy Husbandry which had long prevailed suggested to me the conviction that important Improvements were attainable in this valuable branch of Rural Economy. To accomplish these in a manner that should render them worthy of universal imitation required no inconsiderable capital, much practical knowledge, and incessant personal attention. Such, at least, were the desiderata impressed upon me in the progressive formation of, and long before I had ultimately succeeded in perfecting, the WILLOWBANK DAIRY,—*an undertaking which the Citizens of Glasgow, and many of you, my Lords and Gentlemen, in the visits with which I was honored, have been pleased to speak of in terms that it would ill become me to repeat, but the flattering kindness*

of which is associated with my happiest recollections.

As Senators, ever alive to the protection which British Agriculture, in all its useful varieties, claims from you in your legislative capacity, I submit the history of my humble labours to your impartial review; and as Subscribers and Patrons, I am proud in the opportunity thus offered me of testifying the readiness with which you are respectively known to encourage the exertions of individuals who disseminate their knowledge with a view to public utility.

I have the honor to be,

With every sentiment of Gratitude and Respect,

Your faithful and obedient Servant,

THE AUTHOR.

London, June 1829.

INTRODUCTION.

It has been remarked by many Authors of intelligence and observation, that in those communities where a liberal supply of genuine milk is obtained, fewer premature deaths have occurred; and that there is scarcely any article of food deservedly in more general use, particularly in Great Britain, than the pure and unadulterated milk of the cow.

The various milks in use as food, it may not be uninteresting to know, are cow's milk, ass's milk, ewe's milk, goat's milk, mare's milk, and camel's milk. That of the camel, we are told, is chiefly confined to Africa and China; and that of the mare to Tartary and Siberia. The milk of the goat is more generally used in Italy and Spain, than in any

other countries in Europe: the goats are driven into Leghorn, Florence, Madrid, and other towns, in flocks, early in the morning, and milked in the streets. Goat's milk is recommended by physicians as nearly equally light as ass's milk, the butter made from it containing a larger proportion of glutinous substance, and less oil than that of the cow. Ewe's milk is gradually wearing out of notice. The milk of the ass approaches the nearest to that of the woman, and being the lightest of any, is much recommended in pulmonary and hepatic affections; but the favourite aliment of the human species in this country is the milk of the cow.

The great improvement of late years in the quality of this article may be ascribed to the superior mode of nourishing that useful animal, and to the cleanliness and good management which are gradually being adopted in the various departments of modern dairy husbandry. Such, at least, is the opinion entertained by the Author of the present Treatise, whose knowledge of the universal inconve-

nience experienced by the community from the defective system prevalent many years ago, first suggested to him the idea of projecting an Establishment which, while it should obviate the impediments that existed to the health and comfort of the labouring poor, and provide for all classes a wholesome and abundant supply of milk as it came from the cow, should also exemplify the public utility of a similar system being acted upon on a limited or more extensive scale, in every town in the United Kingdom.

The celebrity which the Willowbank Dairy, as well as the other Establishments projected by the Author, obtained throughout the empire, was in some degree to be attributed to the unqualified approbation bestowed upon them by the numerous and distinguished individuals whose visits to the city of Glasgow were accompanied by a desire to inspect them, and publicly testify their national utility.

It is in compliance with the reiterated and flattering solicitations of very many of these

patrons and friends, and with the declaration of the Highland Society of Scotland that a publicity of the system would be of general utility, that the Author, overcoming the diffidence which has long restrained him—as well as having been hitherto deterred by the many avocations which absorbed his attention—now ventures to send forth to the world a history of the *origin, progress, and successful establishment of the Willowbank Dairy;** an Establishment which has been admitted to have had much originality in its construction, but, like the other extensive concerns of the Author, had no long-standing

* In reference to the Title which this Work bears, the Author owes it to himself to state, that he had never the vanity to designate any of his undertakings with his own name. The distinction was conferred upon his Establishment by the late Robertson Buchanan, Esq., civil engineer, who was requested by the Dublin Agricultural Society to draw up an account of the Willowbank System; and that gentleman, in his Report, denominated it the HARLEIAN Dairy. Dr. Cleland, in his *Annals of Glasgow*, having also made use of the same term, the Author presumed his Work could not receive a more appropriate Title.

some useful inculcations, soon dissipated this error, and the Author, in a short time, found himself perfectly at home at Kinross, attending to the business with diligence, and enjoying the hours devoted to recreation, in angling in Lochleven, or, when the Loch was frozen, rambling about the castle which the fate of the unfortunate Mary had rendered memorable.

After learning the operative part of that business—*fine linen*, which was then manufactured in no other part of Scotland, the Author visited Perth, where he acquired a similar knowledge with regard to *brown linen;* and, on Whitsunday, 1789, he proceeded to Glasgow, and was received there into one of the most respectable manufacturing houses then in town. In a few months he obtained such a knowledge of the cotton manufacture as enabled him, in the following year, to commence business on his own account. In 1794 he produced the

Turkey red-checked gingham, a species of manufacture hitherto unknown in Great Britain. During the first season, the sale of this popular article was confined (per agreement) to the late Mr. Gilchrist, of Edinburgh. Soon after this, it was introduced to the London market, and subsequently became an article of considerable importance as an export to America and the West Indies, whither it was sent in large quantities, and in great varieties of original patterns.

For some time prior to the Peace of 1814 the Author paid nearly £20,000. annually for winding and weaving of cotton yarn, in addition to a large expenditure upon buildings, labourers' wages, &c.

In 1802 he acquired a few acres of ground, merely for a family residence, at Sauchy Hall. This spot had formerly been a bleach-field, and contained an abundance of excellent spring water, an article of which the city of Glasgow was then very

much in need.* The Author consequently set to work to obviate this public inconvenience: he had carts and four-wheeled carriages built, which were employed in conveying large supplies of water daily into the city for the use of its inhabitants. The success of this project led to the formation of the Glasgow and Cranston Hill Water Companies; the establishment of which rendered the Willowbank water afterwards unnecessary.

With a view, however, to turn this indispensable article of life to some other public account, the Author was induced to erect—what was at that time much wanted—namely, hot and cold baths. These were held in much estimation, and received considerable patronage. At length it became a frequent remark by invalids, that it would be a very desirable accommodation if they could be furnished with a little new milk; a wish

* Vide Dr. Cleland's *Annals*, p. 397.

that was soon complied with by sending a cow from the villa at Willowbank to be milked at the baths; and hence was laid the foundation of the Willowbank Dairy, a brief account of the progress of which may not be inappropriately introduced in this place.

In 1810 the first cow-house was erected, which was calculated to hold twenty-four cows; a plan of which, with a description of the building, will be found in the following pages. As the demand for milk increased additional accommodation was provided, till, at the Peace in 1814, three hundred cows could be arranged. At one period, the stock amounted to two hundred and sixty.—*Vide* Dr. Cleland's Annals.

The Grand Duke Nicholas, (the present Emperor of Russia,) his brother the Grand Duke Michael, Archdukes John and Lewis of Austria, and other German Princes, as well as many noblemen and gentlemen from all quarters of the globe, paid a visit to, and

were highly gratified with, the Establishment. Many of them expressed their regret that no plan of the buildings, or account of the System, had been published, which they would have been willing to possess on any pecuniary terms.*

The Highland Society of Scotland also appointed a deputation of its members to inspect the Dairy, and to report their opinion of the same, which proved of so satisfactory a nature as to lead to an unanimous vote of the Society that a piece of plate should be

* Sir John Sinclair, Bart., in his General Report of Scotland, says,—" If a plan and minute description of the Willowbank System were given, it could easily be adopted in every town in the kingdom. The great saving that would thence accrue to the proprietors of cattle would be easily demonstrated; but the benefit which the community at large would derive from this System, (which is admitted to be *original*, and not to be met with in any other parts of the kingdom,) is of much greater importance. It can hardly be questioned that many lives are annually lost to the nation, for want of genuine milk—that most nourishing diet."

presented to the projector of the Establishment. This gratifying testimony bore the following inscription:

"*Voted by the Highland Society of Scotland to* WILLAM HARLEY, *Esq., Glasgow, for having constructed a Dairy Establishment upon a new and extensive plan, at Willowbank, in the vicinity of that city; which was ascertained, upon inspection and report, by a Committee of the Society, to possess important advantages.* 1814."

It should be here stated, that the new and improved house, for accommodating one hundred cows, as described in this Work, was erected after the Author had been honoured with the above mark of approbation.

In perusing the various details of the Establishment, it will occur to the reader that the Dairy was entirely conducted upon that law of nature by which animals and vegetables reciprocally interchange their substances

or qualities with each other, and which the late Mr. Curwen was always so attentive to promote. The "Soiling System"—of which this distinguished agriculturist was justly denominated "the father"—by confining the animals to the spot where they are fed, is productive of a more abundant quantity of dress being collected and prepared, to be returned to the partly exhausted soil whence the food had been produced. The only disadvantage of this system is, that the cattle must be changed every ten or twelve months, otherwise their knees and feet, particularly the fore-feet, will get diseased; and when this happens they will neither milk nor fatten to advantage. It would, therefore, be desirable, in similar Establishments, to have fields into which those cows which are the best milkers and of fine symmetry for breeding, might be turned; and also to have a part of the cow-house exclusively for them in order that they might be fed differently from those that were fattening.

Though this might be adopted upon a small scale, it is quite impracticable for town dairies to keep many cows by grazing, as is done in the country; and even were it otherwise, it would not be so profitable, and would be attended with much more trouble. The advantages arising from the Soiling System, whether upon a large or small scale, are now generally known and approved. The produce of one acre well cultivated, when cut and carried, will go farther than five acres of pasture, besides the value of the manure.

The Author having, at another period of his life, acquired of Blythswood a considerable quantity of poor and waste land; he enclosed it, and cultivated large supplies of vegetables and fruits for the use of the city. A portion of the land was disposed into arbour and bowling greens; tasteful walks were also laid out, and a square was formed and planted upon Blythswood Hill, &c.

By the purchase and excambio of the lands of Enoch Bank, the Author opened up

St. Vincent Street, George Street, Renfrew Street, Bath Street, and Nile Street. Under the last, arches were formed to fill up the ravine; these were converted into ice-houses, &c., under which St. Enoch's Burn was arched over and made a common sewer. The Author commenced building along several of these streets, which was the origin of what may be called the NEW TOWN.

Previous to the above operations, Blythswood had no access from his lands to the city except by Anderstone Walk, and the Sauchy Hall road, the latter of which was at that time almost impassable.

Having introduced good water, pure milk, and other improvements into the city, the Author was subsequently much importuned by a number of respectable inhabitants to turn his attention to the objectionable practices then prevalent in the *baking* trade. The bread in Glasgow was at that time considered very inferior to what was sold in many other places. The Author's numerous avocations,

however, induced him to resist the proposal for two years; but in 1815, at the instance of several of the bankers and principal inhabitants, he commenced the baking of wheaten bread, the superior quality of which was every where approved, not only in the city, but by those who resided upon the west coast, and at the different places where Glasgow steam-boats were in the habit of plying.

Among the various pursuits in which the Author was at one period engaged, he has often felt that none afforded him so much real gratification as the *Dairy*, particularly as regarded the comfortable state of the cows, and a cleanly mode of management; and if he had not the veneration of a Hindoo for these animals, their natural docility and public usefulness to mankind often elicited from him a regret that so little attention was in general paid to their comfort; for, next to the vital nourishment supplied by the maternal sources of the human species, the milk of the cow unquestionably deserves to be ranked. The

delight which the Author felt in seeing so many lovely groupes of smiling children twice a-day enjoying the delicious régalement at the Willowbank Dairy, will never be effaced from his memory; the avidity, too, with which the little urchins sought their customary potations, could only be equalled by their frolicsome gambols afterwards.

Although the Author had never any partner in his numerous concerns, every thing went on prosperously till the Peace of 1814, when the universal depression that ensued upon every species of property, coupled with the heavy losses consequent upon this event, paralysed his exertions, and produced a revolution in his operations which formed a source of deep regret on many accounts; but especially as regarded the throwing out of employment so many necessitous workmen and faithful servants, (some of whom had been with him nearly twenty years,) and the compulsion that was imposed upon the Author to

suspend his aid to several Institutions which he had assisted to establish.

If it be asked how a single individual could project, and properly conduct so many different concerns? it is answered, that it was not from any vain opinion of the competency of his own abilities, but in a judicious division of *time* and *labour*, and in the uniform adoption into every department of that comprehensive word *system:* these may be said to have been the regulating powers of his extensive machinery. The motto, in short, throughout his Establishments was, "Every man at his post and doing his duty."

The Author will not arrogate to himself that many of his plans might not have been better concocted, or rendered more complete in their respective branches. It is nevertheless a source of grateful satisfaction to him to reflect, that in his various undertakings he always aimed at being useful; and he is willing to hope the community have derived benefit

from his labours, and that they will not be displeased with his present humble attempt to promulgate, for the benefit of mankind, the knowledge acquired by many years' industrious application to the affairs of an active and busy life.

POSTSCRIPT.

The Author deems it necessary to offer some explanation to his readers for the apparent imperfect execution of the portraits of an AYRSHIRE BULL and COW. The fact is, they were originally embellishments to Mr. Aiton's "Treatise on Dairy Husbandry;" and that gentleman having very kindly tendered the use of the plates for this work, the impressions were taken off in Scotland and have only just arrived. From the delay which this publication has already experienced by the Author's visit to Holland, together with his time being much occupied in forming in the metropolis,

at the solicitation of many highly respectable gentlemen, an ESTABLISHMENT TO IMPROVE THE QUALITY OF BREAD, with the view of supplying the public with that first necessary of life, in a pure and unadulterated state; he was unwilling to trespass farther upon the indulgence of his numerous Patrons, by sending for the plates and having them retouched and improved in London. He therefore hopes this explanation will be received as a sufficient apology for the absence of that finished execution which is imparted to the other graphic illustrations of the book.

It is due, however, to the Artist to state, that the figure of the animals, their proportions, &c. are understood to have been originally approved of by the "Kilmarnock Farmers' Club."

Contiguous to the Baking Establishment it is proposed to erect, for general inspection, a small cow-house and stable, illustrative of the system pursued by the Author at Willowbank, as explained in the subsequent pages.

London, June, 1829.

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NOTE.—The access of BLYTHSWOOD'S lands to the City of Glasgow, by opening up New Streets, will be found detailed in the INTRODUCTION, p. xxiv.

APPENDIX.

THE

HARLEIAN DAIRY SYSTEM,

&c. &c. &c.

CHAPTER I.

In Dr. Cleland's Annals of Glasgow, it is stated that, in 1780, the price of new milk in that city was two-pence per Scotch pint, or one halfpenny per English pint, corresponding with the Scotch mutchkin. From that time till 1808, the price continued to rise, when it ultimately sold as high as eight-pence per pint, being four times as dear as it was twenty-eight years before. The extent of the supply, however, was by no means in proportion to the increase of the population; hence the scarcity of the article enabled the milk

dealers to obtain so high a price, although the quality was much deteriorated, owing to the wretched system of managing the cattle, and the still more objectionable and general practice of adulteration. There was, besides, no standard for determining the measure by which milk should be sold; so that the public were exposed to the alternative of dispensing with milk altogether, or consenting to be satisfied with it of such quality and measure as the dealers were disposed to vend it. As an instance to what extent the want of system was carried, and the random manner in which the dairy business was conducted, each dealer had measures suited to his own peculiar views; that is, they were either very small, or middle sized, according to the measure of his own conscience; and it not unfrequently happened, that when, in the winter season, the quantity was diminished, instead of getting new measures of a still smaller size, the sides of the summer measures were beaten in to reduce their dimensions, thus

adapting the quantity they should hold to a winter price.

Such was the state of the dairy business in Glasgow in 1809, when the WILLOWBANK DAIRY commenced. The late James Black, Esq. was then Lord Provost of the city; he, as well as many others of the most respectable citizens, patronised the establishment on public grounds, and in particular applauded the mode which its proprietor had adopted of selling milk by the Scotch pint, and its aliquot proportions; the quantity contained in each measure *being marked upon its outside.* This equitable practice gave such general satisfaction to the citizens, and was besides so effectual in preventing imposition and fraud, that his lordship often expressed his regret he did not, when filling the official situation of Dean of the Guildry, in 1806–7, issue regulations upon the subject, and especially to direct the stamping of all measures used in the sale of milk.

Previously to the establishment of the Willowbank Dairy, there was comparatively little

milk used in Glasgow; a circumstance, no doubt, chiefly attributable to the causes already alluded to, namely, its high price and inferior quality. In addition to this, many of the cows were kept in narrow lanes and confined corners, where the atmosphere was contaminated with effluvia arising from mire and stagnant water, and the want of ventilation; so little attention, indeed, was then paid to cleanliness in conducting the business, that many persons, especially those of delicate constitutions, and who, consequently, stood most in need of that excellent restorative, denied themselves the use of milk, from the disgust naturally excited at the filthy mode of bringing it to market.

Such being the state of the milk trade at that time, the Author of this work was forcibly impressed with the necessity of having the premises intended for his establishment, erected in an airy situation, to be properly ventilated, and to be kept perfectly clean. He was, therefore, led to devise a completely new arrange-

ment of the necessary buildings, as well as a new system of management, applicable to the details of the business; and above all things, he resolved that *cleanliness* should extend not only to every utensil used in the concern, but to every individual in the establishment. The premises were accordingly built on a fine airy site, at the top of West Nile Street. It was, however, soon manifest, that the chief difficulty consisted in getting the servants to comply with the regulations respecting order and cleanliness; for, when they were reprimanded for the neglect of any of these, the common reply was, in the true old Scotch style, and which has been so happily ridiculed in the *Cottagers of Glenbernie;* "O! we ken weal eneugh about kye, and we canna be fashed wi' thae new fangled ways." But even this difficulty was at length surmounted, and the Author's perseverance eventually triumphed alike over custom and prejudice—two of the most obstinate and provoking grounds of resistance that a practical man can possibly meet

with in his attempts to alter, or ameliorate, any long-existing system.

The novelty of the scheme, the superior quality of the milk, and the neat and cleanly manner in which the entire establishment was conducted, caused a great demand for the article, the whole of which was, for some time, entirely disposed of at the dairy; when, however, the customers became numerous, it was sent out to those districts in the immediate vicinity of the establishment; and, in process of time, and at the earnest desire of the inhabitants, the supply was gradually extended to the whole city and its suburbs. The districts nearest to the dairy were supplied from hand pitchers; and the remote districts and suburbs, from vessels on spring carriages, drawn by small ponies.

The benefit of the Author's new establishment to the community was soon appreciated; for whenever the Willowbank Milk was sent to a new district, it was observed, that the other dealers not only improved the quality

of their commodity, but had their measures made to a more correct standard. And, after all, notwithstanding the gloomy anticipations entertained by them and their friends, not even the small dealers had any reason to complain of the result; for, as their business increased, so did that of the Willowbank; and, in the course of a very short time, it was computed that the number of cows kept for dairy purposes in Glasgow, was doubled. At the end of about six years, from its commencement, there were, in the Willowbank Dairy alone, two hundred and sixty cows; which, it is presumed, was a number equal to that which had been previously kept by the whole of the small dealers; and yet their business had never sustained the least decline. The liberal supply, furnished from Willowbank, induced a laudable emulation among the minor dealers, and hence arose all the advantages which the citizens so decidedly experienced. The least of these, perhaps, were the improved quality of the milk, and the reduction in the price.

The sale of milk now became an extensive and regular object of trade; and in a commercial town, the success and extension of one concern naturally benefit every other. *Harley's Milk* also became, as it were, the fashion; its unrivalled excellence was the subject of every lady's praise. All the world talked of the Willowbank Dairy; thousands, impelled by a curiosity which its fame had raised, went to see it; and so charmed, in short, was every one with the order and cleanliness displayed, that many, who had never thought of it before, now became consumers of milk as a part of their daily food.

In conducting this dairy business there was one great draw-back, which operated seriously against the success of its projector. Engaged in numerous avocations, the demands upon his time were so incessant as to prevent the possibility of his coming frequently in contact with his patrons, or their servants. The small dealers, on the other hand, were in constant communication with their customers; and, in

a thousand instances, by the temptation of douceurs, induced the servants to give their milk a preference; this was accomplished in several instances, by a less quantity of milk and cream being purchased than was ordered, thereby retaining part of the money, and making up the deficit with water. When this mixture was compared with the milk from the small dealers, it tended, for a while, to create a prejudice unfavourable to the Willow-bank Milk; to obviate this, it became necessary to detect the perpetrators of the mischief; and the facts, consequent upon the discovery, it was deemed proper to publish in the journals of the day.

The Author deems it but justice to state, that, throughout the whole undertaking, his object was never avowedly to bring down the price of milk, so as to conquer opposition, but simply to supply a pure unadulterated beverage, such as would at once benefit the citizens, and yield an adequate return upon the labour and capital employed in the business.

At the very beginning, therefore, he fixed the price at six-pence the Scotch pint, which he conceived a fair remuneration, although the current charge among the small dealers, as already mentioned, was at that time not less than eight-pence. There was some dissatisfaction manifested at this resolution among the dealers at first, but it soon subsided; and in truth there was not much reason for complaint. It has always been a fixed principle laid down by the Author, that any article he was engaged in manufacturing, or dealing in, *never to undersell*, but to compete only in regard to *quality*, and to sell at a fair price.

After the Willowbank System came into full operation, it was acknowledged, on all hands, that Glasgow was better supplied with genuine milk and cream, than any other large town in the kingdom. Those who remember it, will admit that this is not a mere assumption, but derived from the testimony of thousands; and so celebrated did the establishment become, that few strangers or travellers, whatever might

be their occupation or rank, omitted to visit it, as an object even of national interest. The politician, the man of science, the agriculturist, the merchant, and the manufacturer, have all been attracted to it, and publicly testified their approbation. Noblemen of the highest rank too have been seen in the train; and the Author could adorn the catalogue of his visitors with some of the heirs to the greatest monarchies in Europe.

The picture which has just been drawn, of the mode in which the common dairies of Glasgow were at one time conducted, it is believed, may be applied, at the present moment, to most of the dairies in every town in the kingdom; except in so far as they have copied or borrowed from the Willowbank System, of which none have yet disputed or even doubted the originality. This consideration then, among others, has not been without its due weight in prompting the Author to publish a full account of his System, and to lay the result of many years' experience before his

countrymen, with a view to stimulate them to similar exertions. The plainness of his illustrations, and the minuteness of his details, he hopes, will make the System intelligible, and easy to be adopted. There can be little doubt that, if carried generally into effect in different quarters of the kingdom, it would at once contribute to the prosperity of individuals, and to the common good of the country.

As before observed, one of the most prominent features of the Author's System, is *attention to cleanliness*. In no article of food is cleanliness so essentially necessary, as in the management of milk, whether sold in its liquid state taken directly from the cow, or manufactured into butter, or cheese: milk, it is believed, may be tainted more easily than any other liquid, either by mixture, by contact with foreign substances, or by impure air; hence the propriety of cow-houses being built in airy situations, and well ventilated. The milk and dairy-houses should be placed to the windward, (which, in Scotland, is generally

south-west,) or in such a situation as to be out of the reach of the foul air arising from the dung made by the cattle on the premises. From these hints, and the explanations given in the sequel, it is presumed that improvements might be made in the dairies already established; and when landowners, or tenants, require to build new houses, whether for a small, or a large number of cows, it is hoped that the adoption of the System detailed in this treatise will be found of great advantage, not only as contributing to improve the production of a more pure and wholesome beverage so universally used as milk, but as tending to benefit the health of cattle used for dairy purposes. These two objects being attained, the prosperity of the dairy system, and of those who embark in it, will follow of course.

In close, or ill ventilated cow-houses, the cattle will often be found in a profuse perspiration, which is brought on solely by their inhaling an atmosphere deficient in vital air, (oxygen gas;) this necessarily exhausts their

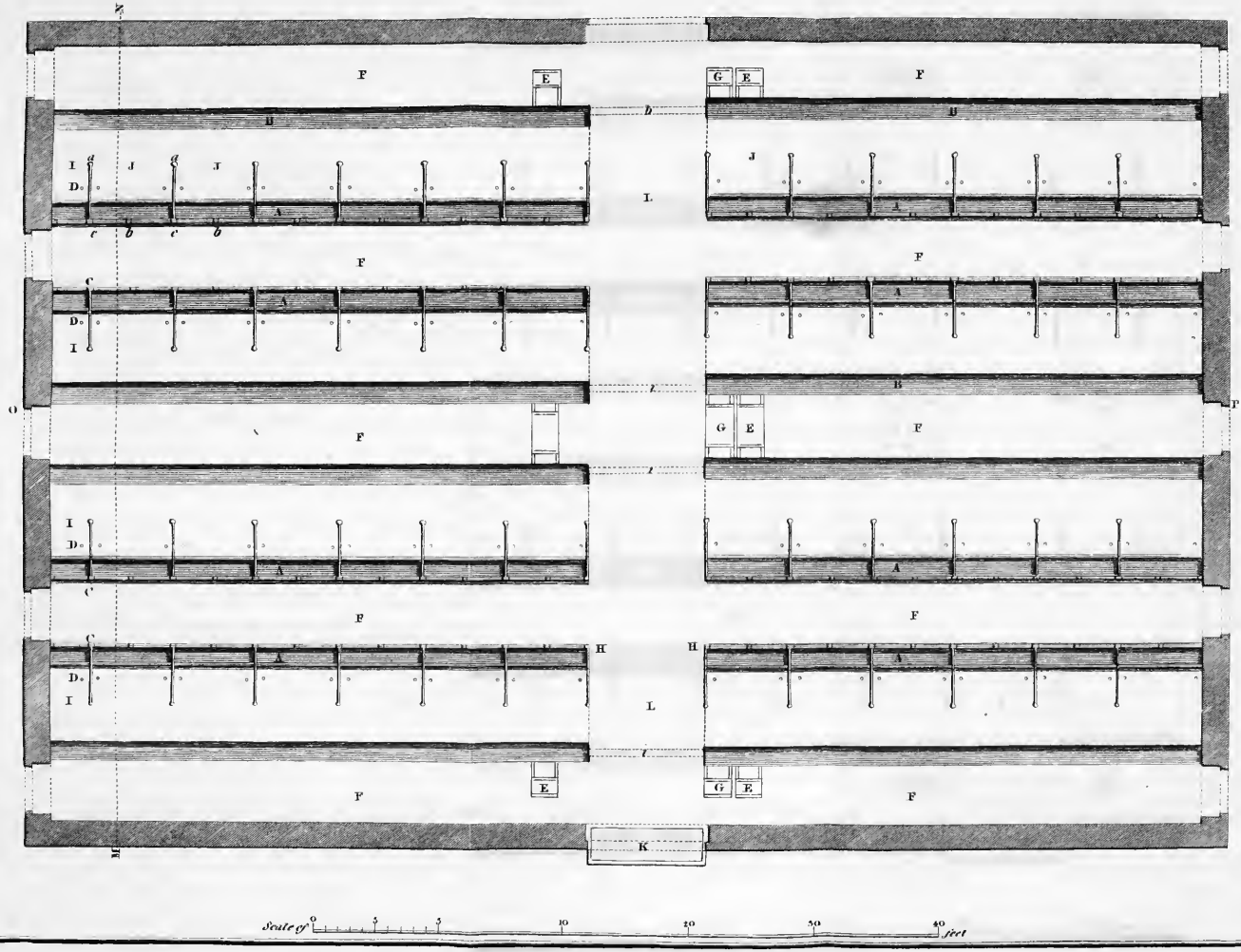
vigour, and makes them liable to be injured by cold when the door is opened, or when they are turned out into the fields; and when they are milked in these dirty hovels, the milk is always impregnated with foul air. Every cow-house, even upon the smallest scale, should be properly ventilated, as subsequently described, and no stagnant water, or filth, should be permitted to remain in or near the premises.

The site chosen for the Willowbank buildings, as already noticed, was in a fine airy situation, at the head of Nile Street, upon one of the areas which formed part of the building plan of Blythswood's estate, and which was bounded on each side, by streets of sixty feet wide. In the centre of this area, the Author formed a mews-lane, twenty feet wide, running from east to west. The first cow-house which he built, and which was projected chiefly as an experiment, contained only twelve double stalls, and, of course, the accommodation was limited to only twenty-

four cows. In forming the new extended establishment, the first building was comprehended in the plan, and fronted the street on the east; it was bounded on the south, by the above-mentioned mews-lane, and additional buildings were constructed, which extended to the street on the west; these consisted of an engine-house, cow-kitchen, &c., which were placed nearly in the centre of the original range of cow-houses. A piggery, store-houses, &c. lined the street on the north, or lee side; the piggery fronted the range of cow-houses, and the area between these two ranges was causewayed, as was also the mews-lane: the whole was kept clean by constant sweeping.

The cow-house, which was last erected, was upon a grand scale, and adapted to contain one hundred cows. It was placed on the south-west part of the area, bounded by the mews-lane on the north, by the street on the west and south, and on the east by the public baths which the Author had built

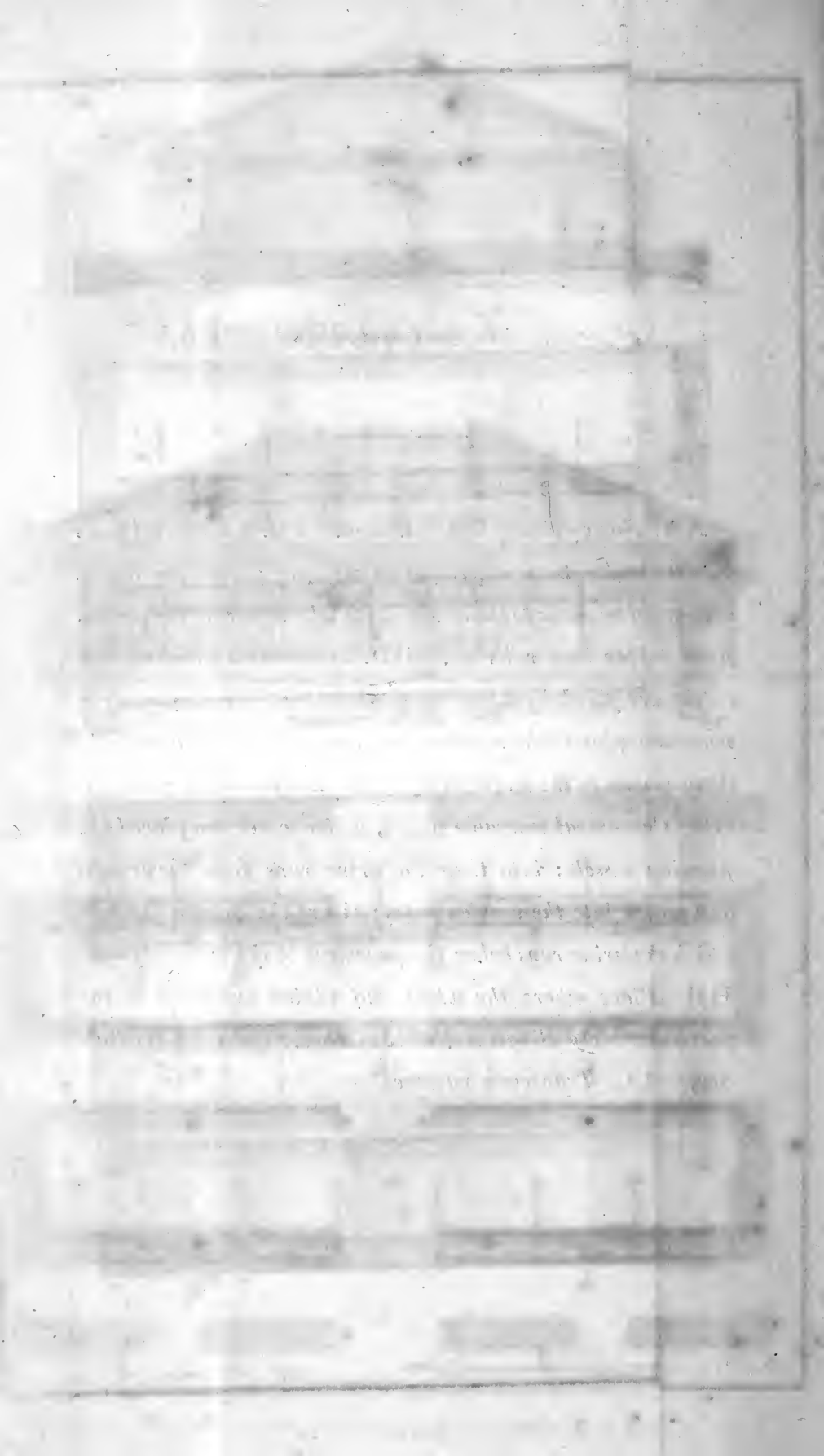
a few years before. Being on a steep inclined plane, it stood upon groin arches, forming vaults, divided into three apartments by transverse walls. The centre division received the dung from the grooves above, which either remained there till it was found convenient to cart it away, or the carts were placed under the aperture to receive the dung direct from the grooves. There were six apertures for the dung, formed in the brick arches, each eighteen inches diameter, and placed three feet distant from the transverse passage; those in the middle longitudinal passage were placed in the centre for the purpose of receiving the dung right and left from the double row of cows; and those in the two-side longitudinal passages were placed in the side of each passage close to the groove; but the apertures at the sides were seldom or never used; it was found better to wheel the dung from the grooves of the side-rows of cows to the central openings, because it was thus kept more closely together, and the cart entry below

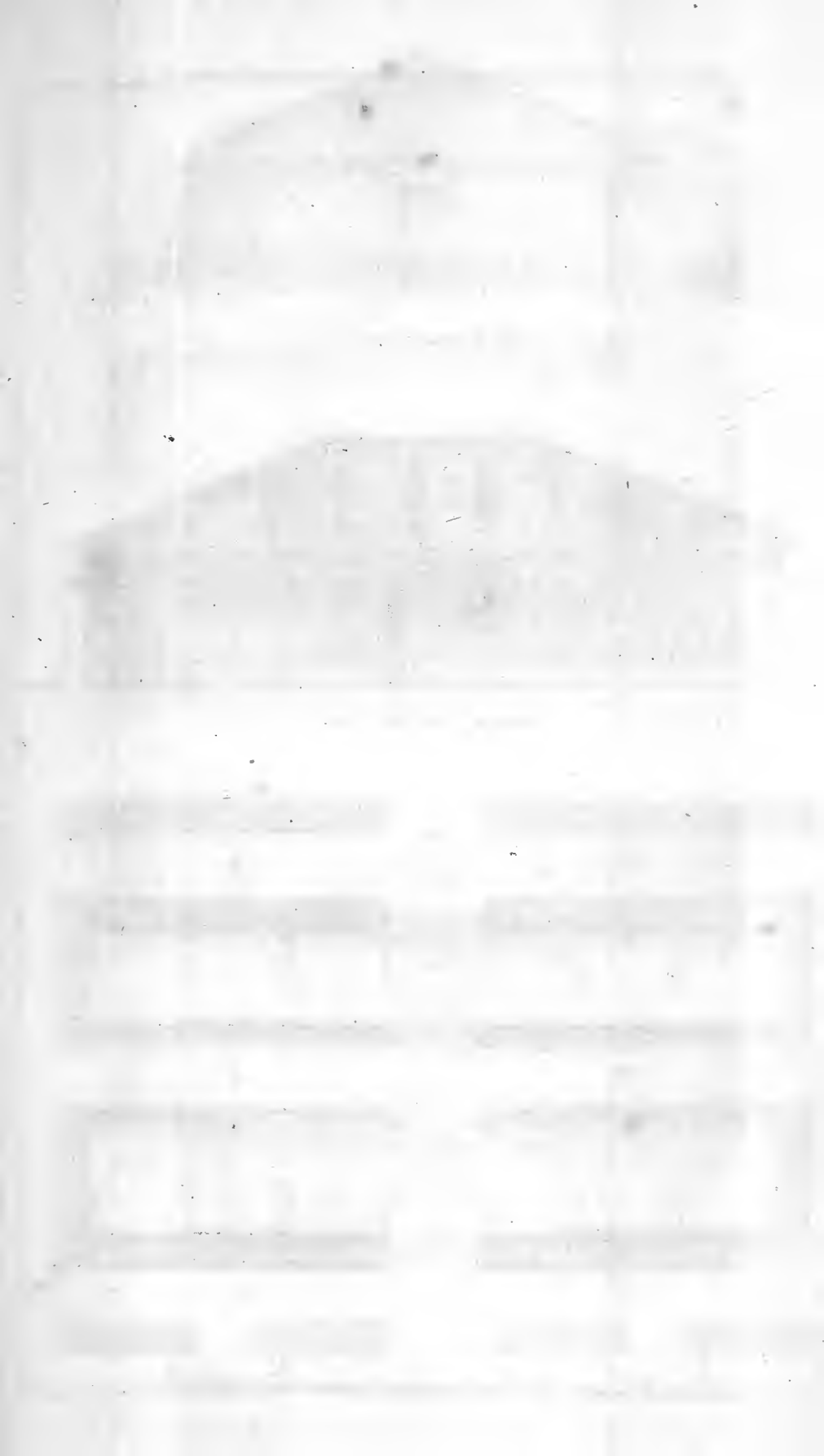


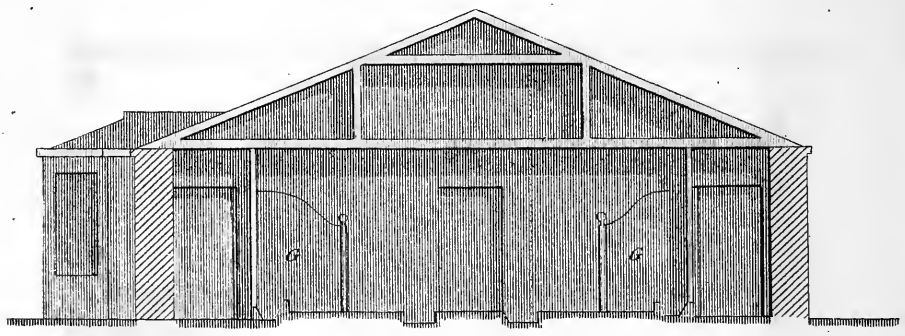
Engraved for the Rotherham Dairy System. Published by Ridgways London 1820

References to the GROUND PLAN.

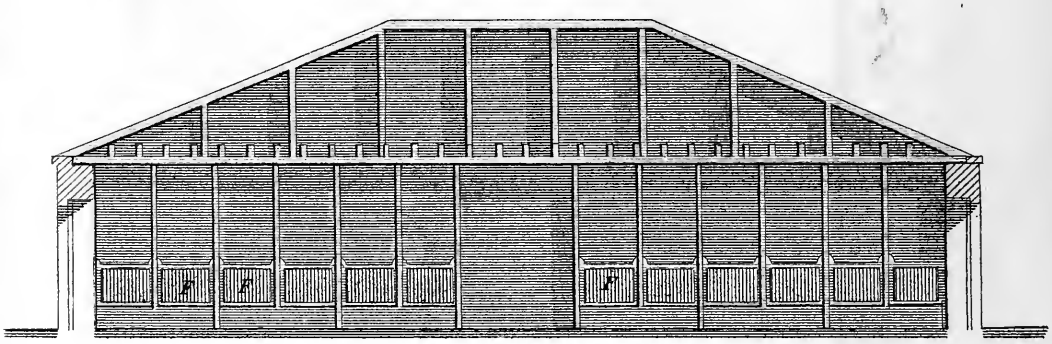
AA. *Stone cribs.* BB. *Grooves.* CC. *Cast-metal posts between which the wire frames* ee *are hung; these frames are suspended by cords to the iron rod* ff, *which go over the pullies fixed to the iron rails* gg. DD. *Iron stakes to which the cattle are fixed by means of small chains.* EE. *Cast-iron moveable plates which cover the opening through which the dung passes to the vaults &&.* FF. *Longitudinal passages.* GG. *Cast-metal moveable plates, under which are placed the filtering vessels; into these the urine runs from the grooves and passes into the wooden rones;* ii *are the grooves through which the urine runs below the pavement of the large passage.* HH. *Place where the wheel and pinion are fixed to the partition.* II. *Single stalls.* JJ. *Double stalls.* KK. *Balcony.* LL. *Transverse passage.*



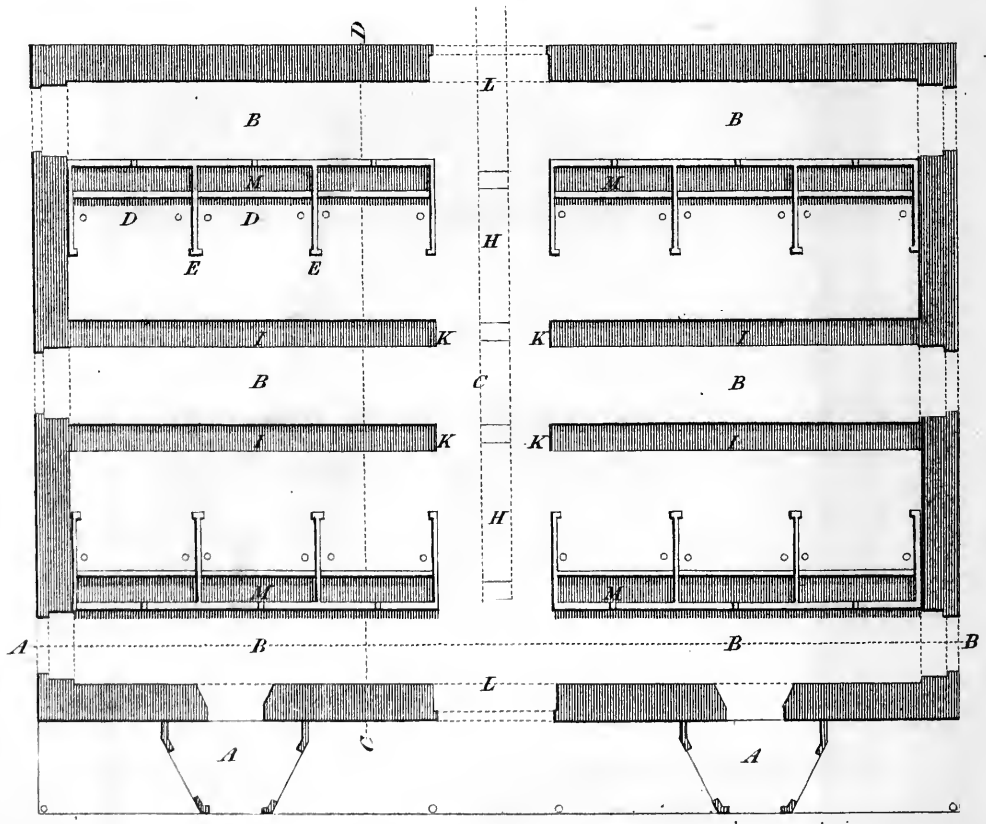




Section on the Line C.D.



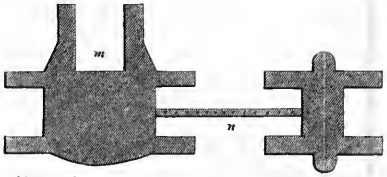
Section on the Line A.B.



Scale of Feet

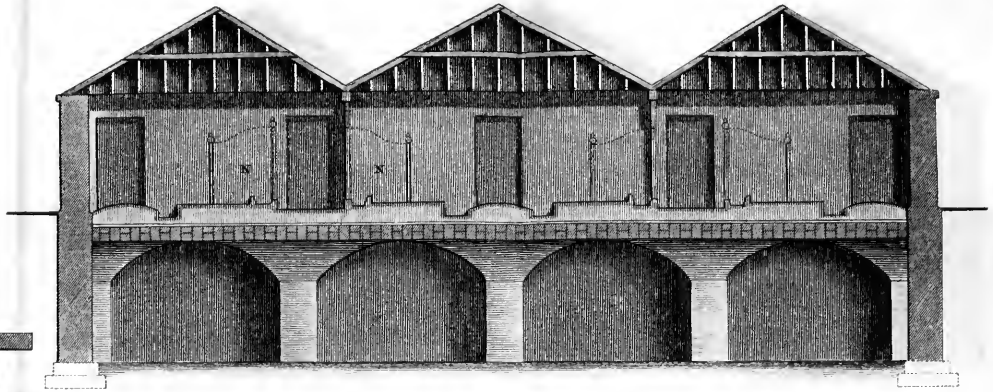
10 5 0 10 20 30

Plan of Cast metal Posts.
a a. ½ full size

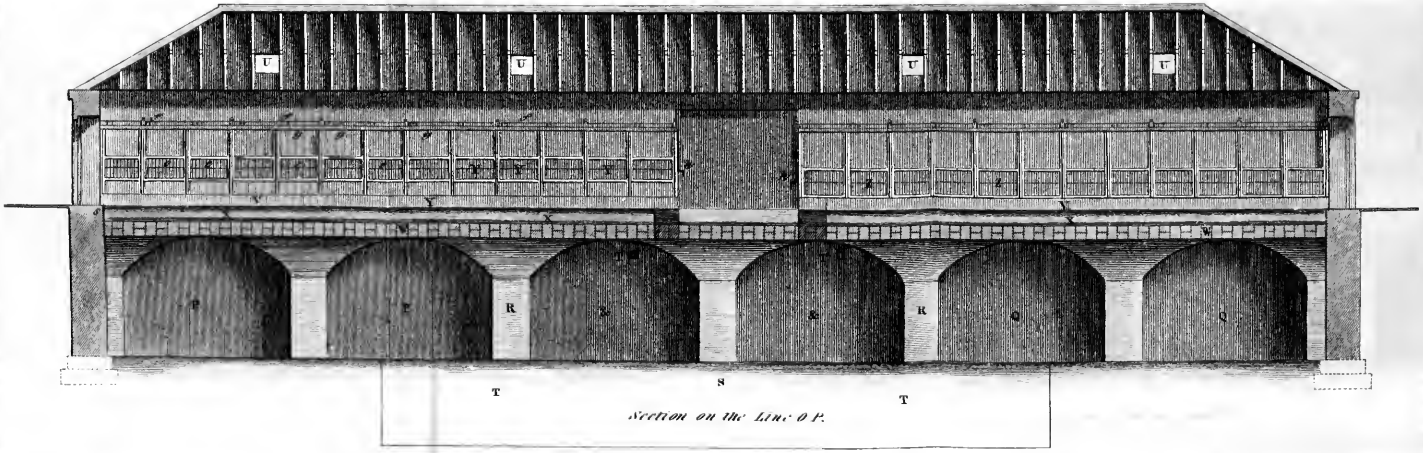


Plan of Cast metal Posts.
c c ½ full size.

Plan of Cast metal Posts
b b ½ full size.



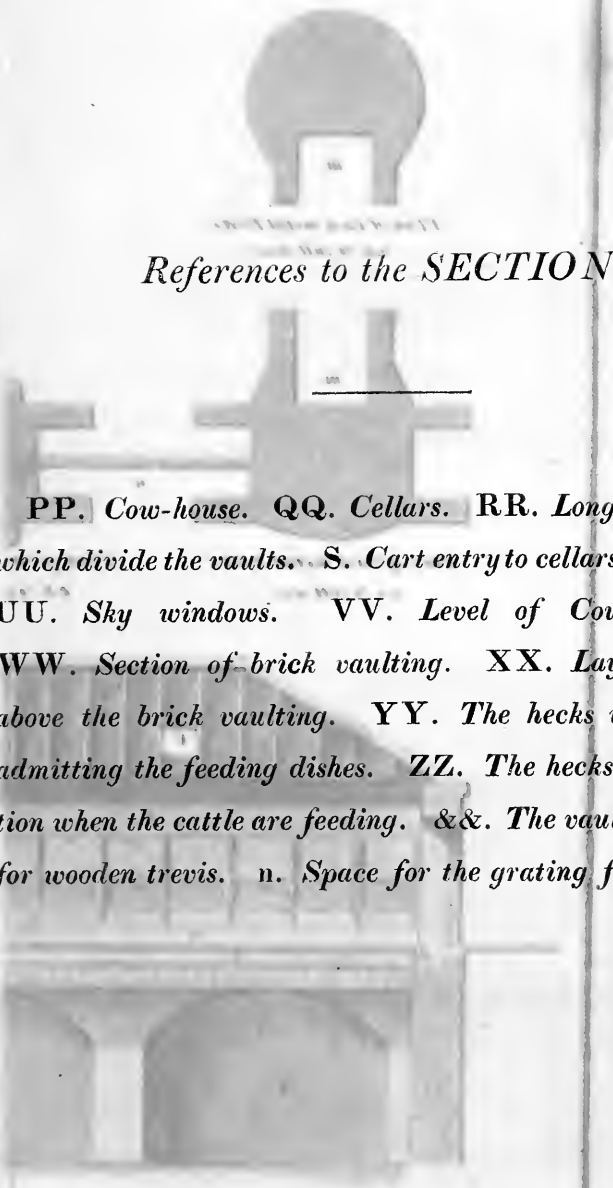
Section on the Line M.N.



Section on the Line O P.

scale of 1 0 5 1 0 1 5 2 0 2 5 3 0 feet

Engraved for the Hookham Dairy System. Published by Ridgways London 1820.



References to the SECTIONS.

PP. *Cow-house.* **QQ.** *Cellars.* **RR.** *Longitudinal walls which divide the vaults.* **S.** *Cart entry to cellars.* **TT.** *Tank.* **UU.** *Sky windows.* **VV.** *Level of Cow-house floor.* **WW.** *Section of brick vaulting.* **XX.** *Layer of puddle above the brick vaulting.* **YY.** *The hecks wound up for admitting the feeding dishes.* **ZZ.** *The hecks in their position when the cattle are feeding.* **&&.** *The vaults.* **m.** *Space for wooden trevis.* **n.** *Space for the grating for heck.*

was thus kept cleaner. There were cast-iron frames fitted into the pavement, across the longitudinal passage in the centre, to support cast-iron covers over the apertures, which were made flush with the pavement. The central cover was three feet long by two feet wide; and at each end it had an additional foot, making five feet in length, to correspond with the pavement. Each of the side pieces had a piece turned down at a right angle, which rested upon a curb stone at the side of the groove; this stone was rounded upon the top, and two inches higher than the bottom of the groove, to prevent the water from flowing over into the dung-hole. The covers had finger holes for lifting them up; the side ones hinged with crooks, and folded back to allow the dung to drop through the apertures; and this was drawn along the grooves with a broad, inverted, or hooked scraper, commonly called a clat. The whole of the covers were taken off when there were ashes or anything else to be mixed with the dung, which was carted along the

transverse passage; this mixture was often necessary to render the dung fit for carting, as the high feeding of the cattle made it rich and soft.

The south division of the vaults was fitted up for cows that were dry, and prepared for fattening. That apartment being quiet, and having little light, was deemed better adapted for carrying on the process of fattening than the other cow-houses, darkness and quiet greatly contributing to assist the progress, and make the cattle much sooner fit for slaughtering. The other, or north division of the vaults, was appropriated as a cellar for holding potatoes, turnips, and other provender; and it answered the purpose remarkably well, both from its effectually preventing the consequences of frost in the winter season, and affording a fine free ventilation by openings to the lane from the upper part of the roof.

Along the south side of the cow-house was a road forming an inclined plane, which turned the south east corner, and entered the cellars

by an archway at the centre; the bottom of this cellar, or dunghill, was paved with white stone, inclining towards the west, or farther end. At that end, or west side of the house, was a large tank, or reservoir, as a depository for the cows' urine; it was fifty feet long, six feet wide, and six deep. The surface of the tank was on a level with the bottom of the cellar; it was covered with flat brick-work, arched, leaving a space in the centre of the arch, four feet square, for taking out the sediment. This aperture was surrounded by a wall sufficiently high to prevent the dung from getting into the tank.

The grand building, which contained one hundred cows, was ninety-four feet long by sixty-three feet wide, within the walls; it was nine feet high, and covered with three roofs, in a pavilion form, the central one being twenty-four feet wide, and the others nineteen feet and a half each. These roofs rested upon two longitudinal beams, supported by cast-iron pillars. There were no horizontal ceilings;

the slates were hung to the rafters on pins, and were not lime-pointed, but had a good cover. This mode saved a considerable expense, ventilated the house better, and was found warm enough for the cattle in the coldest weather. There were thirty windows in the roof, each three feet six inches by one foot eight inches, hung with hooks and eyes, and having a latch-handle fastened to the bottom of the frame inside, to admit atmospheric air at pleasure, and promote ventilation. There were four windows in each side of the roofs, and one at each end. In warm weather, part of the doors and windows were opened, and when very hot, the whole were opened wide, which produced a free circulation of cool air. In short, by attending to a proper ventilation of the grand cow-house, and preserving at the same time an equal temperature, the cattle, whether for milking or fattening, were uniformly kept in good health, and in the finest condition.

The heat was generally kept at the tempe-

rature of from 60 to 64 degrees of Fahrenheit's scale; and as the walls were plastered carefully, the cattle never experienced any injury from cold, even in winter. It was often necessary, however, even at that season, to open some of the windows on the lee side of the house; and if more air was wanted, it was found better to open one or more windows on the windward side, than to open any door. It was customary, also, especially in cold weather, before opening the doors at the end of the feeding passages, to shut all the windows; as a direct current of cold air suddenly admitted, was found to be exceedingly injurious. Great care was also taken to have all the doors and windows tight, and not to admit cold air but when necessary. There were, in all, eleven doors to the grand cow-house, viz. one at each end of the five longitudinal passages, measuring seven feet by three feet six inches; and one at the end of the wide passage, fronting the balcony, seven feet by six feet. All the passages were laid with the

hardest hewn free-stone; the five longitudinal ones were five feet wide, commencing at the side walls; the transverse passage was nine feet wide, near the centre of the building, there being four rows, of twelve cows each, on one side, and four rows, of thirteen cows, on the other side.

The passages were rounded two and a half inches across, which made them wear much longer, and if any liquid was spilt, it ran off.

The floor on which the cows stood was raised six inches above the passages; this not only *showed the cows to greater advantage*, but kept them dry and clean; and two and a half feet of the floor next to the trough was made of composition, similar to what is commonly used in making barn floors; because the principal weight of the cows being upon their four feet, and as in lying down the whole weight is upon their knees, it was obviously desirable to have that part of the stall as smooth and soft as possible. Indeed, it is conceived that joists and flooring would be

the best for that purpose, were it not for the expense. The back part of the stall was of hewn stone; and for about eighteen inches towards the groove, there was an inclination of about half an inch, to let the water go off; and these eighteen inches were of stript ashlar transversed, the strips being about an inch separate; this prevented the feet of the cows from slipping. In all cow-houses, perhaps, the front part of the stall should be rather lower than the back part, since it would enable the cattle to lie easier; and, besides this, they would not be apt to slip their calf. It may here be recommended, *en passant*, that cows which put out their calf bed, or have a tendency to slip their calf, should have a straw mat laid below their hind quarters.

The bottom of the feeding troughs were on a level with the floor of the stalls; both edges were of hewn stone; the outer one next the passage was three inches above the bottom of the trough, and the other six inches higher; they were four and a half inches thick, and

rounded to a semicircle; the trough was one foot three inches wide, and six feet four inches long.

The space between the longitudinal passages was nine feet six inches; in some of the cow-houses there were six inches, more or less, for the different sizes of cows; of which one foot six inches was for the groove, and two feet for the grass, or hay trough; leaving six feet from the inner side of the trough to the inside of the groove. This space was subdivided, in the other direction, by wooden partitions, distant six feet four inches, which contained two cows; each cow being fixed to a stake nine inches distant from the partitions, and six inches from the grass trough, so that the stakes were five feet six inches apart from the inside of the groove. These stakes were made of cast-iron, with a quarter of a circle of nine inches at top, and a cross head six inches long, which had a hole at each end for screw bolts to pass through the partition; so that there were two stakes bolted together

through each partition, and forming a semi-circle; this kept the stakes firm, and prevented the cows from putting their heads over the partition, or trevice. The partitions were supported at each end by round cast-iron pillars, with ball tops, rising five inches above the partition; those which were next the passages were connected by a lintel and pilaster; the latter was placed in the centre between two pillars, enclosing two *hecks*, to prevent the cows from pushing the hay or grass out of the trough into the passages. A range of these hecks, embracing one half of the length of the cow-house, were pulled up and let down when the cows were fed, by the operation of a wheel and pinion, placed on the outside of the partition in the transverse passage.

The partitions of the grand cow-house were all of wood, one and a quarter inch thick; they were four feet long, five feet three inches high at the end next the passages, and moulded down to four feet three inches at the other end; these were supported by cast-iron hollow

pillars, two and a half inches diameter, with grooves for receiving the partitions. Two rows of these pillars were lengthened to nine feet, to support the main beams of the roof; a perpendicular pilaster of cast-iron, two and a half by two and a quarter inches, with grooves for the hecks, was placed in the centre, between two pillars, at the passages, supporting a cast-iron lintel, four by one inch, with a ledge for receiving one and three quarter inch pullies, over which ropes were passed for drawing up the hecks.

All the hecks were three feet two inches long by one foot ten inches deep, framed with deal two and a quarter inches wide by one and a quarter inch thick, and were filled up with one horizontal and ten perpendicular iron rods a quarter of an inch diameter.

There were iron rods five eighths of an inch diameter, screwed into each other the whole length of the subdivision. The hecks were hung with window line, and put through holes

in the iron rod, and a knot cast on the upper side of the rod; there were also three feet of a cart rope, next to the wheel and pinion, which went over a large pulley placed on the top of the partition at the transverse passage. At first, ropes were used instead of iron rods; but the strain upon these was so great as to prevent the hecks from being moved smoothly and without noise.

The chains for fixing the cows to the stakes were placed on swivels, with a ring three and a half inches diameter, allowing an inch of play; and the stakes were two and a half inches diameter, of solid cast-iron. The chains were three feet seven inches long, consisting of twenty-one links, viz. three on one side of the swivel, and eighteen on the other; the short end of the chain had a hook for joining the chain, with a broad point of an oval shape, which was more easily hooked and unhooked, and answered the purpose better than the common mode used in dogs' chains.

The ordinary method of fastening cattle in

cow-houses, is, to fix the neck of the animal between two stakes, similar in appearance to that of a culprit in the pillory. This, to say the least of it, is exceedingly improper; for it completely prevents, what is at once a natural and very necessary operation of the animal itself, viz. the licking of its skin; whereas, by the mode of fastening by a chain and swivel, the cows can at all times apply their tongue to any part of the body as easily as if they were in the fields. Nor was any danger to be apprehended from their liability to attack each other, since those in the same stall were too far distant to commit any injury with their horns; yet they were frequently observed licking each other's foreheads, and such parts of the body as they could reach.

The Author is persuaded that it is of importance to indulge the cows in their propensity to lick with the tongue, as it contributes, like currying, to create a free perspiration, and to increase the circulation of the blood; it also tends greatly to promote the general health

of the animal. A strict attention to the proper ventilation of the cow-houses, is likewise of the last consequence; it not only preserves the health of the cattle, but prevents any accumulation of foul air, and thus the milk runs no risk of being tainted from that cause, as has sometimes been experienced even in passing it from the cow to the pitcher; besides, in a close ill-ventilated cow-house, this evil always results, that the breath of the animal is rapidly absorbed by the timbers, which causes them soon to rot. It is also considered to be improper to have hay lofts immediately above the cows, as their breath taints the provender; and there is, moreover, great danger from fire. This was completely guarded against in the roof above described, there being no wood, except the couples and rafters, which were not liable to such a casualty; indeed, had they been accidentally kindled, they could have been easily extinguished.

The grooves of the cow-house were, as before mentioned, one foot six inches wide,

six and a half inches deep at the end next the side walls, and twelve and a half inches deep at the transverse passage; thereby forming a declivity of half an inch for each cow, to allow the water to run towards the centre of the house, where it ran off as already described. The grooves were also formed upon an inclined plane towards the cows, so that, by drawing back the dung to the side of the groove next the passage, the water ran freely towards the centre of the house, and passed into a circular vessel which was sunk under the passage and covered with plates of iron.

There were three apertures of eighteen inches diameter, which were used as filtering apparata. One of these was in the centre of the middle passage, and upon the north side of it. The filter barrel was sunk about two inches lower than the bottom of the grooves, which were hollowed or washed down to the mouth of the barrel. The urine from the south divisions was carried under the transverse passage; and thus all the urine

of the fifty cows went into the filter, which was placed in the centre of the middle longitudinal passage. All the filtering barrels were covered with cast-iron plates similar to those of the dung apertures; but the pieces that were turned down at the side of the groove, were perforated with small holes for the filter; and in order to filter the water, and prevent the pump from being choked, the filter vessel was perforated all round with small holes, and placed in the inside of another vessel, upon which it rested, or rather hung, by an iron chim, which was run round its mouth; it had a handle across the mouth for the purpose of lifting it up to empty the sediment among the dung. The other vessel was four inches larger in diameter, and receiving the water through the holes and at the top, emptied itself into a wooden conduit, or rone, which carried it along the roof of the cellar to the tank. With all this care, however, it was found that the sediment soon choked the pump; to prevent which, a division was made at one end of the

tank, where filtering boards were placed, with very small holes; this kept back the sediment from the pump, and it was afterwards taken from the tank by pails, when necessary; it was then mixed with ashes, which formed an excellent manure for turnips, and other vegetables. As the dung was preserved from wind and weather, it was considered worth from twenty-five to fifty per cent. more than dung exposed to the atmosphere; it sold at from five to eight shillings per ton; the cow water sold at from four to six shillings per butt, of about four hundred gallons.

According to the best calculation, the manure of each cow was worth, upon an average, about five pounds sterling per annum; the proprietor, however, used the greater part of it for his own gardens, and farm.

In the wall, at the end of the tank, was placed a large wooden pump for throwing up the water into wooden rones, by which it was conducted to the cask, or urine carts. It was ascertained that the urine soon corroded iron.

As every thing at the Willowbank Establishment was arranged upon a methodical plan, its perfection as a system soon attracted no small share of public attention. This was, at first, attended with considerable inconvenience; for the number of visitors whom curiosity drew to the premises was productive of a double evil, that of interrupting the servants, and disturbing the cattle. A remedy, however, soon suggested itself to the Proprietor: he immediately gave directions for erecting a balcony in the new cow-house, from which *a bird's-eye view of the whole interior of the cow-house, and its hundred cows, could be obtained at one glance,* without producing the slightest annoyance or inconvenience, either to the servants or cattle. In constructing this improvement, the Proprietor was induced, for various reasons, to study effect; the chief object, however, was to gratify the numerous spectators, whose frequent visits had now become highly excited. The balcony was, therefore, erected on the outside of the building, opposite to

the main passage; it was about four feet above the level of the floor, and open in front to the cow-house, where a large curtain was suspended. Visitors, on their arrival, were requested to insert their names, and place of residence, in an album, kept for that purpose. The keeper then, by means of a pulley, drew aside the curtain; when the whole establishment, with its hundred cows, and their attendants, were instantly presented to the view of the delighted and astonished spectators. Princes, noblemen, and gentlemen, from almost every quarter of the globe, bore testimony to this interesting panorama. All, indeed, were charmed with the order and arrangement observed in the plan, and uniformly lauded it as unrivalled both in execution and design.

After the balcony had been erected, the Harleian cow-house became, as it were, one of the "lions" of the day. In fact, to visit it occasionally, became the fashion of the town; and the Author, to gratify the desire that prevailed, had copper-plate tickets of admission,

engraved with a design, symbolical of a woman milking a cow, and groupes of children drinking milk under the Glasgow Arms. These tickets were adapted for the admission of any number from one to six. The admission was fixed at one shilling each, which actually produced about two hundred pounds per annum. There was, besides, an immense number of private friends of the Proprietor, and others who were introduced to him, who were admitted gratis.

This celebrated Dairy Establishment was pleasantly situated to the north west of the city, upon a rising ground, adjoining the extensive gardens and walks of Willowbank.

The rural situation of these walks in the immediate neighbourhood of the city, formed a strong feature of attraction to young persons and children, who, every morning and evening, were in the habit of coming (some from a great distance) to enjoy a delicious regalement of unadulterated milk.

The cow-houses, and the whole premises,

were latterly lighted with gas; the large cow-house, from a brass lustre, with four branches, which hung over the centre of the transverse passage. This lighted the house well, and imparted a fine effect when viewed from the balcony. In establishments of this kind, where there is no public company, a small gas apparatus might be erected on the premises, which would not only furnish a light in all respects preferable to that of either oil or candle, but be, on the whole, much more economical.

CHAPTER II.

To the east of the cow-house there was, formerly, a deep ravine, or old quarry, with a rivulet at the bottom. Here cold baths were formed in the low ground, and hot baths higher up. Upon the south side, the ravine was arched over; and one of these arches was formed into a milk-house forty-five feet long, twelve feet wide, and twelve high, from the floor to the centre of the arch; the side walls being six feet, and the radius of the semicircle six feet. In the centre of the arch were five circular openings, ten inches in diameter, covered with wire cloth. The entrance was from the north, and was lighted by a large window in the south end; this window was also covered with a guard of fine wire cloth. The

whole north end of the house, including the door, was framed with wood, and covered with wire cloth. The side walls and roof were lath and standard, plastered with Roman cement, and a space was left all around to promote a circulation of fresh air. The six inches of the circular space between the walls and plaster, were covered with strong iron grating, for the purpose of admitting air behind the plaster, as well as to the side walls and arch. There were a number of fancy circular and diamond frames, four inches diameter, filled with fine wire cloth; these were neatly arranged, about three feet distant in the lath, and made to finish flush with the plaster; by this means a free circulation of air was promoted, and it also exhibited a pleasing appearance to the eye.

The floor was paved with polished ashlar stone of the best quality, and laid upon parapet walls, (to preserve it free from damp,) with an inclination of about an inch and a half from the entrance to the south end, which termi-

nated in a cesspool. Under the pavement was a drain to carry away the water from the north end, where there was a water pipe, and a stop cock. The milk dishes were placed upon the pavement, right and left, leaving a space for a passage in the centre; they were then filled with new milk from three to four inches deep. When all the vessels had been filled with milk, a plug was put into the cesspool; the stop cock at the north end was then turned, and the water allowed to flow until it covered the floor where the milk vessels were placed. This cooled the house; and the fixed air, or the spring of the water, carried up the steam of the milk through the circular opening in the top of the arch. When the dairymaid went to cream the milk, the plug was taken out to let the water off. If any milk or cream was spilt, it was easily cleaned up, from the floor having been previously wet. The floor was regularly washed and rubbed with a dry cloth, which, with the complete ventilation throughout the premises, kept the

atmosphere very pure. In order to make the circulation of air more effectual, a tunnel, about a foot square, was conveyed under the street, along the top of the arch; and two transverse tunnels crossed and communicated with the central one in the middle of the house; that is, they were carried from the sunk area, on the south, to the north side of the building. There were strong wire gratings put at the mouth of these tunnels, to prevent vermin getting in. It was not necessary, however, to devise any plan for keeping out flies from the milk-house, as it was remarked, whenever any got in by accident, they did not survive, owing to the coldness and rarefaction of the place.

A milk-house might be made equally efficient adjoining to the cow-house; the whole, or part, to be sunk under the ground, but to be perfectly free from damp; the milk could then be conducted to it from the milk office by a pipe; but the house should be shaded from the sun, with a northern entrance. It

might be arched, as already described, and roofed over, the space between the roof and the top of the arch serving for the tunnels mentioned in the other milk-house. The floor of the house might be an inclined plane, as in the before-described house, but divided into three spaces; the two side divisions to be raised eighteen inches or two feet above the floor, with a curb stone in front two or three inches high, to prevent the water from coming into the passage. The bottom and sides might be of brick, plastered with Roman cement; this mode would keep the passage always dry, and prevent the inconvenience of the dairy-maid's stooping to cream the milk. There should, also, be only one tier of milk vessels; for where there is one shelf placed above another, the steam arising from the under shelf will gather upon the one above it, and taint the purity of the atmosphere. Private gentlemen, farmers, &c. might have small milk-houses upon this plan, cold water, and free

circulation of air being the principal requisites. The milk-house should always be erected to windward, being thereby protected against any effluvia arising from other parts of the premises.

The churning-house at Willowbank was ventilated and lighted by windows in the north side and in the roof, covered with fine wire grating.

The milk office contained the large tubs for receiving the milk from the cows, from which it was measured out to the distributors. There were rows of racks, or stands, and long pins; the former for holding the milk pitchers, and the latter for hanging up the measuring jugs, lids of pitchers, &c., of each distributor.

The counting house was situated near the gate, and commanded a view of the court, as well as of all who entered and departed, either on business, or as visitors.

The manager had a house within the premises; the dairymaid and one or two of the

servants were also accommodated there, it being necessary they should be on the spot night and day.

There was a scullery, or kitchen, adjoining the milk office, into which hot and cold water were brought for washing the vessels. There was also a boiler, in which, after being washed and rinsed, these were scalded. They were then dried upon a rack, and the milk pitchers, measures, &c. were taken to the milk office, and set in their proper places.

Two apartments, one for the men and another for the women, were allotted for the purpose of keeping their clothes; and that they might the more conveniently change them, before going out to deliver the milk, numerous clothes' and towel pins were fixed in the wall; and the rule to be implicitly obeyed by the servants was, that their hair was to be combed, their hands and face washed, and their dress to be neat and clean. Cleanliness, indeed, was always regarded as essentially necessary in this, as well as in every other

part of the establishment; a task often of very difficult accomplishment, every one, when challenged, being too much accustomed to give the irritable reply of "Tut! I canna be fashed." The Author has often thought that much good might result from having a copy of the *Cottagers of Glenbirnie* in every dairy establishment, and some of its excellent passages occasionally read or impressed upon the minds of the servants, particularly those who have the care of the milk within doors; as it is too often either spoiled or deteriorated from the vessels not being properly cleaned. It is well known that if milk be put into a place, not well ventilated, or where other articles are kept, it will affect its flavour. This was often ascertained by some of the Willowbank customers having their milk deteriorated after remaining a short time with them, whilst it retained its rich flavour with others who received it from the *same pitcher, and at the same time.*

Upon the front, and along one side of the

first range of cow-houses, was a projection of about six feet over the walls, (similar to a Chinese roof,) nearly flat, covered with composition. This was supported by hollow cast-iron pillars about four inches diameter, by which the water was conducted from the roof into the common sewer. There was also an area in front of the house, and a space fitted with seats, under the projection, for the accommodation of milk customers, and servants with children.

The space along the side was allotted for wheel barrows, feeding dishes, and other utensils, and for the use of servants when cutting the tops of turnips, or other work of that description, in wet weather; the milk carts were also placed there.

CHAPTER III.

THE area of ground mentioned in a former page, was subdivided by a mews-lane, twenty feet wide, supported by two arches; the floor on the same level as the floor of the cellars under the cow-house.

The steam engine, and all the machinery connected with it, stood on the north side of the same lane, near the centre of the first range of buildings. The boiler from which the engine was supplied with steam, was close to one of the arches; and this latter served as a commodious cellar for coal dross, which was let down to it most commodiously by an opening in the lane. At one corner of the cellar, near the furnace, was a space about four feet square by two deep, which was kept

filled with dross, saturated with water; and it was believed that the same quantity of dross gave more heat, and lasted longer, when put into the furnace wet.

In an open space, by the side of the main passage, were the steaming vessels. This space divided the barn from the churning house; the former being on the left hand, and the latter on the right, in going northward across the buildings. All the machinery was upon the ground floor, and on the same level with the cow-house. Underneath this, were cellars which communicated with those under the cow-house by one of the arches mentioned above: the laying shafts, with drums, &c. were hung from the joists; and apertures were made in the floor, through which the belts passed to propel the machines; namely, a threshing-mill and fanners, a turnip and potato slicer, a hay and straw cutter, a corn bruiser, and the churning apparatus.

These machines are now so common, and so well understood, that any particular descrip-

tion of them would be superfluous. Their convenient arrangement, and the trifling expense of working them, were the peculiar advantages of the system adopted at Willowbank. The steam engine was one of about six-horse power; but the boiler could have supplied an engine of twelve-horse power. Coiled within the boiler was a leaden pipe 150 feet long and two inches in diameter; cold water was admitted at one end of this pipe by a stop cock, and the water was heated in passing through the boiler. Branches were taken from the other end of the pipe to the scullery, hot baths, bakehouse, &c.

A steam pipe from the boiler was introduced into the steaming vessels, for preparing food for the cattle; so that one fire of dross was sufficient for the whole establishment, and did not cost more than one shilling (the price of twelve cwt. of dross,) per day.

The milk office, and other apartments, were also heated by hot water vessels.

The Author having applied steam to so

many purposes at his establishment, he obtained a celebrity with the public, and especially among the wags, for more feats than he really performed. For instance, it was often said that he not only milked his cows by steam, but achieved other things still more wonderful by that power.

The steaming vessels were made of plate iron; the one for the cows was ten feet long, four wide, and four and a half deep, with a semicircular top, hinged on one side, and lifted by weights and pullies: the lid was formed round the edges, to prevent the steam from escaping. The cut provender, consisting of turnips, hay, &c. was put into this vessel, in layers, well salted, and with a sufficient quantity of water. The vessel had a false bottom, perforated with small holes about four inches from the real bottom, under which the steam was admitted. The potatos were generally steamed by themselves in a vessel; and the fresh water, which is deemed unwholesome, was run off. This is the com-

mon practice observed in boiling potatos for family use, and it is a correct one. In preparing potatos for soup, the first water should be always run off; if it be changed three or four times, and a considerable quantity of salt put into the last water, the Author can certify that the potatos will be *drier* and *clearer* when brought to table than when boiled in the common way. The steam vessel for the horses was four feet long, two feet nine inches wide, and three feet deep, and had a lid and other apparatus similar to that used for the cows. The potatos, turnips, &c. for the horses were washed clean: those for the cows were not washed, but put in by themselves, and when at the boiling point, the first water was let off; they were then mixed in the large vessel, in alternate layers, with turnips, hay, &c., and sprinkled plentifully with salt.

There was a stop-cock under the false bottom for drawing off the liquid when the mash was ready.

The mash trough was placed alongside

the steaming vessels, about eighteen inches lower. It was about eight feet square; the bottom was of polished ashlar; the sides of pavement were two feet high, seven inches thick at bottom, and five at top; the whole was jointed with Roman cement. The trough had also a wooden cover, or frame, to fit, which was five inches high all round, bolted to the stone and rounded at the top to a semicircle; this prevented the stones from being chipped. The bottom of the trough had a dip at one end, sloping to the centre, about three inches deeper than the bottom; this enabled the mashman to clean it out.

CHAPTER IV.

EVERY milker had a strong tin vessel, without a lid, which held about forty quarts. As each cow was milked, the milk was emptied into this vessel, which was placed in the transverse passage, to be out of the reach of any thing that might fall into it were it placed in the passage behind the cows. When the vessel was filled it was carried to the milk office and emptied into the receiving tub, and the quantity marked upon a slate by the clerk, or person in attendance; this task was repeated till all the cows were milked. The total quantity of each milker was then summed up and entered from the slate into the milk-book.

Each distributor had a pair of milk pitchers,

with lids to fit tight, which contained from twelve to eighteen quarts. These were locked and secured to prevent adulteration.

The distributor also carried retail measures, containing a Scotch pint (at six-pence), a quart (at three-pence), a sixth of a pint (at a penny), and a twelfth (at a halfpenny).

In measuring out the milk to the distributors in the milk office, oblong measures, narrow and deep, were used, which contained ten quarts each; there were likewise small ones of the same shape, which contained two quarts each, divided into a penny and halfpenny worths; but these were chiefly used to measure the milk returned by the distributors. In order that the article might be perfectly free from every extraneous substance, there was in constant use a milk sieve, with a block tin rim, and a bottom of the finest brass wire cloth: this vessel was placed upon a frame which went across the mouth of the receiving tub.

The milking pitchers, which held about fourteen quarts, were made of black, or dark

oak wood, with a white stave for the handle, six inches longer than the rest; this was graduated, and the scale burnt with a sharp-pointed hot iron, which made the figures more distinct. One day in the week (Friday was the usual day), the quantity of milk produced by each individual cow was measured, morning and evening.

The clerk, or the person who carried the milk into the milk office, had the number of the cows upon a slate; and as each cow was milked, the pitcher was placed upon a table in the transverse passage; by looking at the white stave, the quantity was at once seen, and marked upon the slate, and afterwards transferred to the proper column in the milk-book.

The milk vessels for the carriages were oblong, similar to the churns, but wider; they contained about thirty-six Scotch pints each, and had a folding iron handle on each side for lifting them into the carriages. The lid was fastened with a cross iron bar, one end

of which went into the eye of a piece of iron which was fastened to one side of the vessel; there was a hasp at the other end of the bar, which was folded down over a staple, and padlocked. On each side of the vessel, transverse to the bar, was an iron screw, of about three eighths of an inch in diameter, fastened to the vessel; the points of which came up through the side of the lid, and were screwed down by a long-tailed screw-nut; and to make the lid quite tight, a gaskin was put round the mouth of the vessel.

Each of the vessels had a float of block tin, or thin oak wood, as large as the vessel would admit; this floated on the top of the milk, and descended as the milk was drawn off, which prevented agitation. In barrels, &c., where there is no float, and much carriage, the milk will be partly churned before it is sold off. In consequence of the lids being moveable, the vessels were also much easier cleaned than they would have been if there had been only a small opening.

In the milk office were several large receiving tubs, each containing about six hundred quarts, graduated into divisions of ten quarts, or five Scotch pints; from these vessels the milk was measured into the distributing vessels.

Most of the vessels for raising cream were made of oak, and were well washed, rinsed, and boiled every time they were emptied. To prevent the bottoms from twisting or warping by boiling, there was a second bottom transverse, and the two were pinned together, as in ship-building. They were twenty-seven inches in diameter, and five inches deep.

The vessels for holding milk and cream for souring stood in the churning-house, or in an adjoining apartment; they were made of wine-pipes cut in two, clean dressed by the cooper, and graduated into divisions of ten quarts; the milk, or cream, stood in them till it was thick and sour, without which it would not churn to advantage. There was a vessel for each different milking, as it was found injurious

to mix the milk; and if milk and cream were put in at different times, it was always well stirred. It was found, however, that the preferable way was to keep every quantity distinct, and to allow it to become sour by itself. The milk was always cooled in vessels, such as those used for raising cream, before it was put into the tubs for churning.

The churns were propelled by means of a steam engine, and were made upright or oblong, each containing about two hundred and fifty quarts, and graduated into divisions of five quarts.

The lid was made to fit close; but a fourth part, or the half of one side of it, was hinged, so as to be opened in order to see how the churning was going on. In the centre of the lid was a hole to fit the churn-staff, with a chim or guard round it, to send any of the liquid that might come up with the staff down into the churn again.

The stroke of the staff could be shortened or lengthened at pleasure, according to the

quantity that was put into the churns. Besides the fancy holes that were made in the foot or bottom of the staff, which was contrived to fill the mouth of the churn, the under side of the foot was closely grooved across three eighths of an inch deep; as it was conceived that these hollows, or grooves, took down a portion of atmospheric air, and thereby tended to facilitate the process of churning.

Large stands, such as are used by masons' labourers for carrying water, were filled at the mash trough, and carried to the head passages at feeding time; from these, the feeders gave a small additional quantity of food to the cows as they required it; but great care was taken not to give too much to any. Some distillers' wash, or water, or a mixture of both, was then given them to drink; and when the animals were satisfied the vessels were removed.

There was also a feeding vessel, or tub, for each cow, which was made of oak twenty inches in diameter and ten inches deep, with

a handle on each side flush with the mouth, so that one tier might be put above another at the mash tub, when filling.

There was as much cut out of the wood as to allow the fingers to get in below the handle, which was made of rod iron half an inch diameter, with the ends flattened and made fast between the hoops and the staves; these were also nailed to the sides of the vessel.

There were, likewise, common pitchers with folding iron handles, which held from twelve to fourteen quarts each. The mashman, and each feeder, had one of these; and every two milkers had one between them for washing the passages, &c. Each milker had also a wooden stool to sit upon when milking, about a foot high, with three feet well spread out.

All the wooden vessels were tapered, just as much as was necessary to keep the hoops fast; which latter were made of iron, and each vessel was graduated and marked with the point of a hot iron to show the figures or marks more distinctly.

The tin vessels were not tapered, but were all graduated with slips of block tin soldered to the vessel inside.

The milk carriages were hung upon springs, or chains, to prevent shaking, if possible; and they were drawn by small ponies. The vessels were labelled "New Milk," "Skimmed Milk," &c., in order that the customers might be sure of the quality of the article which they purchased.

Each distributor was provided with a bell, to warn the customers; and if any unreasonable detention occurred, the customer was given up. Punctuality, in short, was so strictly observed, that each customer knew, within a few minutes, the precise time when the milk would arrive.

All the delivering vessels had brass stop-cocks, with male and female screws; the latter were made fast to the tin vessels with solder; and to the wooden vessels with bolts and nuts. The former were unscrewed and removed every time the vessels were washed, and were

carefully cleaned, that no verdigris should collect.

Every byreman, or feeder, had a box wheel-barrow for removing the cow-dung to the apertures above the cellars. It was afterwards found more convenient to make the depôt in the *centre* of the cellar, than to put the dung down at every aperture.

There were also large light provender wheel-barrows with frames placed on them, to hold as much as the feeder could wheel at one time; these were taken to the head passages, where the feeder gave a portion to each cow, right and left, as he wheeled along; adding a little more from time to time till they had enough.

Each byreman had a large clawt, or scraper, adapted to the width of the groove, for drawing the dung along to the apertures; a small clawt was also used for cleaning the stalls, &c.

The byremen were also supplied with a rake, a besom or broom, and a hard-wood forked stick, for gathering up the dry litter

to the fore feet of the cows; these were preferred to iron, which sometimes injured the animals' feet.

Each milker had a coarse towel, a washing cloth, a currycomb, and a hair cloth.

CHAPTER V.

EARLY in the season, part of the Proprietor's farm and some small fields contiguous to the cow-house, were sown with barley and grass seeds; these were watered with cow urine by means of an engine, upon the principle of a fire engine. There were also used for that purpose hand-barrows with broad wheels, upon which barrels were placed filled with urine. Under the barrels were placed conductors about eight feet long, perforated with small holes; these barrels were easily wheeled along the rich soft ground, which would have been destroyed by horses and carts. The urine was carted to the fields in large casks, from which it was carried in stands resting on spokes, to the engine and barrows.

The grass of the fields thus irrigated was cut five or six times a year; and though not very long in the blade there was always great weight of produce. Indeed it was so thick and rich that it would have rotted unless cut often.

The first cutting generally commenced about the middle of April, and was continued once a month. The grass was cut during the day, when the weather was wet, or moist; but when it was dry, it was cut late at night or early in the morning, and the field irrigated immediately after being cut; the process was sometimes performed during the night. Sir John Sinclair visited one of these fields, which had been cut sixteen times in three years.

There was a public washing-house adjoining the dairy; all the soap-suds from which were carried into a well, or tank, and applied in the same way as the urine; and sometimes the two liquids were mixed together, or if the weather was very dry the urine was diluted

with water. Both urine and soap-suds were applied to the watering of fruit trees; during winter, and early in the spring, every tree was washed from the top to the root, which cleaned the bark, promoted a luxuriant growth, and made the trees bear well. If private families were to preserve their soap-suds, and the urine of the cows (if they have one), it would be found of essential benefit in manuring the garden.

A watchman was stationed within the premises, who came regularly to his post at seven o'clock, p. m., and continued till the milk distributors were sent off at the same hour on the following morning. In the evening he assisted in any little jobs that were required; saw the lights put out, and the cow-house doors and outer gate shut. During the night, he examined the byres every half hour; and if there were any cows near calving, he acquainted the manager, and got the necessary assistance; he also attended the engine furnace, and steaming the food for

the cattle, &c. At half past four, a. m., he rung the work-bell, and at five all the servants mustered.

It was a remarkable fact, that such cows as happened to be in a recumbent posture when the bell began to ring at the feeding hours, were all upon their legs before it ceased.

The byremen, or cow-feeders, after lighting the gas, proceeded to gather up the dry litter towards the crib, with a forked stick of *hard wood,* the wet straw and dung being drawn down with a small clawt into the groove, and pressed hard to the highest side of the groove, viz. the side next the passage; this allowed the urine to run off into the filtering vessel, as before described.

All the servants of the Establishment having next assisted in carrying the mash or soft provender, to the cows, the milkers then proceeded to milk their respective lots, and the byremen gave them the dry provender. The dung was then carried off, and the cows' beds were relaid with dry

litter; which was no sooner done, than they generally laid down. These operations were completed about eight, a. m., when the house was shut up until eleven. All the intermediate hours, from morning till night, were appropriated to preparing food, &c.

At eleven, a. m., the byremen gathered up the clean straw which had been laid down in the morning; the milkers assisted in giving the soft provender, and then proceeded to curry and clean their respective lots of cows. The byremen again gave the dry provender, and relaid the beds as before; and the doors were shut from one o'clock, p. m., till three. At the latter hour the same mode was repeated as in the morning and at mid-day; all hands joined to give the cows their mash: the milkers then milked their respective lots; the byremen at this time gave only a handful of dry fodder to each cow; and the beds being relaid as before, the doors were again shut from five, p. m., till seven. At that hour the litter

was once more gathered up, the water let off, and all hands called to assist in giving water or pot-ale, or a mixture of these, to each cow in its respective vessel. Afterwards a full feed of dry provender was given them; the dung was taken away, the passages cleaned, the cows' beds relaid, and the house shut up at eight, p. m., for the night.

The drink might have been made to run into the troughs; but as water was seldom given by itself, it was found that if either pot-ale, or the mash, were put into the troughs, some keen feeders would take too much; so that their neighbours got too little, and what was left could not so easily be gathered up.

The provender commonly used at Willowbank consisted of hay, straw, grass, and green barley; also Swedish turnips, and the different varieties of Aberdeen yellow, red tops, &c., also mangel würtzel, carrots, cabbages, ground oil cake, bruised beans, and other grains.

Mangel würtzel was recommended to the Author, as provender for his cows, upon economical grounds. He accordingly made trial of it in 1814, but the result did not answer his expectation. It was not productive as a crop, except in particular soils, such for instance as suited carrots. Besides it did not stand the frost, and it was found necessary to be taken up in the fall, the tops cut off, and the roots used during the winter mixed with other provender. A trial was made with this root and Swedish turnips; a corresponding weight of each was given to two lots of cows of equal numbers, and great attention was paid to the quantity and quality of the milk produced, and the improvement in the condition of the cattle. In these respects, however, there was found to be little or no variation. The quantity and quality of the milk, and the improvement of the cattle, were much the same; but as the mangel würtzel did not stand the frost, and moreover required a deep soil in

the cultivation, the Swedish turnips were necessarily preferred.

About this time, Mr. Coke of Norfolk lost some cows; and other agriculturists had their cattle also much injured by eating mangel würtzel; a circumstance which excited intense interest not unmixed with serious apprehensions, and gave rise to much discussion in the periodicals of the day on the merits of that root. There was no instance, however, in the Willowbank Dairy of any bad effects resulting from the use of it.

The quantity given as a mixture, however, was comparatively *small*, except on the occasion just noticed, when trial was made of it with the turnips, and before that trial was made the roots had lain a considerable time in a dry cellar; whereas Mr. Coke's cattle had the roots and leaves when full of juice.

Instead of attempting that ill-judged economy which pinches the cattle of their food, every attention was paid to make each cow eat as much as possible, without running

into the opposite extreme of overfeeding; and for that purpose the mixture was occasionally varied, and sometimes a few raw potatos, or turnips, were given by themselves, which tended to whet the appetite. There is a Scotch proverb which says, "The cow milks by the mou';" and as the object of the Harleian Dairy was to fatten as well as to yield, the more the keepers could get them to eat, the sooner these objects were accomplished.

Young grass, and green barley, but particularly young clover, contain a great quantity of juice, and fixed air, which has often proved injurious to cattle. The irrigation with urine made these crops luxuriant and rich; the first cutting was, therefore, mixed with a large proportion of old hay, or straw, to which was superadded a good quantity of salt, to prevent the cows from swelling or blowing. When wet, a greater proportion of these ingredients was used; this mixture was allowed to stand from twelve to twenty

hours, and was frequently turned and shaken to prevent heating; when the weather was dry, a little water was added at the time of mixing.

As the season advanced, less of that sort of provender was mixed with the grass; and when the grass fields which had not been irrigated were about ripe, cut grass only was given; but *young* or *wet* clover was never given without a mixture of dry provender. By this means the rich juices of the green food were absorbed by the dry fodder, which enabled the cattle to feed freely without the risk of injury.

As neither turnips nor potatos could be procured in summer, a mash was prepared of some of the other articles mentioned above.

When grass became scarce, as the season advanced, recourse was had to the turnip crop, as follows. Each servant, not otherwise employed, had a gardener's basket slung upon his back, and took his way betwixt

the rows of the turnip field, while two persons, one on either side, thinned the turnips, and put the produce into the baskets. The carriers then came in rotation, and soon filled a cart or two. The tops of the young turnips being all fresh, were put into the vessel with the roots and steamed with the other mixtures, and the whole made an excellent mess. In this there was a twofold advantage. While the young turnips made a desirable substitute for grass, those remaining in the field were found to grow much better, and to yield as much weight per acre as if no thinning had taken place. In proportion as the grass decreased, the turnips increased, until the latter became a complete substitute for the former. As the season advanced, when grains and distillers' wash were plentiful and cheap (which was generally the case in winter), a large portion of these was given with the more succulent food; but they were apt to make the cattle grain-sick, as it is termed, and to prove injurious to the stomach

of the animal. It has been ascertained that if cows are fed long upon grains, or distillers' wash, their constitution will quickly be destroyed: cattle thus fed, should not be kept longer than eight or ten months.

A little boiled linseed was considered to be the best antidote for preventing distillers' wash, &c. from injuring the health of the animals; and wheat straw, cut short, mixed with the grains, also prevented the cows from turning sick.

When grains were abundant in the market, large quantities were stored at Willowbank, in deep pits; and it was found that the deeper and larger were the pits, the better they were adapted for the purpose.

In these pits the grains were first hard tramped; and afterwards, in order to preserve them from the effect of exposure to the atmosphere, they were covered with mould, and sown with grass seeds; or, when it could be obtained, turf was laid on. If carefully stored in this way, it was found that grains

would keep in good condition two or three years without salt; and there can be no doubt that they would keep for *many years*, if it were possible completely to exclude the atmospheric air. Now that the duty on salt has been taken off, it would be unnecessary to use that article so sparingly as before; and if a considerable quantity of it were added in storing, this kind of provender would be a decided improvement. It may be mentioned, by the way, that when any of the pits were opened, the mould that was next the draff emitted a very unpleasant smell; a circumstance which tended to excite unfavourable prejudices in those who did not examine or taste the grains. These had always an agreeable acid flavour, a sure proof of their wholesome condition.

When the earth or mould was taken off the pits, it was immediately carried away and mixed with dung, which being impregnated with the vapour of the grains, made good manure.

As the spring approached, it was customary, in the feeding process, to substitute the Swedish turnips and potatos for the yellow turnips, potatos being generally to be got at a very moderate price in the market at that season of the year.

These two staple roots, steamed with hay and other mixtures, continued thenceforward to be the soft food till grass was again in season. Thus a proportion of succulent food was given to the cattle all the year round. Such wholesome food as the Author found cheapest in the market, provided it was in season, he caused to be given to the cows in the greatest abundance; there might have been occasional exceptions to this rule; it was nevertheless the practice generally observed.

In addition to the farm on which the greater part of the dairy provender was raised, there was a great extent of ground cultivated as a vegetable garden for the supply of the citizens. This formed an excellent auxiliary on

all occasions; for the fresh refuse of the garden stock made a fine mixture with the cows' ordinary food; such portions of the refuse as were in a spoiled state, were mixed up with the weeds of the farm and gardens, and carried to the piggery, or save-all; whence it was afterwards given in small quantities at a time to the pigs. This stuff, when added to the offal of the dairy, kept the swine in good condition for breeding, and greatly increased the manure.

The quantity of food given to the animals varied according to the quality or richness; but it was found very necessary to attend as particularly to *quantity* as to *quality;* because rich food, by itself, could not be taken in sufficient quantity to fill the stomach, neither would it digest. The general rule in feeding, therefore, was to give as much good wholesome stuff to each as the cattle would eat clean up, always taking care, however, to administer it rather sparingly than otherwise, in order to avoid given them a surfeit.

It is of the utmost importance to attend to this; for if the cow loathes her food, she will neither milk nor fatten. The usual mode of curing a surfeit in the Willowbank Establishment was, to take the vessel from any cow that appeared to have little inclination for food; her stall was then marked with chalk, to prevent mistakes; and at next feeding time an empty dish was set before her. This practice was continued until the animal showed something like keenness of appetite, when a small quantity of food was given her, which was afterwards gradually increased to the extent of the customary meal.

The late Dr. Gregory, of Edinburgh, sent a medical gentleman to the Author, to enquire "If the cows were subject to any disease, from so many being constantly confined in one house, and never getting exercise in the open air?" The reply was, that "From the manner in which the house was ventilated, and from the strictness of the rules observed with regard to feeding and cleaning, there

was never any general disease, and very rarely a particular instance of it among the cattle." The gentleman was also informed of the above mode of cure when a cow accidentally became surfeited with food. "Ah!" said he, "that's just the doctor's grand specific for complaints of the human stomach;" and he then related the following anecdote of a patient who had applied to the doctor for advice, in consequence of having lost his appetite. He was a rich Glasgow merchant, and for a long time had been a noted punch-drinker. The doctor heard all his symptoms, and then prescribed as follows:—"*Prescription.*—To get up at six o'clock, a. m., and walk round the public green, or down to Govan (a village about three miles from town) till breakfast time; then to take a crust of bread, or toast, and smell it, but not to taste it; next to go to his ordinary business, taking care to walk again before dinner, as he had done in the morning. At dinner time to take another crust, or piece of toast, and to chew

a little of it; but not to swallow even the smallest particle. To go to business again in the afternoon, and finally to go to bed without supper. Next morning to take a similar walk round the green, and then, if inclined to eat, to take a little, *very little* breakfast. By following this rule," said the doctor, " and abstaining from *Glasgow Punch* altogether, I will guarantee that you will very soon regain your appetite."

As mentioned in a preceding page, there was a feeding dish for each cow. These dishes were arranged round the mash trough at feeding time; the mashman (whose business it was to mix up the mash) then stripped to the thighs, and went into the trough; and with a pitcher put about five Scotch pints into each dish. All hands of the Establishment then joined and carried these dishes in a line along the head passage, when each cow received her allotted quantity. Previous to this, however, the feeder wound up the hecks by the wheel and pinion. By the time

the hands returned to the mash trough, another set of vessels was filled, and thus the rounds were repeated till all the cattle were fed. The large stands were then filled at the mash, and carried to the head passage, from which the feeders gave a small additional quantity as the cows seemed to require it, but taking *especial care* not to give *too much* to any. Some distillers' wash, or water, or a mixture of these, was then given them to drink, as before mentioned; and when the animals appeared to be satisfied the vessels were removed, and provender was given them from the wheelbarrow, right and left, by the byremen, adding a little more occasionally till they had had enough. If any provender was left in the trough, it was gathered up before giving the next soft feed and deposited in the save-all for the pigs.

In the cow-house which was first erected, there was a circular hole, with a barrel in the transverse passage to receive the washings of the trough.

The advantage of the head, or feeding passages, was great, and much saving, both of time and provender, accrued from them; as one person will feed four times as many as by the old mode of crossing the groove, and carrying the food from behind the cows, a part of which was usually lost in the grooves; besides, the feeders in this way avoided all danger of being hurt by the cows in going up between them when they were keen for their food, and of course somewhat unruly.

In a former page the cow's steaming vessel is described. This vessel was generally filled in the afternoon, at from five to six o'clock, and if twice filled in a day the usual morning hour was from eight to nine. The cut provender, sliced turnips, and potatos, were put into the vessel in layers; but the greater part of the turnips were put upon the top that the juice might descend to saturate the hay, &c. When common turnips were used the steam vessel was heaped, as these decreased much in bulk; whereas the yellow kind was

little reduced by steaming, and the Swedish none at all.

Turnips, whether given raw, or steamed, ought always to be sliced, which will enable old cows to eat them who could not break a whole turnip; and there is besides no danger of the animals choking. When sliced they can be boiled in a short time, and mix more easily with the draff, &c.; but when, on the contrary, they are in a whole state, a longer time is required to steam them, and they also retain the heat much longer, which sometimes burns the cows when feeding.

When the food was sufficiently steamed, the lees were let into the mash trough by a stop-cock, which was placed under the false bottom; the meat was then thrown out and mixed in the trough by the washman with distillers' wash, or water, or a mixture of both, and some bean-meal, bran, &c. Steamed food produces more milk and makes the cattle fatten sooner.

After the mid-day feed was given, the

milkers went to their respective divisions with a currying-comb and hair-cloth, and curried and rubbed every part of the cows, from the forehead to the tail, and heels: this was so gratifying to the cows that many of them would stop feeding during the time they were curried; the milkers then, with the washing cloth, cleaned the partitions, hecks, &c.

When turnips, or potatos, were given to the cattle raw, and not sliced (which was seldom the case), there was a small iron pin put above the ring into a hole in the stake, as described in the account of the first cow-house.

As soon as the milkers had lent their assistance to carry in the dishes of soft meat, at five, a. m., they proceeded to their respective divisions of cows; each had a milking pail, a large tin vessel for receiving the milk of their lot, with a towel and stool; every two milkers had a common pail for washing their hands, the cows' udders, &c., and a mop for washing the floor. This pail was taken charge of by each milker one day

alternately; with the towel they wiped the udder carefully before beginning to milk.

When each cow was milked, the contents of the pails were emptied into the intermediate vessel, as before mentioned.

Each milker milked from twelve to fifteen cows, averaging eight in an hour; but some could milk from ten to twelve in an hour. The milkers were generally women, their wages being only half that of men, and they were found to milk as well.

One day in every week at least (Friday was the usual day at Willowbank), it was the custom to measure the quantity of milk supplied by each cow, morning and evening. The clerk, or those who carried the milk into the office, had running numbers of the cows set down upon a slate, and as each cow was milked the pail was placed upon a table in the transverse passage; by looking at the graduated score on the handle the quantity was immediately ascertained. It was then marked upon the slate and afterwards trans-

ferred to the proper column in the milk book.

To ensure the cows being completely milked, the milker of No. 1 stripped, or took the aftering, of No. 2, &c.; a small premium was given weekly to the milker who produced the greatest quantity from stripping; this induced each to be careful in milking their respective lot as completely as possible. The milk thus stripped, or the *aftering*, as it is called in Scotland, was put into the churn-house; or when the demand was great for cream, it was put into the milk-house for that purpose.

The milkers changed their respective lots of cows with each other weekly, and by rotation, which showed who were the best milkers. Each milker's name was entered at the top of the list of their own lot of cows, and in this way the alternate weekly change was effected without mistake or irregularity.

The aggregate quantity of milk yielded by all the cows on the measuring days, should

correspond with that of each of the other six days. When the quantities did not tally, the measuring of each individual cow's milk indicated whence the disproportion arose, and to which animals the fault attached; it also assisted in judging which ought to be selected for sale.

In comparing the quantity and quality which each cow thus gave weekly, there was found to be a striking difference in the returns from various cows. Those which were deficient in point of quantity, made up for it in quality; for as the quantity decreased, the quality improved. Some cows, when they had newly calved, gave from twenty to thirty quarts per day; others were quite dry, or nearly so; but taking the total number in the Establishment, the ordinary average was about twelve quarts from each cow daily. It must not be overlooked, however, that both the quality and quantity of the milk were materially affected by the different kinds of food, which necessarily varied according to the season.

Potatos, distillers' grains, and wash, produced the greatest quantity of milk, but the quality was thin and poor; on the other hand, green clover, rye-grass, clover-hay, yellow, and Swedish turnips, bean-meal, oil-cake, &c., produced rich milk and a fair yield.

It should never be forgotten, that the quantity, as well as the quality, of food for milch cows, is a matter of the last importance; for if they got even an abundance of rich food, such as bean-meal, &c., without a due proportion of straw, or hay, they would inevitably lose their appetite.

At Willowbank, lactometers were used to ascertain the quality of the milk; but the best and simplest mode was by glass tubes: these were made six inches long, an inch in diameter, and graduated into eight parts of an inch. The bottom was broad, to make them stand firm; a dozen were placed into a wooden frame, taken to the transverse passage, and filled from the milk pails before they were emptied into the intermediate vessel; they

were then placed in the milk-house, and the number of each cow inscribed upon a piece of paper and put under the bottom of the tubes, which were examined at the end of twelve, twenty-four, thirty-six, and forty-eight hours, and the depth of the cream in each tube marked upon the paper underneath. In an extensive dairy, if it were necessary to get quickly through this operation, two or three dozens of such tubes might be made use of.

The milk of the cows which produced most cream was either set apart to raise cream, or for churning. As the first portion or half of the cows' milk that is drawn off is not nearly so rich as the last half, it is necessary, in order to ascertain the real quality, that the sample taken for the tubes should be from the whole quantity she gives at one time.

When richer milk is wanted for any particular purpose, the last half, or the third or fourth part of each cow's milk, should be kept by itself. A variety of experiments were made at Willowbank to insure accuracy in such

matters. The best method of preventing the milk from being adulterated by the distributors, it may with truth be said, cost more study than all the other departments of the Establishment; although it was only necessary to ascertain how to admit air to allow the milk to run off by the stop-cock, and to prevent water from being put into the milk.

At last, however, a simple method was discovered, which completely answered the purpose. There were three small tin tubes put betwixt the handle of the lid of the milk vessel, and the lid itself; these afforded additional strength to the handle, and prevented it from bending when another pitcher was placed upon the top of it, which was often the case when the milk was drawn off. The two side tubes were soldered to the lid and the under side of the handle; the centre tube was put down through the lid and was soldered close around, and the upper end of the same tube was also soldered to the under side of the handle, except a small point about

one sixteenth of an inch, which was left open; this admitted a sufficient quantity of air through the tube to allow the milk to run off, and at the same time it effectually prevented the admission of water.

Previous to this simple discovery, the Author applied to many to learn if they were acquainted with, or used any plan for checking, the adulteration in question; but it was admitted by all that they had never been able to devise any scheme that would prevent their servants from putting water into the milk (if they were so inclined), as the hole on the top of the milk barrel or vessel, from which a pin was taken to admit the air, always suggested the facility of introducing water.

After the milking of the cows was finished, the distributors shifted their clothes, and washed themselves; and those who carried out the milk got the hand pitchers, and the vessels for the carts, filled from the receiving tub by the graduated measures already described.

The quantity of milk given to each distri-

butor was then entered against his respective number or account in the distributing milk-book, and the vessels locked with small strong brass padlocks, with copper wards.

It may be remarked that unless the locks are particularly good, they will soon become useless. The Author got his padlocks made for the express purpose, as the common ones purchased in shops very soon gave way and became useless.

The distributors of the milk at Willowbank had their respective districts of the city distinctly noted down in a small book kept for the purpose, which also contained lists of the regular customers, with their places of residence. These were copied from the milk-ledger, in which all the routes, and the customers' names, were entered, with two columns to the right—one for the morning, and another for the afternoon; to the right of these was also a money column in which the monthly amount was entered.

The respective quantities given on credit

and sold for ready money, with the quantity returned (of which there was seldom any), balanced the account of each distributor.

If any of the distributors gave occasional credit to a chance customer, they were made accountable for it themselves; and the deficiency was entered into the black book, and deducted from their wages on the first pay day.

The milk routes were so arranged that all the distributors could finish their respective courses about the same time. For every quarter of an hour that any was later than his appointed time of return, a fine was exacted, agreeably to the regulations. The carts went to the distant parts of the town and suburbs.

As *regularity*, *order*, and *cleanliness*, were three indispensable requisites peremptorily insisted upon at Willowbank, with a view to insure the due observance of them, and that none might plead ignorance as an excuse, a table of regulations was hung up in each cow-house, as well as in the milk-office.

When any of the distributors happened to have returned milk, the amount was placed under the quantity taken out, and the total carried to the right-hand column and charged to the churn-house.

The dairy-maid, who had the charge of the sale shop at the dairy, kept a regular account with the Establishment, and had a pass-book containing the names and residence of her regular customers, as in the books of the distributors. It may be mentioned that the dairy-maid had also the charge of the milk-house, the churn-house, and the sale of all the produce of every kind which was disposed of at Willowbank; and she alone had to account for the whole, as neither the manager, nor clerk, was allowed to sell any thing. They only kept the general books so as to preserve a complete check with regard to every article sold. Indeed, so effectually was this method formed, that it is believed there was less risk of purloining, in the way in which this large concern was conducted,

than if it had been only a small establishment where one person was entrusted with the charge of a few cows, and suffered at the same time to interfere with the produce and pecuniary concerns.

Every morning and evening at Willowbank as much new milk was set apart in the milk-house, as was necessary for the cream customers. This was a regulation of some importance, because the cream was sold at six-times the price of new milk. The ordinary price of cream was eighteen-pence per quart, new milk three-pence, skim milk three-halfpence. In order to raise the cream completely, it was found necessary to put a little cold water into the milk set apart for the purpose; if one quart of water was added to twelve of new milk, it would produce one quart of rich cream and twelve quarts of good skim milk, which would be equal in value to twelve quarts of new milk; so that the only loss in selling skim milk and cream, instead of new, was the extra trouble.

When any cream, or new, or skim milk, was left over, it was put into the churn-house in a vessel by itself, and not mixed with the other milk, from the fear of disturbing the coagulation.

The churning machine was constructed to work one, two, three, or four upright, or oblong churns at once, so that skim milk might be put into one, new milk into another, cream into a third, and a mixture of the whole into the fourth. The plan usually followed at Willowbank, however, was to mix the whole together.

Although the prime or chief object of town dairies is to dispose of new milk, yet from various causes, such as buying a number of cows at a fair, or making fewer sales on Sundays than other days of the week, there will occasionally be an extra quantity of milk left on hand. It is, therefore, necessary in a large establishment to have a complete apparatus for churning; and the details should be as regular, minute, and

systematic, as in the milk department. At Willowbank a churn-book was kept, and it contained the quantity and quality of all the milk put into each churn, as well as the produce in butter and butter-milk.

The butter was generally sold at from ten to fourteen-pence per pound of sixteen ounces, and butter-milk at a halfpenny per quart. This last was the cheapest article of dairy produce.

There was an apartment adjoining the churn-house, where all the milk and cream for churning was put into large tubs or vats, in which it remained till it became thick and sour, for it would not churn to advantage till that took place. The churns were always washed clean after churning, and kept dry till they were to be used.

It is the practice with many to place the churn in some corner of the house, and such milk as can be spared from other purposes, or as may be left over on ordinary occasions, whether new from the cow, or cold, is thrown

into the churn, and when this receptacle of all sorts is full, the milk is churned. When milk is thus collected, that which is first put into the churn or vat becomes clotted or sour; if the coagulation remain until it is churned, it does not injure the milk; but if more milk be thrown into the vessel before it is cooled, the sour and new milk ferment, and if that operation takes place before churning, the fermentation will continue in the milk, and the butter-milk will go into curds and whey after churning. Whenever milk is added to the store, the coagulum is broken and the fermentation is renewed. It is absolutely necessary that milk should become sour, and clotted, before it will churn to advantage; but the fermentation should not be allowed to proceed too far; otherwise the milk will become mouldy and putrid, and whenever that is the case, before it is churned, the butter has a bad smell and colour, and the butter-milk becomes unpalatable and unwholesome.

To prevent these effects, and to render both the butter and butter-milk good and pleasant, the milk when taken from the cow should be set apart in coolers, in the same way as the milk that is set apart for raising cream, and when cold it should be put into milk tubs. When a second quantity of milk has been cooled, it may be put into the same tub with the first, provided it has not become sour; but if the milk which was put first into the tub has become sour, the throwing in a second quantity will excite too great a fermentation, and reduce the whole to a state of curds and whey. It is scarcely necessary to say, therefore, that it is improper to mix a second quantity, if the first has begun to sour. Each different milking should be kept in a tub or vat by itself.

Whilst it is proper that the whole milk should become sour, and be coagulated before churning, yet it should never be allowed to ferment so long as to run into curds and whey; otherwise both the butter and butter-

milk will be unpalatable, and what hot water is added to bring the milk to a proper heat for churning, will tend the more to turn the butter-milk into curds and whey; whereas when the milk is properly preserved before churning, the butter-milk will admit of a fifth or even a fourth part of water being mixed with it, and be still good; nay, be much better than that which has been made from the milk that has become putrid, or has had the coagulum broken before it was churned, though no water was put into it.

After the operation of churning has commenced, a little hot water should be added gradually until it reaches the temperature of about 75 degrees of Fahrenheit; but it should never be overheated, nor churned too hastily, otherwise the butter will be soft and of a white colour.

It cannot be too often repeated, that *cleanliness* in every possible respect is the life and soul of every branch of a dairy, from the milking of the cow to the last process

of making butter and cheese; and the slightest deviation from cleanliness cannot fail to be highly detrimental.

It is not the practice in many parts of Scotland to put any salt into butter that is sold new; but it is a great improvement to mix a little with the butter, or to dissolve a quantity in cold water in which the butter is washed after it is taken from the churn.

The quality of the butter-milk sold in Glasgow is generally very good, and there is a great quantity used. It is a very wholesome beverage, and may be turned into a luxury by putting a quantity into a linen bag, and allowing the whey or serum to drop out; then to mix what remains in the bag with a portion of sweet cream and sugar. This is a dish worthy of being introduced at the tables of the first circles.

Part of the butter-milk was sometimes put into a hot place to make it sour quickly, and to be ready for mixing with the milk and

cream in cold weather. It was found that this mode prevented the butter from acquiring the flavour of the turnips or cabbage mixed in the cows' food.

It may not be amiss here to give a proof of the advantage of churning by steam. A gentleman in the vicinity of the city had got a handsome patent churn made by Baker of Fore Street, London, which he conceived to be superior to the common churn; and he said he would engage to produce much more butter, and of better quality, by this patent churn, than could be produced by the Harleian churn. To give a fair trial, his patent churn was brought to Willowbank, when an equal quantity was put into each from the same milk tub. The gentleman's servant commenced with the patent churn, and the steamer was set a-going at the same instant; steam beat the patent, however, by fifteen minutes; and it was found that there were also two and a half per cent. more weight in its favour, besides the quality being better. The only

way to account for this was to ascribe it to the constant and regular motion of the steam power.

From the leaden pipe or worm in the boiler hot water was brought by pipes to the milk-office, churn-house, &c., where vessels of various sizes were placed, made of block tin. These were in size and number according to the heat required and the spaciousness of the apartment. Each vessel had two stop-cocks, one at either end, and in the lower part of the vessel one to admit the water, the other to let it off. If a strong heat was wanted, the waste-cock might be kept half or three parts open; and if a gentle heat was required, it was shut altogether, or nearly so, and opened occasionally to let off the cold water and replace it with hot. As the vessels would not fill with water till the atmospheric air was let off, there was a small tube, about the thickness of a quill, with a stop-cock to suit; one end of this tube was soldered to the highest part of the vessel next the waste-cock, and the other end

was inserted into the waste pipe beyond the waste stop-cock; this allowed the air to escape, and if the stop-cock of this tube was left open, a small thread of water would constantly run through.

All the pitchers, measures, money bags, and hand-bells, were numbered and arranged in lots. The pitchers and measures, when washed, rinsed, and scalded, were put upon racks, or hung upon pins to dry in the milk office. The racks and pins for each set of measures were also numbered to correspond, so that if any article was lost, injured, or dirty, it was easily detected; and the defaulter to whose department the loss or missing article belonged, was fined, and the amount entered in the black book.

Care in the selection of cows is of the utmost importance to the success of a dairy. The Author had cows by way of experiment from different parts of the united kingdom: he purchased ten at one Edinburgh market, of the large short horned breed, at £20. each;

but these did not give more milk, nor better in quality, than Ayrshire cows that were bought at the same period for £13. a-head; and on comparison it was found that the latter were much cheaper kept, and that they improved fully more in beef and fat in proportion to their size than the high-priced cows; a decided preference was therefore given to the improved Ayrshire breed, from seven to ten years' old, and from £8. to £20. per head. Prime young cows were too high-priced for stall feeding; old cows were generally the most profitable in the long run, especially if they were not previously in good keeping. Animals of this description were usually got for little money, and although they were seldom in good order in the mouth when first brought to Willow-bank, they soon improved with soft and rich steamed food.

The cows were generally bought when near calving, which prevented the barbarous practice called hafting, or allowing the milk to remain upon the cow for a considerable time

before she is brought to the market; this base and cruel custom (for which a heavy penalty ought to be legally inflicted) is always pernicious to the cow, and in consequence of it she seldom recovers her milk for the season. The middling and larger size of cows was preferred, such as weighed from thirty-five to fifty stone, English. The Author bought one very large fine cow for £30.; he got £3. for the calf without being fed, and he sold the cow to a butcher for £28.; for a considerable time this cow gave forty quarts per day, and was milked three times each day. He had a number of other very fine cows, which when newly calved and highly fed, produced from twenty-five to thirty quarts per day. The most approved shape and marks of a good dairy cow are as follows:—head small, long, and narrow towards the muzzle; horns small, clear, bent, and placed at a considerable distance from each other; eyes not large, but brisk and lively; neck slender and long, tapering towards the head, and a little loose skin below;

shoulders and fore quarters light and thin; hind quarters large and broad; back straight and joints slack and open; carcass deep in the rib; tail small and long, reaching to the heels; legs small and short, with firm joints; the udder (milk vessel) square, but a little oblong, stretching forward, thin skinned and capacious, but not low hung; teats, or paps, small, pointing outwards, and at a considerable distance from each other; milk veins capacious and prominent; skin loose, thin, and soft like a glove; hair short, soft, and woolley; the general figure handsome and well proportioned. These shapes, or marks, of an improved dairy cow have generally the following qualities:—

First.—She is of a quiet and docile temper, which greatly enhances her value. A cow that is of a quiet and contented disposition feeds at ease; and when pasturing in the fields does not break the fences, hurt herself, or gore other cattle.

Secondly.—A cow that is quiet and contented, is milked with greater ease and yields

more milk than those of a turbulent disposition. When any of the above shapes are of a contrary disposition, it generally arises from improper treatment; such as scolding, striking, or frightening the animal, which tends to make her cross. Kind treatment is both the best preventive and cure of vicious habits in any animal.

Thirdly.—Another quality of the improved Ayrshire breed is, that after they have yielded a large quantity of milk they fatten well, make excellent mixed beef, and yield a considerable quantity of tallow; this is easily accounted for, as in general they feed freely, have capacious stomachs, and when dry, the food which produced the large supply of milk is converted into fat and flesh. These facts should induce every dairy husbandman, whether upon a large or a small scale, to be careful in the selection of his cows.

There were no calves fattened at the Harleian dairy; these were always disposed of as soon as possible. The Author had so many other

avocations on hand and so many duties to attend, that he found he could not get this important department of dairy husbandry overtaken.

The fattening of calves produces a large return, if managed on the improved plan adopted of late, and especially in winter and spring.

At the Willowbank Establishment some of the cows' stalls were longer and some shorter to suit the different sizes of the animals. The largest cows were placed in those next the balcony in the hundred cow-house; the quietest and handsomest were put in the stalls next the transverse or middle passage, and so on in rotation towards the sides of the house. They stood in pairs, and were generally of the same size and colour, at least as nearly so as possible. When new cows were bought, each had a running number in the cow-book, which was put upon a ticket and placed upon her stake with paste, and was also removed with her as often as she changed her place.

The name of the person from whom the cow was bought, with a description of her colour and

mark, also her age and whether in calf or not, and how long gone in calf, were entered in the cow-book. Her price was likewise entered in the money column; and if in calf she was credited with the price got for it, and the date and name of the purchaser were inserted in the cow-book against her number. In dressing the cows the hair was cut clean off their tails, to prevent them from lifting dung or water; indeed they had little or no use for long tails, as from the cleanliness of the house there were few flies, and in the season, when there were any of these, white fancy cut papers were hung from the roof to attract flies.

The vicious cows, or any that had contracted bad habits by improper treatment before being brought to Willowbank, were put next to the wall; and such as would not allow themselves to be touched without kicking, had the fore foot farthest from the wall tied with a rope to the chain that bound them, thence brought along their side and round their hind quarters, and fastened to a ring in

the wall. A currycomb with a long handle was then applied to the rump of the tail, forehead, neck, &c., and every part of the skin was curried. Cows should never be struck or scolded, but spoken to and dealt with in the kindest manner; when struck they will either attempt to kick, or throw themselves down. By persevering in kind and gentle treatment, it was found that in a short time the crossest Willowbank cows became peaceable and easily managed; whereas by a contrary plan, and if not curried or clean milked, they became irritable and restive, and uniformly got worse instead of better. If there are any exceptions in cows thus treated, they must be very rare; indeed there are few of the wild and ferocious animals but may be tamed by kindness. Cows, like many other animals, are partial to a pleasing sound. It was found by experience at Willowbank that cows were very fond of having a tune hummed or sung by the dairymaid whilst milking. Nothing, in short, contributed more to keep them quiet, unless

it was the act of eating their food; but it is well known that in the Highlands wild deer will be arrested in their progress by singing, and will sometimes allow the songster to approach very near them.

If ever Mr. Martin should regain his seat as a senator, and make another motion in the House of Commons respecting humanity to animals, he would do well to introduce a clause to prevent the base and inhuman practice of hafting cows, which often brings disease of the udder and makes them fretful and vicious.

When the cows were bought at Willowbank, each was measured with a tape line from the top of the shoulder to the rump or top of the tail, and girted round from the top of the shoulder immediately behind the fore legs; these dimensions were calculated according to Ainslie's Tables, and the weight entered opposite their number in the cow-book. The whole of the cows in the establishment were measured in this manner once a month, and

the weight entered opposite their numbers in a list which was put in a part of the cow-book, with columns extending to the right, having the date of measurement at the top; thus at one glance was seen the improvement of each cow. There were some exceptions to this as well as to every general rule, but it was found that the weight of the cows when killed and weighed corresponded nearly to the weight by measurement.

In another part of this work the general arrangement of the cows is stated as they were brought into the house; but there were subsequent changes, such as bringing those that were nearly fat and dry together; still it was found most expedient to adhere as far as possible to the original plan, and particularly in keeping those of the same size and colour in the same stalls. In making sales of them they were generally disposed of in lots without any pick or shot. The purchaser was usually allowed a given time to take them away; and, to prevent mistakes, this condition, with the

price and other particulars, was ratified by missives, a copy of which was entered in the sales-book column, which contained also the running number of the cows sold. From the date of sale the cattle were at the risk of the purchaser, who was at liberty to remove them at any time, but bound to pay for their maintenance after the fixed term was expired. If they were partially taken away, the seller had the liberty of pointing out which cows were to be removed first; in this he was commonly guided by the quantity of milk they gave, except when there was a rise or fall upon cattle. In general the same price was got for fat cows as that which was given for them when bought near the calving: the price of the calves nearly paid the expense of keeping before calving. When there were many dry cows, they were put into the dark cow-house or cellar described in the former part of the work.

At the Willowbank Establishment one or more good bulls were kept, to which the cows

were taken when in condition; but as it did not suit to keep them over to calve, it was thought best not to let them have the bull till the prime of the milk was over. After taking the bull they fattened better.

Many gentlemen in the city and neighbourhood sent their cows to the bull at Willowbank: the charge was five shillings. There was a book kept in which was recorded the date and number of the cows that were served by the bull, and a separate part of the same book for the date and name of those who sent their cows.

A month was the usual credit given for the milk; the accounts were then sent in to the customers. If any did not pay, the amount was carried forward, and added to the next month's list; so that at the end of every month the amount due by each customer, as also the total sum, was seen at once.

There was a weighing machine within the premises near the gate, where all the provender, whether hay, straw, grass, vegetables, oil-cake,

or other articles of food, were weighed and entered in the proper book. Occasionally all the food, of whatever kind, which the cows got, was weighed; say once in two or three weeks, or as long as the same mixtures were continued, to ascertain as nearly as possible the expense of feeding per day or week.

All the dung, too, whether sold or used by the proprietor, was weighed and entered to the account of the purchaser, or to the garden or farm. The urine carts, with the casks, were also weighed; but as these belonged to the Establishment and were numbered, it was only necessary to enter their numbers in the book, against which the quantity that each held was always affixed.

In order to prevent the milk from tasting of turnips, &c., take a given quantity of nitre, and boil it in water; let the solution be as strong as possible, but not to chrystalize; when cold, bottle it and cork it well, and put a few tea-spoonsful in the milking pail, and milk upon it; or a quantity may be put into the

bottom of the receiving tub, and the milk stirred about when put into the tub. This in a great measure will carry off the taste of the turnips; but the best and most effectual way is to steam all the vegetables well. It is chiefly common turnips and cabbages that give the strong taste to milk and butter. Aberdeen yellow turnips have little effect, and Swedish none.

CHAPTER VI.

THE piggery belonging to the Willowbank Establishment was kept chiefly for consuming the offals of the dairy, and the refuse of the gardens and farm, and also for turning the whole into manure. Every description of weeds and waste stuff was daily gathered and laid in front of the piggery, and a small quantity was thrown into its area every hour or two. What the pigs did not eat was trodden down, and soon decomposed by their dung and urine. The left mess, &c., was put into the feeding troughs, which were cleaned out and washed daily.

A portion of cinders from the ash pit was given to the pigs daily, which they were found to be fond of: it was supposed that these

tended to promote digestion, and to prevent swelling when they ate or drank too much. The weeds and offals were the only food given to the swine, and these kept them in good condition for breeding. That being the chief object, none were fattened except those that were bad nurses or past breeding; such as were nursing or fattening were better fed.

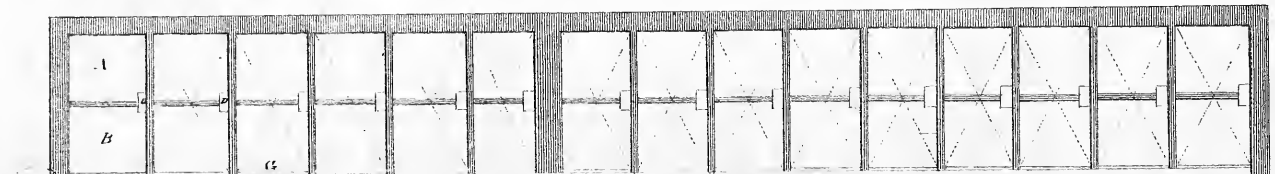
Most of the pigs that were kept at Willowbank were a cross breed of the Berkshire and Chinese. The Author paid 10*l.* for a very large and handsome breeding sow of the former kind, and he got a boar of the latter breed from the late Lady Shaw Stewart of Ardgowan, which produced a breed of medium-sized pigs. They were very handsome, quiet, and good tempered; had short legs, and small bones; were easily fed, and when cut brought a high price for store pigs. They also sold readily for roasting.

All the pigs were regularly curried, and so fond were they of this operation, that

they would often leave their meat and rub their shoulders against the feeder, as an indication of their desire to be scrubbed. Tow and wool-cards were preferred to curry-combs for this purpose; they were also better adapted for cleaning the cows after they had cast their long and rough hair, which they did when they began to fatten.

The young pigs were sold when about six weeks' old for roasting, or when cut they were bought for store pigs. The price varied very much according to circumstances, say from seven shillings to twenty shillings each. One of the servants was selected as properly qualified to kill the pigs, and make them ready for the spit. Gentlemen or ladies who were accustomed to buy pigs for the dinner table, had them prepared for the cook and sent home from Willowbank. They willingly gave a higher price for pigs so obtained than for such as were exposed for sale in the market, as they were known to be cleaner fed and kept than by the common mode.

The Piggery.



A. Sleeping Apartment. B. Feeding Apartment. C. Open Area. D. The Water Trough. E. A Tank.
F. gates to subdivide the Area. G. Sewer. H. Principal Entrance. III. Doors to the provender Loft.

Engraved for the Hardwicke Dairy System. Published by Ridgway's London. 1829. page. 121.

The pig-house was alongside one division of the cow-house; the dimensions of which will be seen in the annexed plan. They were built of brick, and the roof was a semi-circular arch of the same materials. The styes were divided from each other by a nine-inch wall, and these were sub-divided into two apartments, one for feeding, the other for sleeping. The entrance to the latter was just sufficiently wide to admit the pig. There was placed in it an oblong cast iron trough, which was filled with water, to cause the pigs to wash their feet before they retired to rest at night. When the weather was warm, they often lay down in the trough, and thus got a cold bath gratis. There was a water-pipe laid along in front of the piggery, from which a branch was taken into every stye; the trough had a washer in the bottom to let off the water, which was changed daily, immediately after the dung was taken away.

In front of the styes was an area, the

whole length of the piggery, with a wall sufficiently high to confine the pigs. This area was sub-divided by iron gates, as it was found the swine cut the wooden ones. These sub-division gates were hung upon the sub-division walls, and as the pig-styes were of the same width with the area, the gates also shut up each stye when the servant went to take the dung from the area, or when a sow was taken to the boar; this kept every lot or family by itself. The bottom of the area and pig-houses was causewayed with whinstone; the sleeping apartments were a few inches higher than the feeding places, and both were on an inclined plane towards the area, which also similarly inclined towards the houses. At the junction of these two inclined planes a sewer was formed, which had descended to one end of the area, at which there was a large well or tank for the urine to run into. Immediately after the dung was taken from the

area, the washing troughs were emptied, beginning at the highest part of the area, when the keeper, with a birch besom, washed the feeding places and area; this cleaned and carried off all the particles of dung and the left food towards the tank, where there was a filter similar to the one in the cow-house. It may be here remarked that although it is proverbial for sows to wallow in the mire, it has been found that they are nevertheless fond of a clean dry bed; and if straw be within their reach they will make a bed for themselves. They are particularly careful as to this before producing their young. Great attention, indeed, should be paid to them at that crisis, as some will eat their pigs if not watched; others are careless, and often overlay them; but the greater part are kind to, and careful of, their young: they will lie down with the greatest care flat upon their side to give suck, and then rise up very gently. Such as were of this disposition at Willowbank were kept for breeding, and the

others were fattened or sold off as soon as possible.

With regard to the rearing of this kind of stock as a source of profit, the Author does not think it worth while to fatten pigs unless there are offals which would otherwise be lost, as it takes far more value in the sort of food required to fatten them than they are worth when fed; but where there are offals in abundance, he thinks that one or more pigs should be kept. All the refuse and weeds of the garden, the offals, dish-washings of the kitchen, &c., should be given to them; and if they get plenty of litter they will produce manure sufficient for the kitchen garden. When the tank at the piggery was full it ran over into a drain, which carried it into the large tank under the hundred cow-house.

All drains for conducting pig or cow urine, unless very steep, should be made so large as to allow a person to go through them for the purpose of cleaning them out, otherwise the sediment will soon stop them up. The

sediment of the piggery tank was taken out periodically and mixed with ashes, which produced a great quantity of valuable manure.

Upon the top of the piggery was a large barn and store houses, which projected over the open area; these were supported by pillars from the wall in front of the area. This kept the area warm and dry. Some persons imagine, and not without reason, that it is to allay the heat or itchiness of the skin that pigs are so fond of wallowing in the mire; the Author would advise, that when there is any appearance of eruption in the skin of the pigs they should have a little sulphur mixed with their food, and, in addition to the regular currying and cleaning, be well washed with soft soap and water.

CHAPTER VII.

With regard to the mode of keeping the books at Willowbank, the Wages Book had a folio for registering the names of all the servants, with their places of residence. Part of this book had columns for keeping the servants' time, in which all short time was marked. In the right hand column the wages due to each was entered.

The pay day was on Tuesday evening after each Saturday fortnight. This always left two days' pay in hand. At one time, when paid in full on Saturday, some in a frolic thought proper to absent themselves, which caused inconvenience on the Monday. But the chief reason for paying on Tuesday was to prevent the servants from spending their

earnings on the Sabbath, and also to give them an opportunity of purchasing their necessaries at the weekly market, which was held on the Wednesday; and where they could lay out their wages to more advantage than by purchasing late on Saturday night, when the worst commodities are brought forward. Besides, there was extra work on the Saturday afternoon and evening, in preparing food for the cattle; and some of the customers took extra milk on that night, as the carts did not go out on the Sabbath. The hand pitchers only were carried out on that day. The clerk, too, had more time to get the Black Book examined, and the Wages Book completely made up.

This practice (of paying the working men of his various establishments on Tuesday evenings) was adopted for many years by the Author; and although some did not like the mode at first, they soon found its advantage both to themselves and to their families. In reference to this subject, it may be observed

that many young persons, who have their wages and time at command, are enticed away by idle companions on the Sabbath, and are thus often led from the paths of virtue on the day which is most particularly commanded to be kept sacred. Indeed it has often been remarked, that in Scotland many of those who have forfeited their lives to the laws of their country, have dated the commencement of their fatal career from an early disobedience to their parents, and the profanation of the Lord's Day.

In farther relation to the books, there was a table of regulations made pointing out the duty of the manager, clerk, and all the other servants. These were read once a week, and a copy was hung up in the office and in each cow-house, with a list of fines. The fines were kept by the clerk, and at given times were appropriated to the common benefit of all the servants. This made every one careful, as defaulters were sure to be detected for the sake of the fine. In short, there was an inventory taken of every vessel and implement

about the premises and entered in a book. All spare articles were locked up by the manager, and a note of what was on hand was to be seen in the utensil book; and when new articles were got, they were put to the debit of that book. Every article that each servant got was put to the credit of the utensil book and to the debit of the servant, and when any one changed their place in the Establishment, or left the service, they were obliged to account for the articles under their charge. If any thing was missing, the value was put in the black book, and deducted from their wages. In all similar establishments, the inventory should be compared with the stock at least once a month; unless this be attended to, there will soon be much loss and inconvenience.

The Author does not pretend to any superior skill in the book-keeping system he adopted, but as he had no form to copy from, he had his books ruled for the different departments in as concise and simple a form as

possible, and which any person who could write and had a knowledge of figures, might keep with ease, without having been taught a general system of book-keeping. The chief objects in view at Willowbank were accuracy, and to show the daily receipts and disbursements of the Establishment. Also at the end of every month to exhibit the amount owing to and by the concern.

The cow-book, into which every cow was entered as she came into the cow-house, contained a description of the animal, from whom obtained, the price, &c., as formerly mentioned.

The provision book had folios, or accounts opened for every kind of food, which was entered upon a slate when weighed, and transcribed at the first leisure into the book. The amount and value of each kind of provender were summed up monthly, and put to the credit of the farm or gardens, or to that of the individual who furnished the food.

The feeding-book had columns for the different kinds of food, appropriately entitled at the top, and the quantity of each kind entered in their respective columns. The various sorts were weighed in the machine, either on wheel-barrows or carts; but when the same kinds continued to be used for a given time, say two or three weeks, there was only one day entered for that period, which, multiplied by the number of days, showed the total amount.

In the daily milk-book was entered all the distributors' milk, and that which was set apart for cream was put in the milk-house. These two added together showed the total quantity daily. This book also showed what milk was returned, and put into the churn-house: in short, it exhibited the whole of the dairy milk obtained, and how disposed of.

The ledger contained all the customers' names and residences on the left hand of the folio; columns to the right showed the

quantity received by each customer, morning and evening; the third column contained the amount per month; and again, to the right of these, the date when paid. These columns were extended to the right for six or twelve months. The money column showed the amount due by each customer, and the total amount at the end of each month. Each distributor had a small book containing the names of his customers, &c., which was an abstract from the ledger.

The daily cash-book had double money columns. In the first was entered the money received from each distributor for butter, milk, &c.; the second contained the money received from regular or monthly customers, and such butter or cream as was entered in any book on credit. These columns were summed up daily, and the total amount entered in one sum in the general cash-book.

The churning-book had a column for cream, strippings, new and skim milk; and, in a column to the right of these, the daily total

was extended. Another part of the churning-book contained the quantity put into each churn, and the produce in butter and milk.

In the petty expense-book was entered all small incidental sums, which were cast up daily, to balance the cash, and entered monthly in the general cash-book.

In the memorandum-book every thing was noted down that was necessary to be kept in mind, and as these were disposed of they were marked off in the book.

All orders for milk, cream, &c., were entered in the order-book.

In the utensil-book the names of all the servants were entered, with the utensils they had in use. It also contained the whole amount of the stock of utensils.

The black-book contained a note of all the fines that were levied, and all the money that every distributor was short; also the price of any article that was lost or destroyed by carelessness, the amount of which was car-

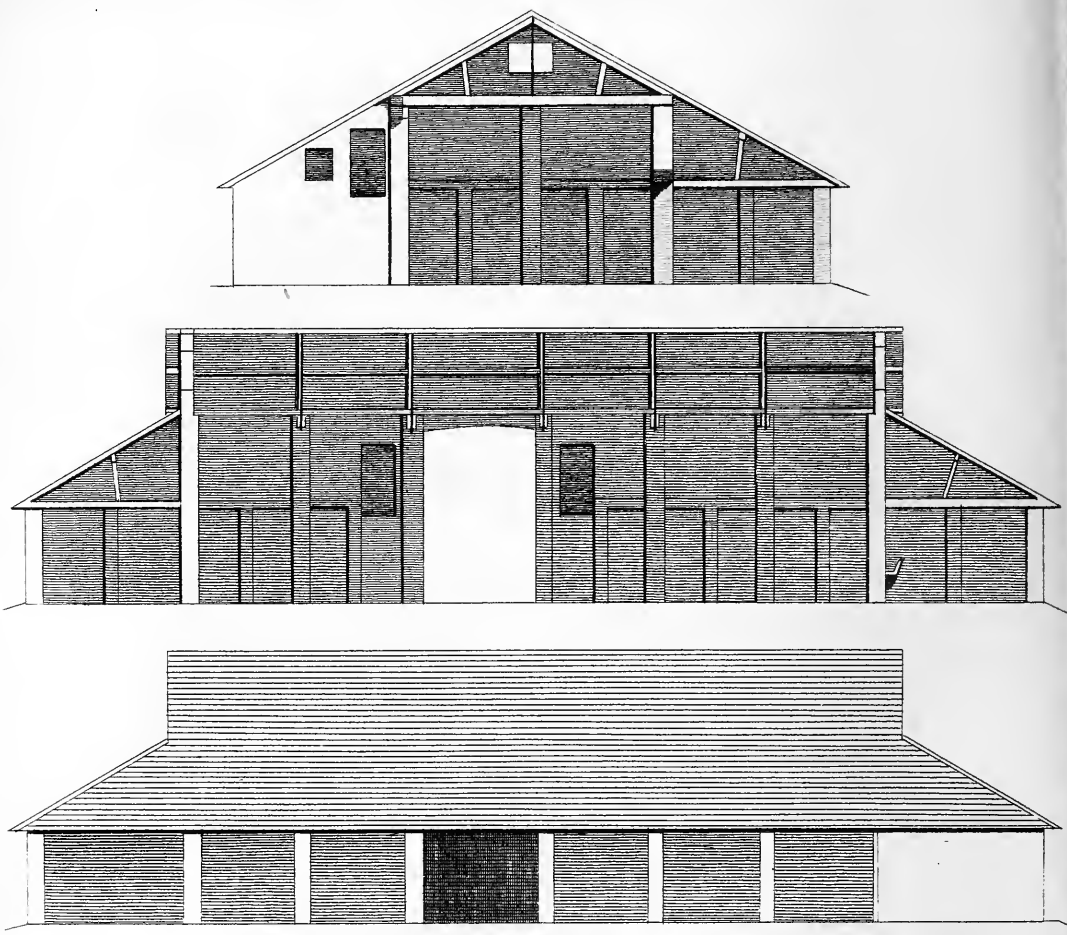
ried to the debit of each servant's account, and deducted from their first pay.

The regular cash-book contained the daily receipts for milch cows sold, dung and urine sold, and all disbursements whatever, say cash paid for cows, hay, and other provender, &c.

The ledger contained accounts for cows, provender, personal accounts, &c.

There was no journal kept, but every thing was entered in the ledger direct from the cash-book and the buying and selling-books. The provender-book showed all the purchases of that article, and the cow-book the various purchases of cows. There were a few folios at the end of the cow-book for entering the lots sold, as mentioned in the section on selling cows.

The piggery-book contained the pedigree of the pigs, the number of each litter, and how disposed of, &c.



Ground Plan, South West Elevation, and longitudinal and transverse Sections of a Barn and Agricultural Buildings erected in 1827 at the lodge Farm at Langton near Spilsby in Lincolnshire by John Stephen Langton Esq.re

Engraved for the British Farmer's Magazine N.o 12 for Aug 1829.

References to the SMALL COW-HOUSE.

AA. *Sale shops.* **BB.** *Longitudinal passages.* **CC.** *Transverse passage.* **DD.** *Double stalls.* **EE.** *Pillars for supporting partitions.* **FF.** *Wire grating hung with weights as a window sash.* **GG.** *Partition.* **HH.** *Common sewer for conducting the cow urine to the tank.* **II.** *Grooves.* **KK.** *Grating for filtering the urine.* **LL.** *Cast-metal plate covering the barrel into which the washings of the troughs are received, and from thence taken to the piggery.* **MM.** *Feeding troughs.*

CHAPTER VIII.

As the history of the large cow-house is chiefly applicable to town dairies, it may be useful to give a description of the first cow-house, which contained twenty-four cows, as being more applicable to private gentlemen and farmers. A sub-division of it, say for six cows, may be adopted to equal advantage by those who farm upon a small scale. The building was forty-four feet long by thirty-one feet wide within the walls: there were three longitudinal passages, four feet wide, with a door at the north end of each, and one transverse passage six feet wide. Additional houses were added to the westward, and the transverse passage was carried along through them. The roof, which was pavilion, was covered

with slates, and hung with pins upon rafters; there were two hatch windows on each side of the roof, and one at each end. The windows were hung with crooks and eyes, and opened with a handle as described in the large cow-house.

There were two rows of cows of twelve each, sub-divided by the transverse passage so as to accommodate two sixes on each side of it, and two cows in each stall, which were separated from each other by wooden partitions. The cows were bound with iron chains and swivels the same as in the hundred cow-house, but the stakes were of round ash wood, about seven and a half feet long and four inches diameter; the bottom end sunk in a stone, flush with the floor; and the top, which was square, was fastened with a screw bolt and not to a longitudinal joist. One half of the stalls were floored similar to the large cow-house; the fore part with composition, and the hinder part with hewn stone: the other half of the stalls had the fore part laid with

joists and flooring about two and a half feet broad, and the hinder part was formed of hewn stone. Wood is decidedly the best for the fore-feet of the cows, as it is softer than composition, and the cattle will require little or no litter; but being occasionally wet with the food and water spilt, the wood soon rotted; had the floor and joists been made of larch timber, there is no doubt they would have been more desirable, inasmuch as they would have lasted longer.

The passages were of hewn stone rounded, as were also the grooves and troughs. The grooves were also inclined to the centre, and to the side next the cows, the better to allow the urine to run into a common sewer which was formed under the transverse passage to conduct the urine to the tank, as shown in the ground plan of this cow-house. The hecks were also the same, but hung with weights and pullies similar to a window sash; there were wooden pilasters at each end to guide them, and facings to keep the hecks in their places.

The bottoms of the pilasters were sunk in the curb stone at the head passages, and the tops made fast to the horizontal joists in the same manner as the stakes. There was a hole in the stake, about a foot from the bottom, with an iron pin to fit, which to prevent its being lost was made fast to the partition with a piece of jack chain. When raw uncut turnips or potatos were given to the cows, the pin was put into the stake above the ring, which kept the cow's head down while feeding, and was a certain preventive against their choking, as it is only when they lift their heads to bolt that the turnips, &c., stick in the throat.

There were small pits in the centre of the transverse passage, with cast-iron covers to fit, in which were placed barrels for receiving whatever meat or drink was left in the troughs, the bottom of which inclined towards the barrels, so that by putting a little water into the troughs all was washed clean into the barrels and carried to the piggery.

Although the sashes were very convenient, the improved mode used in the one hundred cow-house of lifting the hecks by divisions with a wheel and pinion, was preferable, as by that mode the cows were prevented from overturning their feeding dishes. When the dishes were put into the trough with the mash, the inner side, (the side next the cow,) of each dish, rested upon the bottom of the trough, and the other side upon the curbstone next the passage. When thus placed, the ratch was lifted, and all the hecks were let down and rested upon the feeding dishes; the hecks, which were hung by weights in the first cow-house, (now described,) were also let down upon the dishes; but as the hecks were counterpoised by weights, they had little effect in preventing the feeding dishes being tumbled.

About one fourth part of the feeding dish was outside of the heck, which allowed the feeder to put in what additional mash or water was required. The dishes being thus placed

upon an inclined plane, enabled the cows more easily to clean them out.

This description of the small cow-house may be applied to apartments for one or two cows; indeed every cow-house should have a head passage, and the other arrangements mentioned in this Treatise, and also hecks to let their breath escape. When the cow's head is close to a wall, her breath is returned upon the food, which injures it. Hence it is not good for the provender to be kept in a loft over the cattle.

There should invariably be a barrel or small tank to preserve the urine, and a place to keep the dung from exposure to the atmosphere; otherwise the richest particles will fly off in vapour.

The regulations respecting feeding, &c., should also be particularly attended to.

When the Author kept only a cow or two for his family, they were frequently injured, and did not give the proper quantity of milk from the ignorance or inattention of the dairy-

maid. Sometimes they were neglected, at other times they got too much, and when fed with turnips or potatos, they were often in danger of being choked; when these were boiled the cows were sometimes scalded. Potatos or turnips, when boiled whole, should always be broken by the hand or a beetle, and not given warmer than blood heat, otherwise the cow will be injured; but although steamed food be put boiling into the horses' manger, they will not eat it till it is sufficiently cold.

Were an outline of the system of feeding, &c., as detailed in this Treatise, transcribed and given to dairymaids by their masters or mistresses, with an injunction to commit it to memory on entering their service, it might be of considerable advantage to the owner of the cows, and the health of the animals, as well as improve the quantity and flavor of the milk.

CHAPTER IX.

THE following particulars are intended to convey to private families the most profitable method of building a byre and of managing one or more cows.

To such as require accommodation for only one cow, the byre should be constructed fifteen feet inside, measuring from side wall to side wall; the walls should be from seven to nine feet high. There should be a passage of three feet wide at the head and three feet at the tail of the cow; the stall should not be more than three feet six inches wide, and from five and a half to six feet long from the inside of the crib to the inside of the groove, according to the size of the cow. There

should be a space of three feet wide alongside the cow for passing to feed her, or to take away the dung. A post should be placed about half way between the crib and groove to keep the cow in her stall, and prevent her from turning round to soil the side passage. She should be tied to a stake with a chain, ring and swivel; the stake to be placed in the centre of the stall four inches from the crib stone: the crib or feeding trough to be of hewn stone, one foot four inches wide at the top, and one foot at the bottom; the sides four inches thick, rounded to a semicircle; the groove a foot wide, four inches deep next the passage, and eight inches next the stall, which should be four inches higher than the pavement.

The part of the stall next the groove to be as described in the large cow-house; the fore part of it to be floored with deal, and joists or composition.

A heck with wire grating should be hung in front of the cow as a window sash, to pre-

vent the provender from coming out into the passage.

If two cows are kept, the stalls should be six feet six inches wide, and the stakes for fastening them should be placed within nine inches of each side of the stall, to prevent the cows from coming in contact; and if more than two cows are kept, there should be a trevis (partition) between the second and third cow, or the stake of the third cow so placed as to keep her at a proper distance from the second; but in every case there should be a side passage, or a separate entry to the head passage for carrying in the food, as it should never be carried across the groove, or between the cows. It is not desirable to have a hay-loft above the byre in case of fire; besides, as has been before remarked, the cows' breath injures the provender; but if there is no suitable place for keeping the hay, it is very convenient to have it in a loft over the byre; in which case there should be a board hinged to fit the aperture for letting down the hay

to the cow, to prevent the cow's breath from ascending to the provender; and in order to give ventilation there should also be one or two holes made in each side wall close to the hay-loft. If it is wished to have the byres handsome, the walls and ceilings may be plastered, and neat circular openings formed in the ceiling between the joists where the openings are made through the outer walls. The current of fresh air passing between these joists, will draw up and carry off the foul air by the circular openings; and to make the ventilation more complete, air should be admitted as described in the chapter for stables; but the door should be made tight at bottom, as a current of cold air coming in below cannot be otherwise than hurtful to the cow.

The passages should be washed and sanded once a day, and the walls and roof kept clean with whitewash. There should be a dung-pit at the back of the byre, and an opening in the back wall with a door to fit, for putting

out the dung; the opening to be at the head of the passage for taking in the provender. The dung-pit should be thatched over or covered with turf, to exclude rain and the action of the atmosphere.

A barrel or hogshead should be sunk into the ground alongside the dung-pit, to receive the urine by a drain from the grooves. The drain should be closely built, to exclude vermin, and should also be straight, that it may be easily cleaned with a garden hoe, or clawt. Over the mouth of the drain, at the lowest point of the groove, a board should be placed, perforated with small holes, as a filter.

The outer end of the drain should terminate in the barrel, which should be covered with a lid of wood, or a flag stone, and when full, applied to the garden or grass fields.

Where there is a garden, all spare vegetables should be given to the cow, and if boiled they will prevent the milk and butter from having a disagreeable taste. No spoiled vegetables, not even a single leaf, should be given to the

cow, as it would inevitably alloy the flavour of the milk; but all the broke (offal) and weeds of the garden, and offal of the kitchen, should be deposited in the pig-house or save-all. The pig-house should be fitted up alongside the dung-hill, and should have two apartments, to be paved with flag or whin stones; the sleeping apartment to be six inches higher than the feeding place, and the floors of both inclined to the dung-hill; a small opening to be made in the wall of the dung-hill for throwing in the pig's dung. The feeding place should be open at the side for putting in the food, litter, &c.; or a small aperture might be made in the wall of the byre for throwing into the pig-house whatever is left by the cow, as also kitchen water, &c. This will be found very convenient for the servant.

When the cow is fed with young grass or clover, some straw or hay should always be mixed with it and sprinkled with salt.

The most economical way of feeding cows

is the soiling system; but when they are kept constantly in the house they must be changed every year, otherwise their feet would fail and their knees swell. It is, therefore, desirable to have pasture for them to go at large, but if that cannot be obtained, a small plot may be taken to tether them upon; or failing that, they might be turned out to a court or an open shade to get air and exercise.

CHAPTER X.

It is the Author's intention in the present and subsequent Chapters to speak of the Edinburgh, London, and Dutch dairies. And first, of the

EDINBURGH DAIRIES.

The very general complaint that prevailed in other towns as well as in Glasgow, of the insufficient supply of genuine milk, led to the formation of a number of Joint Stock Companies, two of which were formed in Edinburgh. As many of the inhabitants of that city are proprietors of villas, and residences of summer resort, they were, of course, in the habit of occasionally enjoying milk of the purest quality; but, on their

return to town in winter, they felt the want of that wholesome beverage, it being very difficult to obtain the article unadulterated any where in the city; hence, a number of spirited individuals proposed to form an association among themselves for the purpose of obviating this public inconvenience. In the progress of their discussions, however, some schisms arose, which led to the establishment of two Companies; both of which consulted the Author upon the probable success of the speculation, and he strongly recommended an union of their respective interests, by means of which a saving of nearly one-half the expenses in delivering the milk, &c. would be effected, and thereby more easily accomplish the desideratum they had in view, namely, to furnish the public with pure milk at a moderate price. Both Companies not only approved of the Willowbank system, but expressed a desire to take advantage of the advice and experience of its projectors, particularly as regarded the buildings.

One of the Companies, by way of experiment, took a farm with its old buildings thereon, which were converted, as far as was practicable, to the purposes of the new concern. The other purchased a valuable and appropriate site for the premises, upon which was erected a magnificent cow-house, which attracts and deserves the attention and admiration of visitors, and is well worthy the metropolis of Scotland. Unfortunately, however, for the shareholders' prospects, too much money has been expended upon the Establishment to hold out any early hope of a beneficial return. At the request of the Committee of Direction, the Author gave them a sketch of the Willowbank cow-house, and the particulars of the system pursued, which were highly approved, though but a very small portion was subsequently adopted. Though this Company has been unfortunate in its buildings, and in the interior arrangements (verifying the old adage of "too many cooks," &c.), yet the undertaking deserves well

of the citizens, inasmuch as it has been the source of supplying them with milk free from any admixture or impurity. The other Company also send out milk direct from the cow, and both furnish it to their customers from locked pitchers.

The exertions of these Establishments naturally stimulated the small dealers to supply their customers with an improved article; and every means was used to dissuade those who dealt with them, not to countenance the new Companies; so successful, indeed, were these representations, that the patronage which the public were in gratitude bound to afford, was thus surreptitiously withheld.

The city of Edinburgh is now better supplied with milk than at any former period, a circumstance, as has been already remarked, entirely owing to the new Establishments, which may be said to be getting "both the skeith and the scorn." As an instance of the suspicions of self-interest; when the Companies were first projected, a hue and cry was raised

against them, for interfering with the old cow-keepers. This, to say the least of it, was very ill-judged, as the avowed object was not to injure them or put them down, but to be a means of supplying that populous city with milk of a quality very different from what they had hitherto been compelled to receive, and at a fair and reasonable price. It would have reflected more credit upon the citizens of Edinburgh, had they imitated the conduct of a chief magistrate in a certain town in the west of Scotland, who was reproached by the bakers and their friends for encouraging a Bread Establishment, which furnished a much better article than the community had been in the habit of getting. "The bakers," replied the magistrate, "are but few in number, while the town contains many thousands of inhabitants; and therefore I consider it my duty to award my attention to the interests of the many, especially in a matter which relates to the first necessary of life."

LONDON DAIRIES.

THERE have long been established in the vicinity of the metropolis, several extensive dairies, none of which, however, have been at any time so large as has been represented. As, for instance, the popular notion that one well-known dairyman has had as many as nine hundred and ninety-nine cows, but events always conspired against his ability to boast of having a thousand, is erroneous; so far, indeed, from this being the case, the Author is enabled to state, on the authority of the oldest dealers in London, that the ordinary Establishments of the principal dairymen have never exceeded from three hundred to five hundred cows. Considerable sums have been realized by the proprietors of these, not, however, from vending *adulterated* milk; the common practice being, to sell the article entire to wholesale and retail dealers; many of these go to the dairies, and milk a given

number of cows, as agreed upon, when the milk is measured by the dairymen into their own vessels. In other cases, the milk is sent by the dairymen to the dealers in the town; and it is among this class, and the itinerant retailers, that adulteration takes place.

Such was the state of the milk trade in London, when a number of Joint Stock Companies were formed some years ago; several of which, adopting the Willowbank system, sent out this wholesome aliment in its purest state in locked pitchers. The community, however, like the "gude folks" of Edinburgh, did not sufficiently appreciate the advantage of these useful undertakings; the patronage which the supply of such a wholesome beverage ought to have commanded, was denied to the laudable promoters of the health of their fellow-citizens, and to this, added to the great expense of conducting such concerns, may be ascribed, with one or two exceptions, their general failure.

Two of the Establishments, which circum-

stances consigned to sale, have since become the property of a gentleman who has about three hundred cows in each; and a third was purchased by the Alderney Dairy Company; this latter the Author believes to be the only large concern by which the inhabitants of the metropolis are supplied direct with genuine milk. The conductors appear to have paid a due regard to many important points of the Willowbank system; but, particularly to that effectual regulation which relates to the sending out milk from the cow to the customer in locked pitchers. The salutary benefit that has resulted to the public by this practice is to be found in the improved quality of the article now generally sold by the retailers about town.

With the exception of the Alderney Company, the other dairies of any note, both old and new, dispose of their milk to (what may be termed) middle-men, a class of dealers standing between the original venders and those who retail direct to the public.

It must be admitted there is much difficulty in the Alderney or any other large dairy concern, conducting its business in a satisfactory manner by the retailing system. It is well known that a practice prevails among the milk distributors, as reprehensible as it is difficult of detection, of receiving bribes to assign their customers to the old retailers, who, in their turn, give douceurs to the servants of families, and thus corrupt and supplant those channels through which only a reformation of the objectionable practice is attainable. The Author experienced a little of this species of dishonesty in his own Establishment at Glasgow—copper and silver were there, however, the tampering ores; but in London, it seems, particularly among the higher classes of domestics, nothing short of *golden* specifics will successfully convert integrity to its opposite.

Were the heads of families to direct their sons and daughters (weekly and monthly alternately) to receive and check the trades-

men's accounts, it would not only impart a knowledge of dealings that could not fail to be of essential service to them in after-life, but would *securely* obviate all attempts to introduce fraudulent items. It is notorious that those who offer the largest douceurs always receive a preference;—the heedless family, of course, eventually paying double the amount to the imposing tradesman in his extravagant charges. An illustration of this occurred lately to a gentleman, who furnished the Author with the following instance of a practice which he declared was carried on in the metropolis to an incredible extent. A friend in the country sent him a present of some excellent potatoes; but it so happened that he could never get a mess of them properly prepared for his table; they were invariably either over or under-boiled. His children were prejudiced against them; and so general in short was the disapprobation of them throughout the household, that nothing but dissatisfaction prevailed till the

servant was permitted to return to her favorite green grocer.

The Author wishes it to be understood that it is far, very far from his wish to be considered as indiscriminately censuring that necessary and useful class of society, *Servants.* He has not adverted to the mal-practices to which they are exposed by the designing and the dishonest, for the purpose of blackening their fame; his object has been purely to point out that improper conduct which, when detected, if it does not ruin their character, must at least excite the most unfavorable suspicions in the breasts of their masters and mistresses. In conducting themselves " not with eye service, but with singleness of heart," and studying the interest and welfare of those whom they are called upon to serve, they elicit a satisfaction gratifying to their employers and honorable to themselves. What an amiable example, for instance, is exhibited to servants in the conduct of the little Israelitish captive, in the

house of Naaman, who said to her mistress, "Would to God my lord were with the prophet that is in Samaria; for he would recover him of his leprosy."

The servants of those who live in affluence are too apt to entertain the culpable opinion, that there is no harm in purloining a little from the abundant stores with which they are surrounded, just as the Infidel would enquire what sin there was in our first parents eating an apple when the garden was full of them? not regarding the conviction that the crime consisted in doing that which was forbidden. The offences of servants, however, are too often traceable to the negligence of masters and mistresses, who do not adopt the wise man's advice of "looking well to their household;" nor imitate the command of their Great Master, who said to his servants, "Gather up the fragments, that nothing may be lost."

But to return to the Dairies. None of the cow-houses, in either the old or new con-

cerns, are properly constructed or ventilated, nor are they or the cattle kept so clean as they ought to be; and for want of proper passages, much more time is also required for feeding, cleaning, &c., than in the Willowbank plan. These, it appears, are defects, of which the respective proprietors are sensible; and they have confessed that in the event of their building new houses, they would certainly have them constructed after the manner of the Glasgow Establishment.

At the village of East Acton, about five miles from London, the Author has had an opportunity of visiting a dairy that has been lately established, and comprising from one hundred to two hundred cows. The buildings are much better constructed, and, in point of cleanliness, the concern is certainly far superior to many he has seen; indeed, it may be said to be not much unlike the Dutch dairies. To the honour of the sex it may be added, the East Acton Dairy was projected, completed, and continues to be conducted, by a lady.

DUTCH DAIRIES.

In order to render the present work as complete as possible on all matters connected with Dairy Husbandry, the Author deemed it expedient, before sending any of the sheets to press, to visit the Dutch dairies, in order to detail such parts of the systems pursued there as might be desirable to be known in Great Britain. With this view he proceeded across to Ostend, and thence to Bruges, Ghent, Brussels, Antwerp, and other towns.

In Brabant he found the soiling system in general practice. The cows are kept in the house, and the water and provender brought in to them. There is a head passage between two rows of cows, about ten feet wide, for holding the provender, and a deep space is left behind, where the dung, water, and litter are allowed to mix together; this is afterwards taken to a pit or hollow in the court.

Other boors (as they are termed) keep their cows in a cellar without being tied; loose straw is thrown in to them, which, with the dung and urine, are trodden into one mass, and not removed so long as the cows have room to stand. It is subsequently carried to the courts, where the liquid is expressed from it and applied to the fields with a scoop, similar to the manner in which cloth used to be watered in bleach fields in Scotland. Little or no attention is paid to keeping the cows clean; the chief object seems to be to obtain manure; the cattle, therefore, as well as the houses, do not exhibit a very pleasing spectacle; in other respects, however, the dairies are very creditably managed, the milk-house and all the vessels being kept remarkably clean.

The butter is made from cream; the skimmed milk is allowed to sour, and is then made into cheese. The best butter in that country is made to the west of Brussels. The milk-houses are under ground, arched,

and paved with brick; they are lighted and ventilated from the north. The milk is put into small earthen vessels, with a wooden hoop round the mouth of them. When the cream is to be taken off, the dairymaid passes her fore finger round the dish to separate the cream from the edge, and with the same finger pushes the cream over the dish into the cream vat, and the skimmed milk into another vat, or vessel; the cream is then made into butter with a barrel churn, which is suspended by the axle between two planks placed against a wall at an angle of about forty-five degrees.

When the skimmed milk is become sour, it is made into small cheeses, which are poor, white, and sour; they weigh about a pound each. The curd is put into a cloth, and then placed in a small wicker basket, (both of which are kept very clean,) about six inches diameter, and an inch and a half deep, to give it a shape, and dried in the open air. These cheeses, as well as the butter, are daily sent

to Brussels, where they are highly valued though little more than a sour curd.

The sour skimmed milk, of which this cheese is made, is kept in the same cellars or milk-house with the new milk; and as most of the farmers brew their own ale, many of them keep the ale barrels also in the milk-house, a practice of which the Author disapproved. Although the cheese in this district, (as already observed,) is very poor, the butter is considered superior to any in the Netherlands. One of the best milk-houses the Author saw, was at the farm at La Haie Sainte, the scene of the memorable battle of Waterloo. This milk-house was completely under ground, and in an adjoining apartment was an excellent ale cellar; these seemed to have been the only secure places of refuge for the terrified inmates during the dreadful conflict.

The cattle in Brabant and Holland are of the same breed, but of rather a larger size in the latter country; the colour is black

well marked with white, short horns, and in general of a handsome shape. They have for the most part a calf at two years' old, which doubles the stock in two years. They would grow to a much greater size if they had not a calf till the third year; but as in that case the stock would not be doubled till three years, the present custom is of course more profitable.

CHAPTER XI.

In South Holland the cattle are kept constantly in the fields, and, except during winter, are never taken into the house night or day. When they calve, a covering of sail-cloth is put over them; they are also similarly covered in the fall and spring, when the weather is cold; but great care is taken never to put the cloth upon the cattle when their skin is wet, as vermin will inevitably ensue. Their cows form the principal object of their care; so much so, indeed, that they incessantly attend them and amuse themselves with them in the fields as though they were their children. If by accident or disease they happen to lose a cow, which is a rare thing, the loss is seldom or never supplied by the purchase of another

in its place; they rather prefer to wait till the parturition of one of their stock shall fill up the vacancy, so careful are they of their money.

In the neighbourhood of Leyden and Haarlem there are a number of farmers, and landed proprietors, who keep from fifty to one hundred cows each. In the neighbourhood of Delft there are also some excellent dairies. In the angle from Rotterdam to the Hague, the system in all the districts is very different from the mode pursued at Brussels, and other places in Brabant.

As soon as the milk is taken from the cows, is put into large brass pans; and these are placed in a cistern of water direct from the pump; when cold, the milk is emptied into large earthen vessels, or into oblong dishes cut out of solid wood, about thirty inches long, eighteen wide, and five deep; these are placed upon the floor of the milk-house. The cream is taken off with a skimmer at twelve, eighteen, or twenty-four hours, according to the

heat of the weather, and made into butter two or three times a-week. The upright churn is used; there are some in the shape of a puncheon, others conical, but in none of them is the head of the churn-staff near so broad as to fill the churn. The best butter is made in May and October.

When the weather is hot, the cream is cooled with cold water, and in winter it is of the heat of new milk or warmer. The process of churning generally takes two hours, and the butter is then put into cold water for about half an hour—the water being changed five or six times—and the butter well worked with the hand and then salted with the finest salt; it afterwards lies in the vessel from two to four days before it is put into the cask. It is a practice with some to turn it repeatedly during that period.

It will require about two hundred and forty cops of cream to make forty pounds of butter, to which are added one cop and a half of salt; and about eight hundred cops

of skimmed milk to make a cheese of about forty pounds. The cop appears to be about an English pint.

The cheese is made of the skimmed milk before it is sour; one half of the quantity is made as hot as the hand can bear it; it is then mixed with the other half, and ten cops of butter-milk are added, (some put in the butter-milk before the milk is heated). The thickening (rennet) is afterwards put in, and when ready the whey is well pressed out and a handful of coarse salt put to a cheese of forty pounds. A quantity of cloves, which are previously immersed in hot water for forty-eight hours to soften, are split into small pieces, and mixed with the salt into the curd, which is then put into a cheese shape, with a cloth, and pressed for twelve hours with a lever power of three or four hundred weight. It is then taken out and turned, and at the end of another twelve hours, is put under a lighter pressure without any thing around it. The cheese is

subsequently taken out and laid upon a shelf to dry, being turned at the end of twelve hours; and at the end of another twelve hours it is put into a vessel with a pickle sufficiently strong to swim a potato. This pickle is deep enough to cover the half of the thickness of the cheese, which is turned daily for fourteen days, when it is sufficiently salted, and then laid upon a shelf and daily turned until dry; it is afterwards coloured on the outside and put upon planks in the cow-house.

The cheese and butter form the principal income of the Dutch farmers. The Author remarked that they never put beasty milk into the butter or cheese; the calf gets the whole of the milk for the first seven days, and for a few days after that the milk is made into small cheeses, which, being formed and pressed, are hung up in small nets suspended from the roof, and kept for family use.

In these districts the butter is generally

rich and sweet, but the cheese is comparatively poor; some relish it for the flavour of the cloves, and others dislike it on that account; but in general it is considered the cheese is improved by this infusion.

The cows are milked twice a-day, at three a. m. and three p. m. A good cow, about four years' old, will give twenty-four cops of milk per day, which will yield one-eighth, or three cops of cream, a proof that the milk is very rich. A cop of cream is sold at six times the price of new milk; and skimmed milk at half the price of new. This custom corresponds to the Scotch mode; but, in London, the cream is about twelve times the price of new milk!

The Dutch farmers conceive that when a cow has her first calf, she has less milk, but the quality is very rich; after the second calf, a greater quantity, but not so rich; and she is considered at her best after the third or fourth calf, but the milk is of course not then so good. It is, perhaps, for this

reason that some dairy farmers sell their cows when at their prime to those who keep town dairies, the object of such being to obtain quantity rather than quality.

In Holland, a calf newly dropped sells for about a guilder and a half, (two and six-pence English,) but when fed, from twenty to fifty guilders are obtained. The veal is very superior, and is considered a great delicacy. The common way of rearing calves is to give them the whole of their dam's milk for seven days, then butter-milk, and afterwards whey. A good cow, nearly at calving time, will cost from one hundred to one hundred and twenty guilders, and will bring about the same price when fat. A cow will weigh from seven to eight hundred pounds Dutch.

CHAPTER XII.

NORTH HOLLAND is famed for good cheese, but the butter is poor. The best cheese, called Edam, is made in one of the richest districts in Holland. It is about thirty miles in circumference, with a high embankment around, planted with trees: the soil is clay. The greater part of the cheeses are made of a round shape, vulgarly called "Dutchmen's heads," and weigh about from three and a half to four pounds each; these are made every morning and afternoon from the warm milk as it comes from the cow. The cows are milked about five in the morning and evening. When the weather is very hot, it is cooled a little, and when cold it is made to new milk heat, or rather more.

About two spoonsful of rennet are put into as much milk as will make ten or twelve of these small cheeses; this thickens it in ten or fifteen minutes; it is then stirred, the whey pressed out with the hand, and the curd made into a ball shape. The whey is afterwards put into a pan and made as warm as the hand can bear it. The cheeses are then put in and turned in the hot whey, which hardens, and smooths the outside; they are afterwards wrapped in cloths and put into circular shapes, the bottom of which are concave, with small holes to let off the whey; a lid is then put on, and pressed with an hundred weight for twelve hours, when the cheeses are taken out of the shapes and the sharp arres pared off the upper side; they are then inverted and put without a cloth into the shape for another twelve hours, after which they are placed under a weight of about fifty pounds; that is, a plank is laid over them and the weight put upon the plank, from whence they are subsequently

removed and put upon shelves, being daily turned until they assume a proper shape, when they are rubbed over with salt (more is put into the curd) made sufficiently damp to stick to the cheese; they are then put each into a shape without any pressure and turned once a-day for ten or twelve days, and rubbed with salt daily. A trough is put under the shapes to receive the pickle that runs from the cheeses. When the cheeses are taken out of the shapes, they are put into this pickle for one day, after which they are placed upon shelves and turned daily till dry, which they will become in five or six days; they are then put into cold fresh water for three or four hours, washed and dried with a cloth, and laid on the shelves to dry; some rub them with a little beasty milk, others with a little boiled linseed oil, which excludes the air. These processes being completed, they are ready to be sold to consumers or cheesemongers.

In Rotterdam and Amsterdam there are

many extensive cheesemongers, who have large warehouses in those towns as well as in the country districts. These buildings, which are well ventilated, consist of from three to five flats, or stories, and are fitted up with shelves to suit the different sizes of cheese. When the cheeses are brought from the farmer they are allowed to lie some time in the warehouse, where they are turned once in two or three days, according to the state they are in. When well dried, dust or mould will collect upon them; this is clean scraped off with a knife curved like the thick end of a sickle. The operator sits upon a stool, in the fore part of which is a small hollow to lay the cheese upon; the operation is quickly performed. The scrapings fall into a vessel below, and are given to the pigs.

After the cheeses are clean scraped they get two coats of colouring, which is done by boys with a brush similar to that used by painters, only without a handle. The first

coat of colouring is allowed to dry before the second is put on; and when the last is dry, a little boiled linseed oil is used; this is considered particularly useful in the spring and when the drought is strong, as effectually preventing them from cracking. The cheeses are then in a finished state, and lie in the warehouse until sold or exported. They are occasionally turned, but are considered not so palatable till they are four or six months' old.

These cheeses are shipped in great quantities to the East and West Indies, South America, and Great Britain. The best are made in May, and sell for the highest price; the next in summer; but the winter or hay cheese is deemed the worst, as the cattle get little else but hay in that season. There are some who give a little oil or rape cake with the hay, but green crops are almost invariably neglected; (the grass is very much saturated with salt). If turnips, mangel würtzel, &c., were given to the cattle, it would unques-

tionably improve them, and increase their produce. In summer they have a profusion of rich grass; and when, in winter, they receive nothing but dry hay, their condition and milk must fall off; but, as already stated, it is a fruitless task to attempt to reason a Dutchman into a change of his customs.

The merchants exercise great caution in depositing all unsound cheeses in a place by themselves, and which are reserved for home consumption.

After the cheeses are made, (which, as before-mentioned, is every morning and evening,) the whey is put into barrels placed on end, and the cream that is cast up is skimmed off daily for a week. This cream, from the sour whey, is then churned; but the butter is very poor indeed and scarcely brings more than two-thirds of the price of cream butter; it is generally sold fresh, for as it will not keep it is of course unfit for exportation. The whey is given to the pigs.

Considerable attention is paid to the

rearing of these animals, but they are in general very coarse made, long in the body, legs, and ears; nevertheless, the bacon and hams made in Holland are excellent. The pigs are kept very clean, and, in general, have a boarded place a little higher than their feeding apartment to sleep in. They are washed daily, and scrubbed with heather, (heath) brush (or ringe), and when there is any appearance of what in the North would be called the "Scotch fiddle," rye meal is given, which cools and cleanses them.

The pigs, when seven or eight months' old, are sold for sixteen or twenty guilders. This the Author conceives the most productive part of the boor's business.

The colouring liquid for dyeing the cheeses is made from old coarse linen rags, which are imported from France, and sold at from a guilder to a guilder and a half per pound: they produce from £.30 to £.40 per bale. The rags are called *turresel;* some say they are old bags which have been used for

pressing the grapes, and that it is that use which gives them the colour; others, that the French dip them into a brown or reddish liquid, and, when dried, are exported for making colouring liquid.

About seven pounds of these are put into a barrel, with about four gallons of cold water; after remaining twelve hours, they are put into a press and the liquor squeezed out and poured into the barrel; the rags are then put into a second barrel, with the same quantity of water, which is similarly pressed out; a third barrel is also used, which generally takes out all the colouring matter. A second quantity of rags is put into the first barrel, and undergoes the same process. The first barrel, of course, will be the strongest liquor; this is emptied into a barrel with a stop-cock for the purpose of drawing it off to colour the cheese. The liquor has the appearance of port wine.

The first barrel is then filled with the same quantity of cold water, and put last, or in

the third place; the second barrel is then brought forward, into which new rags are put; this goes through the former process, and the liquor, when sufficiently strong, is put into the store barrel. The liquid is fit for immediate use; but it will keep for months without injury.

The next best cheeses to Edam are those made at Gouda, a village situated between Amsterdam and Rotterdam, and celebrated also for its manufacture of tobacco-pipes. These are also made from new milk, and manufactured and coloured in a similar way, but the colouring of all the Dutch cheese is on the outside; no cloves or any other seeds are put into them, as in the skim-milk cheese of South Holland. The Gouda cheeses (which are thought by some to be superior to the Edam,) weigh from ten pounds and upwards, and are similar in shape to the Scotch and English.

Very little cream cheese is made in Holland, it not being an article of trade; but

when merchants receive orders to supply their correspondents in London, Edinburgh, &c., the boors and farmers are directed to make the necessary quantity. The usual way of making cream cheese is, to allow the new milk to stand till it thickens a little, but not to be sour; then to take off the cream. The cheese is made by the same process as that from new milk.

There is a fifth kind of cheese made in Frieseland, but which is very poor, called "canters;" these are made from skimmed milk. The Frieseland butter is also very good. It may be received as an universal fact, that wherever good rich butter is made, the cheese is poor, and *vice versa*. The Author did not think the best cheese made in Holland equal to what is produced in many districts in England, or the Dunlop cheese of Scotland, for, although it is made from new milk, it has occurred to the Author that this arises from part of the fat going off with the whey and the process of making, and part afterwards

extracted by rolling the cheese so long in hot whey: he is, nevertheless, persuaded, there is no butter to be got equal to, or even so good as, the Dutch cream butter. It does not appear that they make any butter from the new or whole milk, which the Author thinks would be an improvement, and more profitable, as in general the milk is very rich; the butter, too, would not be so strongly flavoured, and would keep better. Cheeses might be made from the butter-milk similar to those manufactured in Brabant from sour skim milk.

In some districts, at the season when the milk is richest, they allow the morning's milk to stand till the evening, when it is skimmed, and mixed with the evening milk as taken from the cows; this is made into cheese. By removing the cream, they say, the cheese keeps better, especially when sent into hot climates; but the Author strongly suspects there is another reason, namely, to get some rich butter for themselves, as that made from the whey is very poor indeed.

In North Holland, neither the water of the cows or pigs is kept, but is allowed to run to waste. In South Holland, the water from both is conducted into barrels, or tanks, and covered over to exclude it from the atmosphere. It is applied to grass lands in the fall, winter, and spring; but this is performed in a slovenly manner by means of scoops. It is seldom or never applied to the garden, either for the trees or green crops; and as the cows are in the house during the winter months only, the pigs' water is all they get throughout the year. The cattle are never taken into the house night or day, till the cold weather sets in; and when taken in, the cloths are removed from them, and they remain there until the spring, when they are turned out for the season. During winter great pains are taken to keep them and the cow-house clean. In many cases their tails are tied to a rod, or stick, and drawn up to prevent their coming in contact with the dung, or water; when turned out, all the stakes

and yokes by which they are tied are removed into the loft, or to an out-house, and the groove is covered with planks, the litter completely taken away, and fine dry sand put into the fore part of the stall. Those who wish to be more particular, cover the sand with nine-inch square brick, or tile, so that the stalls may be compared to the hall of a gentleman's house; rows of planks are put along the house, one tier above another. The cow-house is thus turned into a cheese-house during the season, so that it has scarcely any appearance of its former purpose. The roof is generally pretty lofty, being from ten to twelve feet high; the ceiling is plastered, and in some of the better sort of buildings, the loft, or apartment above, is also plastered and used as a cheese store and granary. There is generally a handsome trevice or partition which divides the length of the house into three or four stalls.

In some of the cow-houses there is no head passage, but a semicircle hollow formed of

brick-on-edge about four or five inches deep, into which the water is let at one end, and runs all along, and what is over is let off at the other end. Other houses have a head passage of from four to six feet beyond the hollow alluded to; but all of them have a passage from four to six feet behind the grooves; each groove is about eighteen inches lower than the stall, and nine inches lower than the passage behind, so that the cows stand high and dry. The bottom of the groove is inclined a little towards the cow as well as towards the centre, or ends, to allow the water to run into the reservoir.

At first it appeared that the deepness of the groove would be dangerous for the cows; but as they never go out till the spring, and as the place is kept clean, and sanded, and the back part of the stall laid with small clinker brick, no accident ever happens. The place for the fore feet is either filled up with fine dry sand, which abounds in Holland, or litter;

so that the cattle stand very easy, and their knees are not hurt in lying down.

There are some cow-houses in double rows, having passages in front and rear. Some of the more ingenious boors have small holes near the ceiling, to afford ventilation; but in general there is little or no attention paid to this essential point either in the cow-houses or milk-houses. The neglect of this necessary precaution cannot fail to make the change very hurtful to the cattle, when taken from the cold fields in the fall, to the house; and again, when removed from the house to be exposed to the nocturnal atmosphere. The cloths with which they are covered may in some measure prevent any bad effects from such transitions, but were the houses to have ventilators so constructed as to open and shut, according to the state of the weather, it would certainly be a desirable improvement. The Dutch are so sensible of their long-acknowledged superiority in dairy husbandry,

as to be indifferent to any advice, however advantageous might be its adoption; and are at all times most reluctant to make even the slightest change in their old established practices, be they ever so objectionable.

The whole of the interior of the cow-houses, as well as the stables, with the exception of a space for the fore feet, are all neatly laid with small brick, and daily washed and sanded. The milk, churn, and cheese-house, are kept beautifully and almost indescribably clean; the floors are of marble slabs, or Dutch tiles; the milk tables, too, are of finely polished marble. These latter, however, are not much in use, the milk vessels being generally placed upon the floor, which is the coldest part of the house.

There were very few thrashing machines in the dairy districts from which a power might be taken for churning; but all the respectable farmers have the churning apparatus drawn by a horse, or mule; most of them have a pump well in the apartment, for

washing the dishes, and also in or adjoining the cow-house. The most scrupulous attention is paid to keep every vessel and utensil as clean as hands can make them; many of the vessels are made of brass, and give such evidence of their polished purity as to well supply the purpose of a mirror.

The wooden vessels are generally painted both inside and out, even to the milking pails; but this the Author did not think well of. The Dutch, however, contended that, when properly dried, they impart no unpleasant taste to the milk, are easily cleaned, and do not imbibe any milk or liquid.

So careful are the Dutch to preserve all the cream for butter, that that article is scarcely to be seen in use for tea or coffee, either in private families or at hotels.

The general habits of the Dutch people are characteristic of sobriety and industry. Of their energy or inventive powers the Author, nor, he believes, scarcely any one else, is enabled

to say much; not one step will they move out of the old beaten path unless they are doubly sure of a better footing.

As water is so abundant (which, by the bye, is somewhat brackish) the pumping a little daily into the milk-house and then drying it up, and also having a proper ventilation, would be a very great improvement.

The particular attention paid to cleanliness in every thing, as well as the mode adopted of salting their butter, the Author presumes to be the reasons why the Dutch butter is so good.

Most of the boors, it was observed, had egg-racks in their milk-houses, where the eggs were deposited, the small end uppermost; they conceive that this mode of stowing them makes the eggs keep better.

CHAPTER XIII.

CANALS abound every where in the Netherlands. The trade in the interior, as well as in all the towns, is carried on by navigable canals; but the largest and most magnificent is the one from Amsterdam to the Texel, which is sufficient to navigate a line-of-battle ship. The different properties are also separated by canals, which in general have rows of trees on each side. The farms are subdivided by smaller canals into separate fields connected with draw-bridges or gates upon the bridges. The Author did not hear of any instance of the cattle going into these canals, or sinking or lairing in the mud; they are contented and quiet, and never attempt to go from one field to another but

when the gates are opened. At the hours of milking they assemble at the place where they are to be milked; this is generally shaded from the sun; and some of these places are paved with brick, and regularly cleaned, otherwise they would be miry and dirty in wet weather. All the water in these canals is brackish; the pastures must, therefore, be flavoured with salt; this is, perhaps, one reason why the cattle enjoy such good health, and some think that it has a good effect both upon the butter and cheese; it is certain that cattle are fond of, and improve by, salt. In some countries where salt is mixed with the earth, wild animals resort to it, and often make deep holes or pits by licking the salt; it is in these that they are often destroyed. The huntsmen secrete themselves in the neighbourhood, and shoot them as they go to their saline repasts.

There are great quantities of new milk sold in the towns, and some of it is brought a considerable distance along the canals. A

number of boors have generally a boat amongst them, and the farthest from town sets off very early. As the boats come along the canal each farmer has his milk ready to put on board; they then proceed to the town, where officers are appointed by Government to examine the quality of the milk; and if it be under the fixed standard, it is confiscated and given to the Orphans' Hospital. This regulation is of very great importance to the community, not only because the milk is examined as soon as it reaches the town, but because those who are deputed to this office occasionally try its quality when the retailers are going about distributing it. Indeed, a great part of the milk is sold by the farmers to dealers, who retail it to the inhabitants. None of the milk vessels are locked up; there is less need of this salutary check, as the smallest quantity of water can be detected by the Government Tests. Most of the farmers, or extensive dealers, have an instrument by

which they examine their milk before it is exposed to sale. The Author was desirous of purchasing one of these Tests, but unfortunately he could not find one ready made: they cost from ten to twenty-five guilders each, according to the size; the larger they are the more accurate they are considered.

At and near Rotterdam the cows are fed with the draff and dreg from the gin distilleries; but the milk from this is not so good as the grass milk, or even as that from hay or oil-cake; neither is the butter or cheese so good, and which consequently sells at a lower price. Both the draff and dreg are carried a considerable distance in boats along the canals, the draff in one part of the boat and the dreg in the other. These are pumped out into vessels upon the banks of the canal for the use of the farmers.

CHAPTER XIV.

THE following GENERAL REMARKS may not be deemed an inappropriate termination to the Author's continental tour.

The King of the Netherlands is said to have the largest private fortune of any monarch in Europe. He rises early in the morning, and has a levee before breakfast to all who call. The name of each applicant desirous of an audience is entered in a book, and the royal attention is conferred upon individuals in the rotation in which they are written, without any respect of persons. After breakfast, his Majesty is closeted with his Ministers: the rest of the day is devoted to public and private business.

The King of the Netherlands is a general

favourite, and certainly not the less so for the deep interest he is known to take in the welfare of agriculture and the commercial affairs of the nation.

The Court resides one year at the Hague, and another at Brussels alternately.

The canals and highways in the Netherlands are made and kept in repair by Government, for which a tax is levied upon the inhabitants. The roads are tolerably good from Ostend to Antwerp; some parts are made chiefly of sand, others are causewayed with whin-stones brought from France. In South Holland the roads are paved with clinker brick and covered with fine sand, which makes travelling very pleasant. The Author saw no metal roads in North Holland; they are formed like a ridge, with the soil, which is chiefly clay; this makes a very agreeable road when the weather is dry, but when otherwise all communication upon them is stopped, as in many places carriages will sink up to their axle. When drought sets in, these roads are levelled with a mattock and spade, and a pair of horses draw a large

harrow along upon which the driver stands; this makes good travelling while the drought continues; but the canals form the chief mode of communication, by boats, when opened, and, when frozen, the inhabitants walk or skate upon the ice.

Holland, from the ground being low and damp, does not afford good pasture for sheep; the mutton is, therefore, inferior. Beef is tolerably good, and the veal excellent.

In Brabant the established religion is the Roman Catholic; and in Holland the National Church is Presbyterian; but in both countries, there is a free and full toleration. The King is a Protestant. Each parish has a church, and a parochial schoc[l] where even the poorest may receive a good plain education. In this respect Holland resembles Scotland, and the manners and habits of the people seem somewhat a-kin to the Scotch. They are sober and industrious, civil and obliging, but not much given to hospitality, except to those who are in the habit of paying them money. In many cases where the

inhabitants receive large sums, the purchaser is not even asked either to eat or drink; but from this general rule the Author found some grateful exceptions, as the following instance will testify.

The Author had a letter of introduction to a boor about fifteen miles north-west of the Hague, where he arrived about nine in the morning. The dairy-work (making butter and cheese,) was just finished, and the premises, furniture, and utensils, in fine order, and beautifully clean. The boor and his wife were sitting in the kitchen. The farmer read the letter, and then handed it to his wife; both gave the stranger a hearty welcome. The boor then set about dressing himself, in which he was assisted by his wife, who put on and adjusted his neck-cloth; during the performance of which the boor smilingly said, "Do woman in England do so to their husbands?" adding, "bad woman make poor boors, good woman rich boors." He stated that his woman rose at three, p. m., and

superintended the milking of the cows and making the butter and cheese. When the boor had finished dressing he took the Author over the fields to see his cattle, and through all the premises, and returned to the house entering by the principal door into a spacious dining-room, elegantly furnished; a profusion of glass and china was exhibited upon the tables and sideboard. It was remarked that although the shoes of the boor were quite clean, he took them off before entering the room, and carried them in his hand, until he reached the parlour, where an excellent breakfast was prepared; this was succeeded by a plentiful supply of Schiedam and Cognac. Previous to commencing breakfast the boor and his wife covered their face with their hands, and, in a devout manner, seemed to implore a blessing upon their repast.

Breakfast being over, the Author then put a string of queries, which he had previously prepared, and to all of which he obtained the most satisfactory answers.

Piety, industry, mutual affection, and liberality, appeared conspicuous in this happy pair. The Author was informed that the principal room of the boors' houses is seldom or never used, except on occasions of marriage or birth.

At the Hague the Author met with a Swiss gentleman, who related the following anecdote relative to lucern. His grandfather, he said, was the first who cultivated that perennial plant: he had seen some of it growing wild in the fields, and was induced to gather a small quantity, which he offered to his horses and cows, both of which ate it with avidity. This tempted him to collect a little of the seed for the purpose of sowing a small patch, which succeeded beyond his expectation. Hence ensued the general circulation of this choicest of all fodders. The Author was also farther informed of the mode practised in Switzerland, when there happens to be a failure of provender. It is this: in winter, the cattle are put into a warm house, where

the water is carried in to them, but is given in small quantities; by which means, they will be satisfied with less provender than if they had their full desire of water, and in the spring-time they will be found in good condition.

In Waterland (North Holland) there is a beautiful little village, called Brook; the streets and lanes of which are tastefully paved with brick, and are kept as clean as a parlour. The houses are also very handsome, both inside and out; the exteriors are painted with oil paint of the most brilliant colours. No horses or cattle are allowed to go into the village; the cow, however, is a special exception,—she is an universal favourite, and is therefore permitted to go along through the streets to and from her pasture unmolested; and when any spot is defiled by her progress, the ordure is removed and the place immediately washed.

The inhabitants of this delightful village are principally rich merchants, who have

retired from business. They have little or no intercourse with the neighbouring inhabitants.

When this little district was desolated by flood a few years since, which ruined many of its residents, the inhabitants of Rotterdam and Amsterdam proffered their assistance to subscribe money for their relief; the wealthy nabobs of Brook, however, declined the aid.

CHAPTER XV.

THERE can be but one opinion of the essential truth, that the breathing of fresh air is the primary improver and preserver of health, whether in the human or brute species.

The most eminent of the faculty tell us, and the experience of every moment of our lives confirms the remark, that Air, when it is fresh, cool, and wholesome, has a most invigorating influence on the lungs, the skin, and the stomach. In short, "if we have it not, we die."

Were any illustrations necessary to demonstrate the necessity of this vital principle, we may find them in the cases of individuals whose daring experiments in diving bells

show how frequently fresh air must be renewed to render their immersions of any duration; and in the appalling effects which resulted from the memorable and fatal incarcerations in the Black Hole at Calcutta.

So soon, indeed, does air, when inhaled by many, become unwholesome, that various contrivances have, from time to time, been invented by ingenious individuals, for either admitting a fresh supply of pure air, or partially renewing a portion of the exhausted. The celebrated Dr. Hales recommended Ventilators, of a particular construction, for the convenience of dwelling-houses; but the Author does not remember to have heard of any similar contrivance for effectually accomplishing the same benefit in stables.

It will be the object, therefore, of the present Chapter, to inform the reader of the means which have occurred to the Author's experience, as the best calculated to promote this end.

VENTILATION OF STABLES, &c.

Of late years, very great improvements have been made in the fitting up of stables. Many of these, however, are not much better ventilated than the old stables, and none that the Author has seen are ventilated as they ought to be, not even his Majesty's new stables.

It is well known that the urine of horses produces much ammonia gas; and when this is not let off it becomes injurious to their eye-sight. When stables are kept dark, the effect of the ammonia together with the horses being brought from a dark and close abode to a clear and cold atmosphere, necessarily injures the health and eyes of the animal, and sometimes even causes blindness. In proportion as the stable is substantially built, and well finished, the heat is the greater during night; and in the morning the horses will frequently be found in a profuse sweat.

When taken out in this state, the animals will consequently be liable to catch cold. To prevent this, some make openings in the walls, or a space at the bottom of the door; but this is only increasing the evil; for these apertures and spaces merely let in a current of cold air, and thereby expose the animal to a similar affection in the house; it is therefore of the last importance that stables should be so constructed as to enable the horse to breathe a pure and refreshing atmosphere, without suffering from cold. Such is the object aimed at in this Chapter; and to obtain which the Author suggests that there should be no loft above the horses, but instead thereof ventilators should be introduced through the ridge of the house, and at the top of each gable: or if there be a hay-loft, it ought to be from twelve to fifteen feet above the floor of the stable. Between each joist, and both side walls, there should also be a space close to the flooring, twelve inches long by six inches deep, which should be occupied by a

strong wire grating, to keep out vermin. Each of these openings should have a board, or shutter, inside, to slide up and down, so that one or all of them might be opened in full, or in part, according to the state of the weather. Venetian blinds might supply the place of boards at the pleasure of the owner.

There should be no ceiling of lath and plaster in stables, for a very obvious reason, that it is invariably a harbour for vermin. If gentlemen are desirous of having their stables finished in that way, there might be small handsome openings made in the ceiling between the joists, so that the current of air passing from the windward to the leeward, would, in its longitudinal direction between the joists, draw up and carry off the foul air from the stable; but this will not be complete unless atmospheric air be introduced into the stable below, which ought on no account to be obtained from under the door, or from any other opening that would admit a *current*.

In stables of single rows, and where the

horses are at a considerable distance from the door and front wall, openings should be made at the bottom of the wall, twelve inches long by four deep, and eighteen inches apart, to be filled with cast-metal plates perforated with small holes; this will so apportion the air (in the same manner as the rows of a watering-pan distribute water) as to prevent a current coming in contact with the horses; it will at the same time imperceptibly mix with, and force off, the hydrogen gas, by the openings above.

The ventilation of stables will also be farther promoted by having vents (flues) carried up in the gables and side walls of the building, and also boards for the purpose of damping or shutting them at pleasure.

There are some who have tubes to go up through the ceiling, hay-loft, and roof; but frequently there is a blow down through these upon the horses, which can scarcely fail to give them cold. Where these tubes are used, a board should be attached to them a few inches from the ceiling, and six inches broader

all around in the mouth of the tube, with a cap turned up on all sides, to spread the wind that might blow down along the ceiling; or when the weather is very cold, these tubes may be shut up altogether.

If the stables have a double row of horses, such as the Author has witnessed in some of His Majesty's stables at Pimlico, the atmospheric air cannot be admitted by the side walls; but an opening from one to five feet high, and five or six inches wide, might be made through the gable walls and brought out on each side of the doors, and cast-iron plates with small holes, as mentioned above, placed at the mouth of these openings; the air would then blow into the space for the door, and mix with the air of the house, without blowing upon the horses. An iron grating would require to be placed outside, to prevent vermin from getting into the flue; wooden shutters should also be made to fit the openings inside, to allow more or less air to come in as wanted.

In a stable of single rows, where the house is narrow and the horses near the front wall, air should be admitted as above, by the sides of the door, and also by the sides of the windows.

In addition to the injury which horses and cows receive from close houses, the breath condenses upon, and is imbibed by, the timbers, which naturally cause them to rot and give way much sooner; besides, it soils the paint, plaster, &c. But to render the atmosphere of the stables perfectly sweet and pleasant, there ought to be a drain under every horse at the place where he stales, the mouth of which should be covered with a piece of cast-metal hollowed a little in the centre, and perforated with holes; under this plate should be a cesspool (stench trap) to prevent the foul air or cold coming up. All wet litter, and dung, should be immediately removed.

The drains from each stall should be collected in a common sewer, communicating with the

dunghill. A little water should be daily poured into each cesspool to prevent any disagreeable odour, as well as to clear the drain.

A dunghill should be sunk in the most suitable part of the yard, and should be tightly built round and covered with a door to prevent vermin getting in. The water that comes from the drain, will tend to prevent the dung from heating; and if that be not sufficient, soap-suds or plain water might be added, which would prevent the dung from wasting and turn it into liquid manure; it might then be drawn up by a pump, and applied with great advantage to the gardens, grass lands, &c.

The straw, or litter, will be found excellent manure for potatos; it will make them dry, and early.

If hay is kept in the loft there should be a small aperture with a door to fit tightly, and this should never be opened but when hay is put down for the horses. In many stables these openings have no cover, and

hence the provender becomes impregnated with the foul air of the stable, which renders it both unwholesome and unpalatable. Where stables are not properly ventilated, and where post-boys are in the habit of keeping their clothes in the stable, or in an apartment adjoining, an offensive effluvia resulting from their daily avocations, (whether on the dickey or saddle,) will be exhaled from the apparel. The want of ventilation is also very injurious to the harness, tending to decay the leather and tarnish the metal.

The Author is aware that these recommendations may not probably receive the approbation of grooms, who wish to keep their stables *warm*, the better to give the skin a fine pile; and *dark*, the better to make the horses frisky when brought out to the light: but this unnatural beauty of the skin, and sprightly appearance of the animal, it is well known, will soon go off, whereas a fine skin, produced by that useful furbisher *elbow grease*, and a well-lighted and

properly ventilated stable, will do more to improve the health and add to the energy of that valuable animal, the Horse, than any thing else with which the Author is acquainted.

It would be well, too, were grooms to take an example from the boors, who, as mentioned in the account of the Dutch dairies, always take off the cloths when they put their cattle into the house, and only cover them when the weather is cold; whereas horses are generally kept not only in a hot stable, but are clothed (and many of them very thickly) night and day; and when turned out, have no covering but the harness.

Of the importance which the subject of ventilation is beginning to be regarded, the Author ought not, perhaps, to deny himself the gratification of quoting the following remarks, (which have been pointed out to him by a friend since this treatise was written,) confirmatory of his own opinions. They form

the portion of a Chapter from a recent and deservedly popular work* on the subject.

The Author having, in the preceding Chapters, pointed out the arrangements necessary for an establishment of public training stables, proceeds to treat on a very important point, that of Ventilation. "One of the principal objects," says he, "to which grooms should pay the most scrupulous attention, is that of the health of their horses; indeed, they have discovered that this object is, in a great measure, to be attained by keeping their stables much cooler than they formerly did; yet, as there may be some of the old school who still adhere to the former practice, (that of hot stables,) I shall make a few observations on the impropriety of their so doing.

"It was formerly the common practice among grooms in the winter and spring, to regulate the temperature of the stables agree-

* A Treatise on the Care, Treatment, and Training of the English Race-horse. By R. Darvill, V. S. 7th Hussars.

ably to their own feelings; and it was their custom (at least with those I lived under), if the weather was at all cold, to have the long dung laid at the bottom of the stable door, and to have every aperture in the stable closed; this, together with the heat from the breath of the horses, and the fumes arising from the wet dung under them, made the stables, what was called by the groom, 'comfortably warm;' for in those days it was the custom (to use the language of the stable,) 'to muck out only twice a-week.' This temperature, I should say, if allowed to speak from my own sensations, far exceeded, in all probability, that of a hot-house, to say nothing of the impurity of such air. Indeed, at the time I am alluding to, I could mention many proofs, in a variety of instances, of the inconsistency of a number of grooms in the management of horses, but I have great satisfaction in stating that the generality of these men now understand the thing much better than they formerly did.

"It is now pretty clearly understood, and indeed almost universally admitted by them, that a constant supply of fresh, pure air, is not only beneficial, but absolutely necessary for the preservation of all horses taken from a state of nature, and placed in an artificial atmosphere."

APPENDIX.

No. I.

About a mile north of the Glasgow cathedral the Author purchased a farm called Sight Hill, so named, perhaps, from the circumstance that the highest point commanded a view of fifteen counties.

The high part of the farm was a hard cold tilled bottom, and scarcely produced any vegetation. The Author also acquired from Blytheswood that lot of ground called Garnet Hill, a part of which he sold for the Glasgow Observatory; this hill was also a cold barren till. There were no roads through either of these lands; an improvement desirable to be adopted, and to accomplish which the Author obtained a quantity of ashes and rubbish from iron founderies

and other public works which he had screened. The coarse parts were excellent materials for making roads. The harped or screened ashes, sand, &c., were carted to, and laid thick upon, the barren hills. The cow urine was also carted to them in large casks, and emptied upon the highest parts, which ran down towards the bottom: as the highest parts were the barest, the urine being applied to these first, saturated them completely, and such portion as was not retained, descended towards the bottom or low grounds. Part of the land was trenched with the spade, and the rest ploughed three times as deep as possible; first up and down, second across, then up and down, and forward, into ridges; it afterward received a good top dressing with lime. The mixture of the sand and ashes with the till, when saturated with urine, produced excellent crops of wheat, barley, turnips, clover, rye grass, &c.

During the fall in winter or spring, a portion of cow urine was put on, and also some

more of the fine rubbish as just described. The weight of the crops that were raised in these high lands was almost incredible.

There were about five acres of Garnet Hill in front of the Observatory, planted with strawberries of assorted kinds; the ground was prepared as stated above, and the strawberries were planted in rows, which were trenched between every fall or winter. The field was divided into sections; across the hill, and at the top or head of each of these sections, there was a small trench made; the cow urine was carted along the top of the field, and by turning the stop-cock the urine ran into the trench at the top of the highest section. A small opening was made between every row of the strawberries to admit the urine which saturated the first section; the remainder then went into the second trench, &c., to the bottom. The highest sections were the poorest; but from their being more richly saturated with the liquid they soon became as fertile as the lowest. The mode of irrigating

was then changed, viz. a small cut was made from the top to the bottom of the field, and the urine made to run down that cut and fill each respective trench; allowing a larger quantity to the sections that stood most in need of it. This mode produced abundant crops of strawberries, very rich in quality, and, having a southern exposure, most delicious in flavour.

The urine destroyed worms and almost every kind of vermin, and there was little difficulty in applying it, during frost, to hills and inclined planes, and where the ground was flat. The fields were irrigated by attaching rones to the barrels, similar to those used in watering streets.

When this liquid was applied to gardens where the ground was level, it was brought to the nearest point that the cart could reach, and from thence carried with stalls and spokes to the interior, from which it was taken with pails and watering cans, and applied to the roots of cabbages, &c.

As there were several carts with urine barrels, two or more were employed according to the distance; one was left in the field, and the others were plying in rotation. Two men carried the stalls, and two or more applied the liquid to the ground or crop; by this system a great extent was watered in a short time. Morning or evening was the time generally chosen for these operations.

In a former part of this work notice is taken of the application of the urine to fruit trees. Besides the general advantage of it when applied to all trees, it was found a complete cure for the scale; this is an insect (very much resembling the paring of the nail of the thumb or finger,) which grows upon the tree, and sticks as closely as sea shells to the bottom of a ship or rock; they stunt the growth and prevent the fruitfulness of the tree. Various methods were tried to destroy or disengage them; nothing however proved effectual except the application of oil, but this, it was found, shut up the pores of

the tree, and was thereby detrimental to its growth; at last the cow urine was applied, which proved a most complete remedy: it was thrown on the trees by an engine in the evening during frost; next morning they appeared quite chrystalized, and when thaw came, the scales (as they were called) were loose, and easily washed off with the first heavy rain. In a short time the trees recovered their appearance, and became vigorous and fruitful.

The urine was also of great advantage to gooseberry and currant bushes; besides nourishing them it kept the stem and branches clean, and tended, in some degree, to prevent the attack of caterpillars: the urine, however, did not operate as an effectual remedy, for neither the bushes nor fruit-trees entirely escaped.

Amongst his numerous undertakings, the Author laid down an extensive bowling green, and although there was a great depth of gravel and sand put above the soil, and no mould

but the little earth attached to the sod, the earth worms came from the soil beneath, and threw up mould on the surface; in this case the urine was applied by the engine during the night, which killed all the worms that were upon the surface, and running down into their holes, nearly extirpated these vermin; indeed, it had a similar effect whereever applied. Besides the nourishment it afforded to grass lands, it killed almost every species of vermin that fed upon grass, and hence its almost universal importance.

The many valuable purposes which were thus served by the application of urine, was the cause of the Author preserving it with so much care.

Many years before the Willowbank Dairy was established, the Author formed a cesspool in the *parterre* at Willowbank House, into which all that came from the water-closets, &c., was conducted; the mouth was covered with a flag stone, and gravel was laid above it; when full, these were removed

early in the morning, and the contents taken out and applied to the kitchen garden; the stone and the gravel were replaced, so that the cesspool was not seen, nor any unpleasant odour emitted. There was a similar cesspool or tank in the court where the wash-house and byre were placed, for collecting the cows' urine and soap suds, which were also applied to the garden; this kept the whole of the premises clean, and free from impure air.

It may, perhaps, appear to some readers, that too much has been said upon a subject which may not seem worthy of such particular remark. The Author, however, is anxious to publish a full and explicit detail, not only because he has experienced the great utility of what he is recommending, but because he wishes to convey his knowledge of the subject in such a clear and intelligible manner as shall enable any person to adopt similar experiments, which he assures them will not fail to yield both advantage

and satisfaction. Whilst the Author studied *system* in all things, he also thought it essential never to lose sight of that useful maxim, that "nothing should be lost."

No. II.

GREAT care at all times was taken to preserve the dung from exposure to the atmosphere, which was effectually accomplished by the depôt being made in the cellar under the cow-house, as before mentioned; and when the dung was carted to the farm or gardens, there was an embankment of earth thrown up all around it; a sufficient quantity was also put upon the top to prevent the action of the atmosphere, and this was never laid out or spread upon the fields until it was ready to be covered up immediately with the spade or plough, when it was then put down as deep as possible, so that in the decomposition the juices and vapours arising from it might saturate the earth above, and nourish the crop,

instead of being wasted in the atmosphere, which is uniformly the case with dung when exposed upon, or put in, near the surface of the ground. Besides, when the dung is well covered, it is more efficacious, and lasts longer, and in dry seasons the ascending gas affords moisture to the plants.

As the cattle were high fed at the Willow-bank Establishment, and a great quantity of salt was used after the duty was taken off, the dung was very rich and much more profitable when applied by the Author, or sold to others, than poor dung at one-third of the price. The advantage of using rich dung does not seem to be generally understood.

For instance, suppose a ton of the best quality cost six shillings, and that three tons of inferior dung at two shillings did not yield more nourishment than the one ton of rich quality; and suppose that the cartage, tolls, &c., cost the farmer two shillings per ton more before it could be laid out on the field for manure; the rich ton would thus cost him only eight

shillings, whilst the three inferior tons would stand him in twelve, thereby showing a saving of four shillings, or one-third in favour of the rich dung; and if we suppose a farmer to purchase five hundred tons per annum, the saving that would accrue to him by using the best quality, would amount to £100. sterling annually.

No. III.

It has been noticed in a former page that fruit trees, when washed with cow urine, are not only thoroughly cleaned, but are rendered more luxuriant and fruitful, and are less liable to be injured by the caterpillar; it is generally such trees as are weak or of a slow growth that suffer most from that insect. The eggs that produce them are deposited at an early period in the bud, as the insect was generally discovered when the buds began to open. The best method which occurred to the Author for destroying them or marring their progress, was to water the fruit branches, or rather the buds, with tobacco juice; but this method was both tedious and expensive, as it took a considerable quantity of juice to go over a large tree, and it was also found to be

much more difficult to collect that portion of the juice that fell to the ground, (which was generally considerable,) than when gooseberry or currant bushes were watered with it; but when trees upon esplanades or walls were sprinkled with the juice, the vessels which were made for the gooseberry bushes were placed alongside the bottom of the walls and esplanades, and the juice was thrown upon the trees in a longitudinal direction with a syringe, and what the trees did not retain, fell down into the tin vessels, so that there was little or no waste. A little snuff put into the bud is also successful in destroying the caterpillar.

There can be no doubt, if the duty were taken off tobacco used for these purposes, it would be an essential benefit to the orchardmen, without producing any injury to the revenue.

The caterpillars that were most injurious to the small fruit at Willowbank, particularly to the gooseberry bushes, were of two kinds, namely, a large one about an inch long, of

a black or dark greenish colour, and a small green one.

The former destroyed both the leaves and the fruit, and left nothing but the bare stem, which rendered the bushes unfruitful for a year or two after; it was discovered that these caterpillars were produced by a fly about five eighths of an inch long, of a brown colour. Previous to depositing their eggs they were observed hopping or hovering about the root of the bushes, and were so full and heavy that they could scarcely fly. When these were first noticed, it was supposed that they were the female parents of the insect, which was demonstrated by pressing them betwixt the finger and thumb, when a great quantity of eggs protruded; this led to an examination of the bushes, and it was found that the young and tender leaves at the bottom and in the centre of the bushes, were indented with the eggs of the fly in a regular and beautiful manner, resembling the appearance of tamboured work, or the stitching in the

wristband of a shirt. In a short time the eggs became animated, when they quickly devoured the leaves upon which they were bred, and then proceeding upwards, as rapidly destroyed all the young and tender leaves of the interior. During this injurious activity, there was no appearance of any mischief going on upon the outside of the bush; they would, however, suddenly spring out as from ambush, and in a day or two not a vestige of verdure was to be seen. The same work of destruction was commenced upon the next bush, if not already destroyed, and failing that, they fed upon turnips or any other vegetable nearest, leaving nothing but the stems. These ravages upon green crops were never, however, to any great extent at Willowbank; at no time, indeed, did the ravages extend to more than a quarter of an acre in one place; but so completely were these portions eaten up as to verify the sacred text, "Before them was like Eden, and behind them a wilderness."

The most complete cure for, or rather pre-

ventive of, this desolating insect, was to examine and pick off the leaves at the bottom of each bush where the eggs were deposited, and put them in a vessel, in which was a little water. The taking away these leaves and the young shoots, instead of being injurious to the bushes was rather beneficial, and, eventually, preserved them from destruction.

The extraordinary instinct of these as well as other insects, is strikingly demonstrative of the wisdom of the Supreme Being, and of the tender regard displayed in the formation of every work of his hands. The sagacity of the caterpillar in choosing the tenderest leaves, and the warmest part of the bush for its nourishment and the comfort of its brood, furnishes to parents of the human race a reflection not unworthy of frequent remembrance.

Athough the anticipation of the destructive effects of these insects was painful, it was far from uninteresting to mark the instinctive solicitude which they manifested for the succession of their tribes—a solicitude which,

while it is doubtless intended to answer some valuable purpose beyond the finite ability of man to discern, ought to impress us with the conviction that nothing was created in vain.

The other species of caterpillar was a small green one, which made holes in the fruit and leaves; and, although it did not destroy the foliage, it rendered the crop of little or no value. The Author could not discover how or where these were bred, but when they appeared upon the bushes many attempts were made to destroy them; one tolerably successful way was to go to the gooseberry fields (there being a great extent planted,) early in the morning, and spread a linen sheet under the bush; then to strike the stem smartly with a stick, which was sure to bring down the caterpillars by thousands; these were emptied into a pitcher with water, and the rest of the bushes gone over in the same way. The most complete and effectual mode of preventing these insects from destroying the fruit and injuring the

bush, was, as has been already observed, by the application of tobacco juice; which could always be obtained from tobacconists. When very strong, this liquor was diluted with water, and applied to the bush with a syringe, similar to what is used in hot-houses; and in order that the bushes might be properly washed, and none of the juice lost, there were tin plate vessels made of a semi-circular form, with a ledge or chain about an inch deep turned up, and a small semi-circular opening made in the straight side where the two semi-circles met, to encompass the stem of the bush. A pair of these semi-circles was placed upon the ground, close to, and under, the bush, for the purpose of receiving all the juice which the bush did not retain; this was emptied into a pail carried by the person that used the syringe; the other took the semi-circular tins to the next bush, so that in a short time a great number of bushes were gone over with little trouble and expense, and none of the juice was wasted.

No. IV.

FRUIT trees, it is known, will not thrive upon land where the bottom is gravel, or till, unless flags are put under the roots when planted; these may be thin, but should be of a considerable diameter; this will give the roots a horizontal direction and make them spread all around, thereby promoting their growth.

If the roots are properly covered, the nearer they are to the surface the better, as they will derive more nourishment from the manure applied to the soil, and the genial rays of the sun, than when they get deep into the earth; besides, when the roots have a wide spread, the trees are not so easily blown from their upright position by the wind.

Young trees, particularly apple trees, are often much injured by hares peeling off the bark; various preventives have been used, such as rolling the stem with a straw rope, or anointing it with oil; the latter mode, by stopping up the pores, is found to be injurious to the trees; and the former is attended with considerable trouble and expense, and is rather hurtful, inasmuch as it intercepts the salutary influence of the atmosphere.

In the Willowbank Orchard (which extended to several acres) an effectual remedy was used. Mozie (privy dung) and soot were mixed together in a pail to the consistency of paint, and then applied with a painter's brush in the fall, or beginning of winter, to the stem of the trees. In a short time, a person may go over a considerable quantity; and if the weather be dry, one coat will serve during winter; but when washed off with rain, the process must of course be repeated.

The hares, it was remarked, never touched

any tree to which this preventive was applied. When the mixture was occasionally washed down with rain, the ground derived an excellent manure from what it received.

No. V.

THE mode of planting thorns for fences has been long known, and in general well executed; but, from either partial or total neglect afterwards, most of these hedges become inferior fences. They are frequently too open at the bottom, and from not being protected by a ditch and paling, slaps (gaps) are frequently made which are seldom or never properly filled up. A breach in a stone wall or dyke, can be easily repaired, but not so with a thorn hedge.

The Author's practice in planting quicks was to form a ditch, and raise the bank or face of it about one-third of the intended height; then to put a good layer of dung, but none of it to be nearer than within six

inches of the front of the ditch; a few inches of clean mould was laid upon the dung, and smoothed with the spade. The tops of the thorns were cut, leaving only three or four eyes; they were then laid horizontally, but the point was not allowed to project, but to be flush with the front of the ditch; good mould was put over the thorns, and the remainder or inferior stuff from the bottom of the trench was laid uppermost. The more weight that was put over the roots, the more luxuriant the plants grew. All weeds, particularly quickens, and such as spread their roots in the soil, should be carefully taken out before planting, otherwise it will be almost impossible afterwards to disentangle them from the plants; and they will, besides, absorb the juices which should go to nourish the hedge.

If the soil and season are favourable, thorns thus planted will grow to a considerable height the first year. In the fall, the hedger should carefully examine the

hedges, and if it is discovered that any plant has failed or is weak, a thriving shoot of the adjoining plant should be laid horizontally across the defective one. The whole hedge should then be cut down to within three or four inches of the ground; this will make it spread and grow thick at the bottom, which is essential to make a good fence. In the ensuing fall, the weak places should be examined and repaired, as stated above; the sides and top of the hedge should be dressed with a hedge-bill and scissars, and the above process repeated annually. The greatest care should be taken to clean and dress the hedges, and free them of weeds, and to let no grass or any thing grow within a foot or two of the hedge. Hedges thus treated will soon become beautiful and secure fences.

But there is a mode of making thorn hedges a much more substantial and secure fence, than by the common practice; which is to allow only one shoot to grow from each plant; all the others to be broken off,

(rather than cut,) as soon as they appear. In a very few years, say two or three, the shoots will grow to the height of five or six feet; they should then be pruned as bare as a walking cane, and cut to the same length, and plaited in an angular direction across each other, which will form diamond openings or squares. When plaited in this way to the top, the point should be tied with a piece of bass, (matting,) and if there is any hollow or projection in any part, these may be made straight by driving a stake perpendicularly into the ground, and fastening the bend to the stake with a piece of bass; this operation should be performed in the fall, winter, or early in the spring, before the buds break. A profusion of shoots will grow up perpendicularly from the angular or horizontal parent plant, and will closely fill up all the diamonds; if, however, there should be an opening in any part, it should be filled up by a sprig from the adjoining plant, as recommended in the common hedge.

This fence is peculiarly adapted for a garden or pleasure ground, and should not be allowed to grow broader than from eight to twelve inches; when full grown, it will resist any encroachments by animals.

In common hedges if a bullock gets in his head between the main stems, he will make his way through; but plaited hedges may be considered impregnable.

The Author had some fences done in this way at Willowbank by a transplanted hedge, about twelve years old, which was taken up by the roots; the plants were pruned and cut to the same length; part of the roots were also cut off; they then resembled shinty clubs. They were planted four or five inches apart; good mould was put round the root and plenty of dung applied under them, but not a particle was allowed to touch the root; they were then plaited and treated as above, and in one year a fence was formed which effectually excluded hares, poultry, &c.

The plaited or net-work thorn hedges were

used for outside fences to the orchard and gardens at Willowbank; but the interior fences which separated the walks from the fruit gardens, were made of horn-beam and beech, alternately, and plaited the same as the thorns. At the crossings, they frequently became grafted into each other. There were privet, and other evergreen shrubs, planted close by the roots of the beech and horn-beam; as all these kept their leaves during winter. The contrast of the foliage presented by the green and brown was very beautiful, and the shrubs formed an excellent shelter from the cold and bleak wintry blasts.

Sweet-briar, which exhales the most grateful odour, was also planted alongside these hedges, especially such as were near the dwelling house; but it was found that the briar tended to canker the horn-beam and beech, so that the regalement it imparted to one of the senses was marred by the pain of witnessing the injury sustained by the fence; and which brings to memory the poetical

illustration of what too frequently happens in ordinary life,

> "Hence still my joys with sorrow meet,
> And all my tears are bitter sweet."

There was a great extent of gravel and grass walks surrounding the fruit gardens, with flowers and ornamental shrubbery on each side; these were between the thorn and fancy horn-beam and beech hedges, and were united along the low grounds across the ponds by Chinese bridges, which led to the summer-house upon the top of the hill, whence was a better view of the city, and the country around, than could be obtained from any other point. From this site the Author could witness, by a telescopic view, the distant operations of his servants in the garden and farm, which was found to be of great advantage.

Previously to building the Glasgow Observatory, Dr. Ure had the use of this summer-house for making his astronomical observations.

No. VI.

A LEARNED writer tells us, that "Knowledge is power." Let us then turn whatever knowledge we possess to a good account. The divine goodness that pervades the universe presents an abundant field for its exercise; and a peculiar bounty is constantly exhibited to us in the advantages that one spot possesses over another. A particular instance of this may here be mentioned. In early life, when the Author resided in the Ochels, he observed by the sides of the mountains, several wallees, (water springs,) where the grass was luxuriant and ever-green, (as the springs did not freeze in winter,) whilst all around was bleak and barren. To these green patches the cattle resorted, and some-

times laird (sunk) in the swamp, and would often have perished had they not got assistance.

Now, if the husbandmen had made trenches on each side of these well-springs in the form of a semi-herring bone, the water would have irrigated the barren ground adjoining, drained the bogs, and protected the cattle from accidents.

Many mountain rills might be sent along these hill sides, by trenches or furrows cut as described above, which, by the distribution of the liberal bounty which Providence sends forth, would turn barren ground into good pasture. This might be done (at least in part) by the shepherds, in place of loitering their time in useless inactivity.

The importance of irrigation is now generally known and valued, but it is by no means carried to the extent it ought to be; whilst other liquids, possessing the most valuable qualities for vegetation, are almost neglected. Amongst these may be mentioned urine, soap-suds, kitchen water, &c. In the country these are

generally thrown out in front of the dwelling house, to the great nuisance of the inmates and passengers. This remark applies equally to villages, farm houses, and the habitations of the poor.

In cities these valuable manures go into the common sewers, where they accumulate and run into and pollute the streams, banish the salmon, &c.

The Author, when passing over the bridges across the Clyde, could never witness the copious flow from the common sewers without deeply regretting that so much valuable manure (the common "guid" of the town) should go to worse than waste. This suggested to his mind a plan by which the contents of the sewers might be rendered valuable to the city, and beneficial to the country; namely, by constructing a large common sewer to run parallel with the river, as far down as was necessary, and thereby consume the whole in irrigating the soil. At suitable distances, the water might be raised by a common pump or steam engine,

and made either to run into trenches, or carted away with barrels, or both.

Tanks might be formed at the sides of the sewers at proper distances from each other, to collect the sediment; and by a sluice the communication of the sewer with the tank could be cut off when the manure was to be carried away.

Previous to laying out money for the above purpose a trail might be made by sinking a well alongside one of the sewers, and placing a filtering board perforated with small holes at the mouth of the well, to keep out the sediment, which otherwise would choke the pump. The water might then be pumped into barrels and carted to the gardens or farms in the neighbourhood. This would give employment to many carters who have little to do in consequence of fewer buildings being now carried on.

In order to cover the expense of the well, &c., the carters might be charged a trifle for each barrel, or so much for a day's drive; or if

the well was made adjoining a steam engine, a cistern might be fitted up, and the water pumped into it by the engine and let off into the barrels by a valve, as was done when the Willowbank water was sent into the city.

The indefatigable and efficient superintendant of public works might irrigate the public green with water from the sewers, during fall, winter, or spring; or in place of carting it, a pipe might be laid, and the water forced from the lowest part of the Moleander-burn into the highest part of the green, and let off by a stop-cock into long perforated wooden rones, which would spread it along the surface; or the carts and barrels that water the streets might be employed for that purpose.

The Author is confident that this would produce a great weight of grass, and by perseverance might ultimately rival *auld Reekie,* (Edinburgh,) the common sewers of which are said to produce annually grass worth £50. per acre.

A small portion of what is collected in the common sewers would be sufficient for this purpose; the remainder might be let down on either side of the river, and, by irrigating the lands, would tend materially to promote the growth of corn, grass, and vegetables. This continued action and reaction would be productive of the most beneficial effects; for while it was accomplishing a desideratum for the town, it would at the same time impart increased capabilities to the country, and confer the most flourishing prospects on both.

In towns and villages where there are neither common sewers nor scavengers, the ingredients alluded to are thrown out into the street, where they are allowed to putrify and pollute the atmosphere until a visitation from above shall carry them away. They are then conducted into the nearest stream, and thus rendered extremely injurious both to the human species and to fishes.

Were a dam or reservoir formed at the

lowest part of these towns or villages, all the manure would be washed from the streets and carried into them by the rain; the villagers might then apply it to their gardens, or the farmers to their fields.

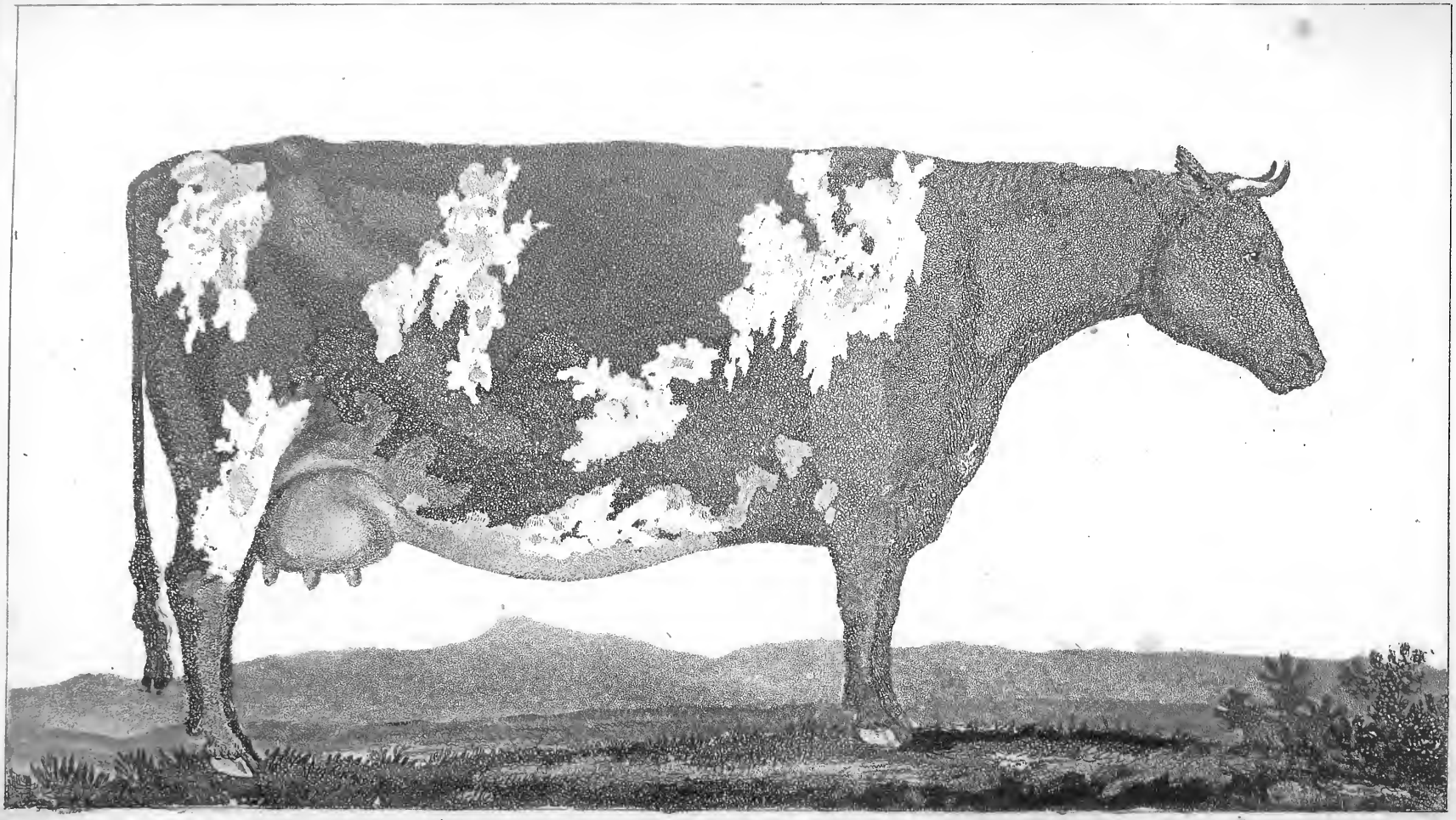
Some villages in Scotland, it is known, have small rills that run along the main street; these should be also applied to the purposes of irrigation. A Cockney in a conversation with Sandy was once running down his country, and sneeringly contrasting its magnificence with boasted London, and the bridges over the Thames. Sandy replied, that if he would visit the despised country of the North, he would show him a town where there were more than one hundred stone bridges; referring to Auchterarder, a village west of Perth, where every family has a flag-stone laid over the little rill opposite their door.

The Author submits to the consideration of those who are better qualified than himself, an investigation of the ideas he has thus

feebly pointed out; but he humbly conceives that were his suggestions to be acted upon, incalculable advantage would result to every city, town, and village, where such nuisances and neglect at present exist. Much increase of the earth's products would also as certainly ensue, and the result might be similar to that derived from the common sewers of Edinburgh just alluded to.

No. VII.

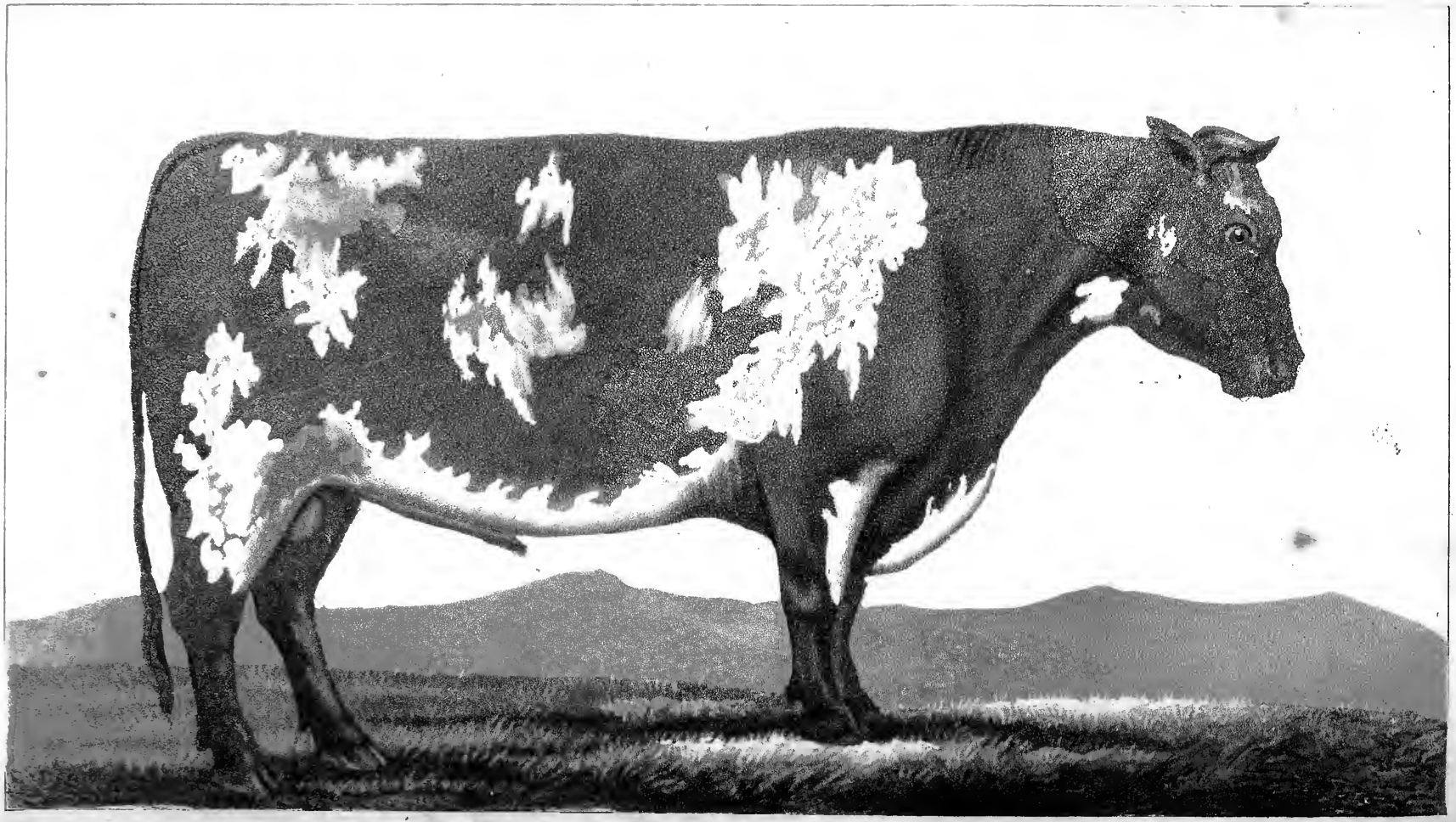
As the stock contained in the Harleian Dairy was composed of cattle of the Ayrshire breed, of whose excellence the Author, from long experience, entertained a very high opinion; he has thought this work might be deemed incomplete, were it to omit furnishing the reader with a brief history of the qualities of those valuable cows. He had at first intended to sketch such history from his own information; but, as the subject has been so ably treated by Mr. Aiton, in his popular work on Dairy Husbandry, it would be an act of injustice to the reputation of that much-respected and useful writer not to take ad-



J. M.c Kinlay Delt.

R. Scott Sc.

AYRSHIRE DAIRY COW.



J. M.c Kinlay Del.t

R. Scott Sc.

AYRSHIRE DAIRY BULL.

vantage of this opportunity to introduce his own interesting and very accurate

HISTORY OF THE AYRSHIRE DAIRY BREED.

"The dairy breed of cows in Ayrshire," says Mr. Aiton, "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 in the county of Ayr,† that dairy husbandry had not only been practised in Cunningham, but that the making of butter and cheese

* Mr. Aiton's work was commenced in 1815.

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

had 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, Peebleshire, 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 avoirdupoise, 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 aspect 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 animals 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 generally 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.

" 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, Esq., 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, Esq., 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, Esq., of Sundrum, and raised a numerous offspring in that quarter of Ayrshire.

" John Orr, of Borrowfield, Esq., 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 freaked 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."

From a subsequent section in the same work, the Author gives Mr. Aiton's interesting account

Of the manner in which the City of Glasgow was supplied with Milk.

"It has been mentioned," says Mr. A., "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 buttermilk 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 potatos 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."

In speaking of the accommodation paid to the cattle in their byres in Scotland, Mr. Aiton is pleased to give the following flattering account of the Willowbank Establishment:

"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 long been engaged in manufacturing cotton goods, 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 the baths soon became a place of general resort." * * * * *

" 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 so much neglected." * * *

" 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 of the cows, want of cleanliness in those who fed and milked them, and the nature of the milk itself, so apt to become impregnated with foul air and every impurity, have 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 whatever." * * * "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." pp. 67, 70.

No. VIII.

It has been suggested by those to whom the Author submitted particulars of his various undertakings, as embodied in the Introduction to this work, that no mention had been made of one public effort which had cost much application to accomplish. Without intending to obtrude any matters upon the reader which may be deemed irrelevant to the ostensible character of the present work, the Author hopes he shall be excused by his patrons generally for bowing with deference to the well-meaning counsel of intelligent friends, and publish, in this place, a brief sketch of an endeavour anxiously pursued, at one period of his life, to improve the moral

condition of the lower classes of the Glasgow community.

Before the existence of a Police Establishment in Glasgow it was usual for the citizens, in rotation, to patrol the streets nightly. In the Author's turn to perform that duty, it constantly occurred to him to be a witness of such deplorable scenes of vice and depravity as to impress upon him the conviction that if some feasible plan were devised, and followed up with resolution of purpose, much of this dissoluteness might be reclaimed. With a view to attain this desirable end, and with the co-operation of others in advice and assistance, a number of Sabbath schools were opened in the city and neighbourhood for imparting religious instruction to the children of the poor; the Author's clerk keeping an account of the number of schools, scholars in each, books distributed, &c.

Though the Author exercised a general superintendance over these schools, his prin-

cipal attention was directed to the one formed in the Merchants' Hall, Bridgegate Street, where, as well as in the vicinity, the shoals of neglected children might be compared to so many lambs in the midst of wolves, without the protecting presence of a shepherd.

After it was resolved to make an attempt upon this "Billingsgate" of Glasgow, the principal impediment that presented itself was the want of an appropriate accommodation; and the only place that could be so converted was a garret in which, during summer, the town lamps were deposited, a sorry convenience for a school-room, and at first as dark and miserable as the understandings of those it was intended to enlighten. At this period, (1797,) the late John Lawrie, Esq. was Dean of Guild, to whom application was made for permission to occupy the room as a Sabbath Evening School. It is but justice to this worthy magistrate to state, that he not only assented to the request in the most courteous manner, but regretted that the place was so

ill calculated for such a praiseworthy purpose. He also accorded permission for sky-light windows being introduced in the building; and thus, by receiving the light of heaven into an abode where it had never shone before, led the way for the diffusion of that divine light which enlightens the understanding and turns darkness into light. The object, indeed, sought to be accomplished was the fulfilment of that patriotic and christian wish expressed by his late Majesty, "that every child in his dominions might have a Bible, and be able to read it."

The room having been supplied with forms for the children, a very tolerable attendance of the indigent and uneducated continued during the winter. The return of the season, however, when it was customary to take down and deposit in their usual place the street lamps of the town, compelled the surrender of the garret, a circumstance much regretted by the worthy Dean of Guild before alluded to, who felt a deep interest in

perpetuating an attempt which had already commenced with such favourable hopes; he even offered, rather than the children should be dispersed, to defray the rent of any suitable accommodation that could be obtained. Permission was eventually given to occupy the Merchants' Hall; this concession was hailed with much satisfaction, and the Hall was for several years the means of congregating not less than four hundred children every Sabbath evening.

The method which in the first instance used to be adopted to collect this large assemblage, was to tempt by kind entreaties, and the promise of trifling douceurs, any of the loitering groups which were generally to be seen in the streets; these endeavours seldom failed of success, and frequently stimulated the voluntary attendance of others. The novelty, in short, of poor children getting admission to the Merchants' Hall soon attracted a multitude, till the difficulty at length became how to secure *order* and *silence* amongst

so many, the greater part of whom, too, had never been present at the performance of divine service. These desiderata, however, were soon attained, by a proper observance of *system;* as the multitude that were fed in the wilderness by Him who desired that they should sit down by hundreds and fifties, the easier to facilitate the distribution of the food, and the gathering up of the fragments.

At one end of the Hall a chair was placed, next to which the little children from three to five years' old were made to sit down upon the floor in a circle. Those a little older were placed in a second circle, and so on till all were seated. The oldest children and adults were seated upon forms, or stood behind; by this arrangement all were in full view of the teacher. Many of the youths, it was remarked, were from fifteen to eighteen years of age; few of these could read, and still fewer had a bible. Those who happened to have this book were desired to stand up in their places; and instead of reading by rota-

tion, the rule was to single out such as were not intent upon their bible; this had the desired effect of making all attentive. Instead of attempting to rivet the children to a long discourse, the time was chiefly devoted in rehearsing their knowledge of the catechism, or of the portion of Scripture which had just been read; this was pursued in the same manner as in the reading, namely, by putting a question to the one that seemed most inattentive.

The simplicity of this mode produced a silence and attention almost incredible. The catechising generally commenced with the youngest children, by asking "Who made you?" Very few, it was found, could reply to this question; but when any one gave the proper answer, it was remarked to them generally, "that that poor child knew more than many nations of men and women." Such observations tended to encourage even the least of the children.

Questions were occasionally put to the chil-

dren which it was not expected they could answer; and a short pause was then made in order that every one present might form an answer in their own minds: when the teacher answered the question, it was intended to convey instruction to those that were grown up, and to spare the agitation and embarrassment which their ignorance might raise by being in the presence of children.

As there were so few that could read, the next attempt was to teach that useful branch of education; and those that were of an age to acquire more, were requested to come to the Hall on Sabbath morning, at seven o'clock, at which hour a number of assistants, provided by the superintendants, were in attendance to divide the children into classes. It was found, however, that one lesson in the week was insufficient for the purpose of improvement. There were then four apartments obtained—two for boys, and two for girls. In each apartment about fifty children attended; and for the accommodation of those who were

engaged at the public works, the hours of teaching were from eight to ten in the evening.

The teachers were warpers, or other servants of the Author, who were allowed two and six-pence a-week. Books and oil were purchased at the wholesale price. Each teacher had an oil-vessel and lamps.

In the course of two years, about four hundred children and adults were taught to read the bible who did not even know their alphabet when they first attended the school; and, except those who actually resided in the district, scarcely any one knew of these anxious endeavours to supplant ignorance, and engraft knowledge; but it sufficeth that it is recorded in "the annals of the poor."

The children of these schools continued to make rapid improvement in the acquisition of those truths which, it is hoped, have directed and prospered the undertakings of their more mature years. To the Author the reflection has frequently afforded indescribable satisfaction that he was an humble instru-

ment in setting afloat this accessible channel to virtuous knowledge; a satisfaction that has been not a little heightened in after years by the grateful confessions of many, that their first seeds of useful instruction were sown in the Merchants' Hall at Glasgow, on a Sabbath evening; and to whom the Author may justly apply the words of a much-esteemed English poet:—

"Knowledge was proud that they had learn'd so much;
"Wisdom was humble that they knew no more."

It was about this period that Mr. Thomas Bewley (who was taken away in the midst of his growing usefulness,) took an active part in getting the Lancastrian system of education introduced in Glasgow; in furtherance of which, a number of respectable inhabitants were invited to a meeting which was held in the Chapel of Ease Session House. The scheme was opposed by some as unnecessary in Glasgow, where there were already so many schools with able teachers. When the proposal was near being rejected, Baillie

John Tennant, the only individual present who knew what was doing at Bridgegate, opened the way for a brief account of what had been achieved in that quarter, and how much was yet required to impart to *all* the poor children of the city the inestimable gift of an useful education. This announcement silenced any further opposition, and the proposal was adopted; though, unfortunately, some of the gentlemen who opposed the scheme were elected managers. The expectation that the Lancastrian plan would prove successful, caused the Bridgegate Schools to be given up, which has since often furnished a source of real regret.

The Author will pass over the result of the above appointment by merely stating that the greater part of the money subscribed for *two* Schools was expended upon *one;* and in a short period of time the scheme was abandoned and the subscriptions lost.

The picture which the Bridgegate School exhibited of the deplorable state of ignorance,

vice, and wretchedness, that prevailed in many districts in the city of Glasgow, suggested the necessity of some more general and effective means being adopted. To accomplish this, a plan was conceived, but which was never publicly announced, as it was expected the Lancastrian School would have compassed the object. The following are the outlines:—

1. To divide the city into twenty-four or thirty departments, and to choose a respectable housekeeper to act as the head of each department.

2. To divide each department into sections of from twenty to fifty families, and to choose an overseer from the householders of each section.

3. To have a clerk or inspector for each department, who should make up a complete list of every family, the number of their dwelling, and a list of inmates, distinguishing those who could not read; also, in a separate column, a list of the sick and deceased. The clerk of each department to have an

account opened for each section, and an abstract of this copied into a small book and given to the respective overseers.

4. When the survey should be completed, a general meeting to take place of the heads of all the departments, and their overseers, for the purpose of devising means for erecting Week-Day and Sabbath Schools sufficient to accommodate all that required instruction, and to appoint suitable teachers.

5. A library to be established supplied with books and tracts suitable for the children; such books to be circulated through the different departments in rotation.

6. The clerk, with the assistance of the overseers, to see that every uninstructed child should attend School.

7. Where the parents did not co-operate with the overseers in causing the children to attend regularly, both children and parents to be deprived of all civil privileges. It might, also, in addition, be proper for the legislators to enact a law compelling parents to give their children a suitable education,

or if unable to do so, to order them to be sent to a Free School. No interference whatever to be exercised towards religious opinions; these to be as free as air.

8. The clerk to make a monthly survey, noting the removals by death or otherwise, and inserting new in-comers.

9. Quarterly meetings to be held of the heads of the departments, and their overseers, for the purpose of examining into the state of the Schools, &c.

10. An annual public meeting to be held, to which the magistrates and ministers of all denominations should be invited; the Honourable the Lord Provost to be chairman: the Reports, to be previously drawn up by a committee of the heads of the departments, to be read at such meetings.

Such is an outline of what was imperfectly devised when the Author superintended the Week-Day Evening and Sabbath Schools in Bridgegate, from 1797 to 1802. It is submitted now that the city has such an effective police established, the minor and minuter

parts of the above plan might be carried into effect with little difficulty.

This scheme, it may be urged by some, would occasion additional expense for clerks and surveyors; but an abundance of these might be got on moderate terms from that class of the community who are unfit for hard labour; besides, the *prevention* of crime that might be effected by this mode would be but a trifle compared to the immense sums which are expended in *punishing* delinquencies. Another advantage, too, would result in a complete census of the community being kept up monthly.

To those who may object to the plan as being impracticable, the Author will merely refer them to a recollection of the efficient measure adopted by the police of Paris under the dynasty of Bonaparte. This stated—and every one who has visited that capital must have heard confirmation of its truth—that the plan was so effective *no person could enter Paris or leave it without the knowledge of the Police.* We may even refer to a much

more ancient example, and consider what must have been the difficulties with which the rulers of Judah had to contend in re-building the wall of Jerusalem, after the Babylonian captivity; neither the taunts nor threats of their adversaries disheartened them. The rulers and the people united cordially and firmly together, each building his own part; "With one hand they wrought in the work, and with the other hand held a weapon."

Let the magistrates and community of Glasgow adopt a similar plan of co-operation, or devise a better; and by "a strong pull, a long pull, and a pull altogether," keep in the yoke until ignorance, the fruitful mother of vice, shall be banished from their streets and lanes. Then may the *unceasing* prayer of the City Arms be indeed verified—

"LET GLASGOW FLOURISH."

Tilling, Printer, Chelsea.