IV.—*Recent Improvements in Dairy Practice.*

By Joseph Harding.

The spirit of improvement which has so largely pervaded the agricultural world during the last twenty-five or thirty years is not more manifest in the production of corn and meat than it is in the manufacture of butter and cheese; and though the latter branch has not derived as much benefit from the assistance of national or local agricultural societies as the former, it has yet made great progress both as to the quantity and the quality of its products. To the attainment of this object nearly every well-informed and intelligent dairy-farmer has contributed his part. In detailing these improvements I may not, perhaps, be expected to go into all the dairy districts of England, and to particularise every improvement which has taken place in each of them; my experience, as a Somersetshire man, milking a dairy of my own of from 70 to 75 cows, will enable me to speak from personal and practical knowledge as to the improvements, in all their details, in the dairy practice of my own county, more especially in the manufacture of cheese.

I believe, however, from the knowledge which I have of other dairy districts, such as Gloucester, Wilts, Leicester, Derby, and Cheshire, that any disinterested person taking upon himself to write upon the subject could not fix on a district better calculated to answer the requirements of the Royal Agricultural Society of England than the county of Somerset. It is true that this county is not much noted for its butter; but as a district for making cheese, due regard being had both to quantity and quality, it is not surpassed in Great Britain. Here is made what is termed the "Cheddar cheese," which is always quoted in the London market at a higher price than any other (Stilton excepted, which is not a fair example). Here, too, an example has been set in the improvement of machinery, utensils, and mode of manufacture, which has given a stimulus not only to all the surrounding districts, but even to Scotland.*

But my business is not so much to eulogise the dairy practice and produce of this or any other district, as to detail, in a simple and intelligible manner, any improvements which have tended to increase the quantity, improve the quality of these products, and at the same time to reduce the labour of manufacture.

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* See a pamphlet published by the Deputation sent by the Ayrshire Agricultural Association to the various cheese-making districts in England, to ascertain the best and most remunerative method of cheese-making, and reprinted in the Journal of the Bath and West of England Society, 1857.

Increase in Quantity.

In order to show an increase in the dairy produce of any given district, it would be necessary to know its aggregate amount at different periods; but as, to the best of my knowledge, no records exist which furnish this information as derived from any dairy district in England, it will be impossible to contrast our present average produce with that of former years. The only course, therefore, which we can adopt is to take a single farm which may be considered a fair specimen of the district in which it is situated. A farm of 150 acres in this county, of fair quality, divided into 110 acres of pasture and 40 of arable, would, some years ago, probably have been stocked with 30 cows, 5 or 6 heifers (to keep up the stock), besides a few horses. The arable course would have been 1 fallow, 2 wheat, 3 beans, 4 wheat again, 5 clover mown twice, then fallow again; barley being grown occasionally on suitable soil.* It was thought that on the pasture-land no more cows could be kept than the one-half would maintain in summer, the other half being mown for winter-keep; that would give (allowing 3 acres per cow) 90 acres for 30 cows, and 20 acres would be left for the young stock and horses. The arable land at this time received the greater part, if not all, the manure.

A farm of this description would now keep 50 cows. The larger part of the arable land would be in grass and roots, corn being grown only on the decay of the grass plant, which, instead of being mown would be grazed by the cows, and admit of being stocked a fortnight earlier in spring than the meadow-grass: the straw would be cut into chaff and mixed with roots, meal, oil-cake, or some other substitute to make it equal in nutriment to hay. The roots would be chiefly grown by artificial manures, and a portion of them fed off by dry sheep, so that a considerable part of the yard manure could be spared for the pasture-land. Although I have spoken above only of an increase of 20 cows, I know some farms on which the extra number is even larger.

Where the farm is wholly pasture, as is the case with a large number of the dairy-farms in this county, there cannot be as large an increase of produce as is stated above. Yet even here, as the land is made to carry as much stock as possible, the increase in the number kept is considerable. Some farmers will feed nearly all their land and sell the cows in the autumn, looking forward to replacing them in the spring of the year. This seems to be an expensive mode of increasing dairy produce; but where

* Clover is not so much sown on dairy-farms as it would be if it could be safely fed by cows.

the land produces a large quantity of milk the grass is of far more value than the hay.

Others, again, have adopted the plan of preserving a few acres of aftermath (after being fed once) till the spring; the young grass is thus drawn up by the shelter which the old affords, and consequently comes to feed earlier than it would otherwise do. This feed is valuable for turning out the cows by day; it thus both lessens the consumption of hay and increases the yield of milk. Among my acquaintance the farmer who realises the largest amount of profit per cow, lives in Leicestershire, and makes both butter and cheese. His farm is a loamy soil, not much affected by drought or wet, so that it is generally in a growing state throughout the summer. He keeps only cows and young stock. The cows have the first feed of every field, the heifers following them in the round of the farm. A man brings up the rear to clean up the droppings, so that the field is clean and fresh for the cows on their next round.

The building of houses and yards for the accommodation of the cow has not a little tended to an increase of produce, inasmuch as it has enabled us to keep the stock off the land during the winter months. The grass consequently grows earlier in the spring, and enables us to mow earlier, so as to secure a better feed on the aftergrass. The introduction of artificial manures has rendered us great assistance, especially for the arable lands, although the pasture likewise feels the effects of the change. Bones have been used on the pasture, but not to such an extent nor with such success as in Cheshire. Besides all this, nearly all the wet lands have been drained, and the wide and useless hedgerows grubbed up, so that our atmosphere has become dryer and more healthy. Nature has lent a helping hand, and we have in consequence a longer summer and a shorter winter. A large quantity of cheese is made from some of the hills which formerly only fed a few half-starved sheep and cattle. Some of these improvements may seem to be of small importance to the casual reader; but when carried out through a whole district, as in this county, the effect is great, and these, I believe, are the chief causes which have led to the dairy produce of this county being increased, within a few years, 25 per cent.

Reduction of Labour in the Manufacture.

Under this head, speaking first of butter, I may state that the improvements are not so great either in the mode of making, the utensils employed, or the reduction of labour, as in the case of cheese, because two very simple processes only are required to accomplish the object, namely, "churning" and "working." Churning is a simple process of agitation, and whether it be

accomplished by a vertical, a longitudinal, or a rotatory motion, the effect is the same; and notwithstanding the many attempted improvements in the construction of the utensil employed, there is not for general purposes, anything superior to, or that is likely to supersede, the old barrel-churn. In it, either a large or a small quantity of butter, and that of the best quality, may be produced.

As to the working the butter—which is generally performed by the hand—the object is the extraction of all the buttermilk. Some persons use small wooden spades, others envelope their hands in a cloth, but nothing of this kind can be termed a "late improvement." The greatest step in advance consists in the fact that observation and the introduction of the thermometer has enabled us to lay down a rule for the temperature to be maintained in churning. It is found that if the cream be put into the churn at from 55° to 60° in summer and not less than 60° in the winter, it will be churned in good time, that is, from half an hour to forty minutes, and, if properly worked, will produce good butter. If it be churned at a lower temperature it will be too long in churning, and will require heating during the process. If above that temperature, it will "come" too soon and will be frothy and oily; in both cases the butter will be inferior. Until a comparatively recent date, it was a difficulty in cold weather to get the butter churned; the process not unfrequently occupied several hours, and I have known the produce to be thrown away as utterly useless after all. This difficulty is now entirely overcome.

Experience, moreover, has taught us that although, if milk be allowed to stand till it becomes stale or sour before the cream is removed from it, the butter thus made will not be good; on the other hand, if the cream be taken while the milk is sweet, the cream may be kept until it becomes sour, without the butter being materially affected.

The process of butter-making varies in different countries. In Scotland, Ireland, and Wales they churn the milk, and, when this is done properly, I believe that the butter, for delicacy of flavour, cannot be surpassed.

In the making of cheese a much greater improvement has been effected, in consequence of its having received more attention than butter-making, cheese being the staple commodity of the district, and, when well made, more remunerative to the farmer. For many years past it has been our object to produce the *best cheese* with the *least possible labour*,—an object we have, in no small degree, accomplished. Within my own recollection, a week, at the least, may be said to have been occupied in making a cheese,—that is, from the time the milk was coagulated till the cheese was taken from the press to the cheese-room. During this time it was turned in the press twice every day, and had salt

rubbed over it by the hand every morning. I have known, in a dairy of 50 cows, 52 cheeses to be thus turned twice a-day, giving a vast amount of unnecessary labour to the dairy-woman and expense for cloths to the farmer. This state of things exists to this day in some of our largest cheesemaking districts.

The machinery and utensils, too, were of a rude description. The presses were either a large stone raised by a screw, or a box filled with some heavy material and suspended between two upright posts and lowered or raised by ropes and pulleys. I should have thought it almost incredible that there should exist a cheesemaking district in England that had not partaken of the universal improvement in the cheese-press, had I not learnt a lesson the other day. A friend of mine was travelling in a railway carriage in Lancashire in which some farmers were discussing the merits of an improved cheese-press lately introduced into their district, when one of them, convinced of its superiority, said, "I do not think I shall lay out much money in a stone-press again."

The utensils were generally made of wood, and the whey, however large the quantity, had to be ladled out of the tub with a heavy wooden bowl. The curd, when put into the vat, was broken into small pieces by the hand, so laborious a work that I have seen dairy-women whose finger-joints were grown large and stiff in consequence. After the cheeses were introduced to the cheese-room, they had to be washed and scraped before they became marketable, which was not generally the case until they were from four to six months old, although they were what we should now term *thin cheese*. In many instances the cheese was kept until the following spring. The process of manufacture was unsystematic and irregular, without regard to an even or proper temperature; consequently the cheese was of unequal quality—some good, some bad—from causes unknown to the dairy-women. This was the state of things when improvement in the machinery and utensils began to be studied. It is just, however, to state that, with regard to the cheese-tub, a few wealthy and enterprising men thought it desirable to substitute copper in lieu of wood many years before this general movement took place. These tubs were made rough and at a great expense, many of them costing from 40*l.* to 60*l.* apiece, according to the number of cows kept.

About thirty years ago the first improved cheese-press was exhibited in Wells market, in this county, and, though extremely simple, proved to be a step in the right direction. I think that prizes have been awarded to it in its incomplete shape more than once by the Royal and other Agricultural Societies. The principle of its construction was that of the lever in its simplest form. The subject was immediately taken up by the mechanics

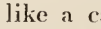
of the neighbourhood, who gradually improved upon the cheese-press until the model now in general use was produced. It consists of a screw and lever, the former working in a brass socket, and serving as a fulcrum * for the latter, by which the pressure, produced and regulated by a weight attached to the opposite end of the lever, is conveyed to the cheese. When the screw is reversed the lever drops on to a pin, the pressure is withdrawn, and the cheese may be removed. This is decidedly the best implement for the purpose that has yet been invented. It is manufactured in large numbers by the best agricultural implement makers in this and the adjoining counties.

About this time copper, and sometimes brass, began to be used more frequently for making cheese-tubs, but, being too expensive for general use, tin was successfully substituted and continues to be employed to the present time. It costs one-third the price of copper, and will last for twenty or thirty years. All the other utensils of the dairy which were formerly of wood, such as bowls, pails, &c., are now made of tin, which saves a vast amount of labour and expense in brushes.

The vessels are in some cases improved in shape as well as in material; the cheese-tub, which was flat at the bottom, is now made convex to facilitate draining off the whey. A large brass tap is soldered into the bottom of the tub, inside of which is a strainer made of fine gauze, wire, or other material, to prevent small particles of curd from escaping. The whey flowing from this tap is conveyed in a pipe leading from the floor of the dairy to a tank or cistern in the piggery, from whence it is pumped for use. That the milkers may not enter the dairy, a tin receiver is placed outside the house, into which the milk is poured and conveyed to the cheese-tub by a conduit, at each end of which is a strainer to prevent any filth from the yard from passing into the cheese-tub. It is a mistaken notion with many practical cheesemakers, and all theorists, that an exceedingly fine strainer is necessary in order to separate the whey from the curd. If the cheese be well made, the curd itself is the best strainer or filterer; but where there is a large bulk of whey to be drawn off from the curd, it will flow through the tap with great force, so as to carry away particles of curd, if something is not placed inside as a strainer. To obviate this, a new and valuable instrument, called the Whey Separator, has just been invented by Mr. Robert McAdam, of Garsty Hill, near Crewe, Cheshire, for which he has taken out a patent. It is made of brass, and is a telescopic tube, one end of which fits on inside the outlet in the bottom of the tub; to the other end is screwed a receiver, which floats on the surface of the whey, which enters

* See illustration, p. 92.

its perforated brass under-surface, and is thus conveyed down the tube to the brass tap at the bottom of the tub, the tubes sinking into each other as the whey subsides. This separator costs about 40*s.*; it is the best thing of the kind I have ever seen, as it takes the whey from the surface, where it is most free from curd, and prevents the mass of the curd from being disturbed by the whey on its passage to the outlet.

The curd-breaker generally in use for breaking up the coagulated mass is either the shovel-breaker or the revolving-breaker. The former is made of wood in the shape of a shovel with a bent handle (); through the lower end of the handle, at right angles to it, 9 or 10 brass rods are inserted, extending about 6 in. on either side, and secured at each end by a strip of wood about 14 inches in length. The revolver is made of rods of iron, set in a framework fitted to the inside of the tub, where it is made to revolve upon a vertical axis by a handle at the outside of the tub like that of a churn.

The vats, which were formerly made of turned wood, are now made of staves like a cask. In not a few instances tin is employed for the purpose, but I scarcely think it will come into general use for our thick cheeses. The stave-vat has recently been improved by being made to open at the side at one of the joints between the staves, corresponding to opposite joints across the top and the bottom; the opening is sufficiently wide to allow of the cheese being easily liberated from the vat when reversed for the purpose. To accomplish this, there are four projecting screw-holes: one at each end of the two severed iron hoops which encircle the vat, one at the top and one at the bottom. When the vat is closed, two of these screw-holes will be opposite each other, and through them a screw-bolt is inserted which keeps the vat together; by loosening these bolts the vat is enabled to expand and the cheese is easily liberated.*

An apparatus has been invented for cheese-making by Mr. Keevil, of Wiltshire, and is in use in that and some other districts, which, though not applicable to the Somerset or Cheddar mode of making, is, I believe, of service in making the Wiltshire cheese. It consists of a tin tub, down the side of which there runs a strip of gauze wire, 3 or 4 inches in width, which allows the whey to escape to a brass tap at the bottom. A breaker is used, similar to the revolver above described, but Mr. Keevil has altered the round rod to a flat knife-shaped piece of iron, thus altering the principle of *breaking* the mass to that of *cutting*. Instead of a vat into which weights were put for the purpose of pressing the curd in the tub, a perforated circular piece of tin is

* See illustration, p. 92.

used, fitting the inside of the tub, to which pressure is applied by a screw running through a strong cross-piece of iron, fastened to the opposite sides of the tub. The cheese-tub is on a raised platform, and can be made to incline at pleasure, so as to allow the last drop of whey to escape.

A much more useful apparatus for our improved method of cheesemaking has been invented by Messrs. Cockey and Son, of Frome. Its object is to save the labour of carrying the milk to and from the boiler for heating previous to the introduction of the rennet, and also of carrying the whey for scalding the curd. A small boiler is placed in a desirable situation, from which hot water is conveyed by pipes to a chamber underneath the tub, where it can be turned off or on at pleasure by stop-cocks. One advantage in this apparatus is, that during the summer nights cold water may be let into the chamber underneath the evening's milk, which is thus rapidly cooled down to the temperature of the water. This expedient is very valuable for keeping the milk sweet till the morning, as we make cheese only once a day. The apparatus is extensively used in this and some other counties. During the winter months the cheese-room and dairy are heated from the same boiler.

The Improvement in the Quality of Cheese

is due partly to what is here technically called "*slip-scalding*" and to increased attention bestowed on the manufacture, and partly to more careful storing in the cheese-room. In all these cases the thermometer and the clock have greatly assisted in reducing cheesemaking to a regular system. The process is now conducted in the following manner. The morning's milk is mixed with the evening's at a temperature of about 80° (varying 2° or 3° in the spring and autumn), the rennet then is added, and an hour is allowed for the curd to form, when it is carefully broken up; and here commences the system of *slip-scalding*, now generally adopted in preference to the old method. The scalding whey is now added to the curd in its pulpy state, before it has had time to subside and get hard. Experience has shown us that a finer description of cheese is produced upon this principle, which is adopted by the best cheesemakers in this county. What is here called *scalding* is the raising the mass of curd and whey to the temperature of 100° Fahr. By Cockey's apparatus, hot water is introduced into the chamber by pipes placed underneath the tub to accomplish this purpose; otherwise, hot whey is poured into the mass, which in both cases is being well stirred, until the desired heat is obtained. The curd is then allowed to subside, and, after the whey is drained off and the curd becomes dry, instead of being broken by the hand, it is passed through the

curd-mill, after which salt is added and mixed with it in the proportion of 1 lb. to 56 lbs. It is then put into the vat and press, where it remains three days, after which it is taken to the cheese-room. The cheeses are made from 9 to 14 inches in thickness, some even more. They are only turned twice in the press, and that is when the cloths are changed.

The method of keeping the cheese in the cheese-room has also been improved.

At one time we thought it desirable to keep them in a low and even damp temperature, but the cheese was then a long time in getting ripe, and a fine mellow flavour was not readily obtained. We now introduce them at once from the press to the cheese-room, which is kept at a temperature of from 50° to 70°, as the case may be; and we find that the cheese ripens faster, acquires a richer flavour, and can be sold much sooner; so that our thick cheeses are often cut over the counter at three months old, sometimes even less; though a few years since the same sized cheese would have required eight or nine months to acquire the same degree of ripeness.

This system of making has diminished the make of whey butter. Where we made one pound per cow, we now make one pound for every seven cows, and sometimes less; the quantity is so reduced that we often do not think it worth the risk of imparting sourness to the cheese, but turn the whey off to the pig-tank. Some persons tell us that we lose a great deal of valuable food in our whey, as proved by the bacon fatted from it. When bacon is fatted from whey alone this must be the case; but the whey from a cheese well and carefully made would not fatten a pig in six months.

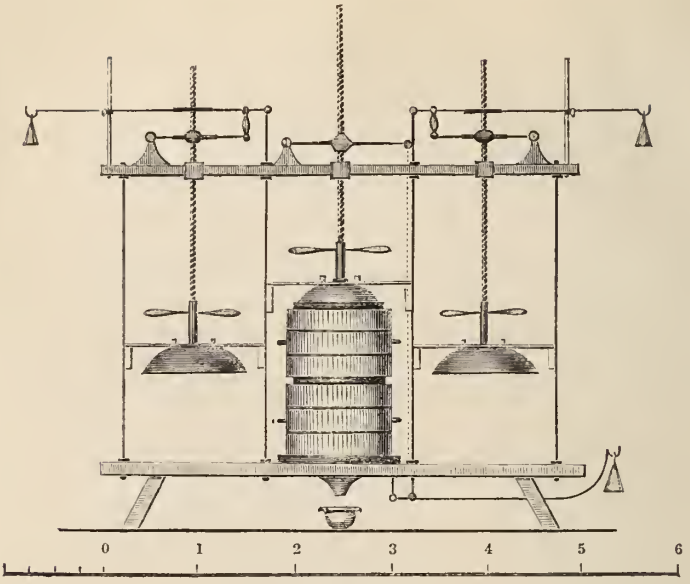
To the cheese consumers of London, who prefer an adulterated food to that which is pure, I have to announce an improvement in the annatto with which they compel the cheesemakers to colour the cheese. The improvement is not in the smell, which remains as unpleasant as ever; neither is it in the taste—that is as filthy as ever; but it consists in this—that we now get annatto in a liquid state, instead of a cake, which saves the trouble of rubbing out.

I have now enumerated the principal improvements in dairy practice that have enabled us to send into the market a superior article, increased in quantity 25 per cent., at a reduction of the original labour of more than half. Although we have attained this result by studying, as far as our observation and experience go, the state of the curd through the various stages and manipulations which it undergoes, and have acquired, so far, some knowledge of what we are doing, we have not yet arrived at perfection. *Cheesemaking, as a science, is not understood.* I could ask a dozen questions, which suggest themselves at

the various stages of the process, and which cannot now be answered.

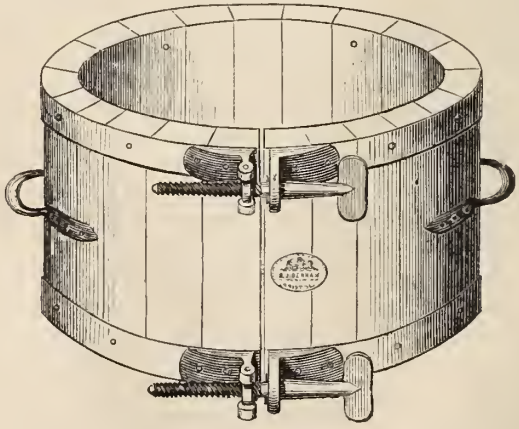
We have now a valuable body of rules laid down for our guidance; though strict observation and practical experience are, of course, requisite for their successful application. But this is not enough. A wide and unexplored field is before us, into which we should enter. Milk, as taken from the cow, is of a peculiarly rich and delicious flavour. The object of the cheese-maker should be to preserve that flavour throughout the process, and leave it to ripen in the cheese; but the accomplishment of this design is not always certain (especially in thunder weather), in the absence of an instrument with which we are not yet provided. Liebig and other chemists tell us that milk, in its pristine state, possesses a quantity of sugar, which, in the process towards decomposition, produces lactic acid. Alkalies are also present which neutralize the acid until an increased amount of the latter is generated, when the milk becomes sour. Believing this to be true, and knowing that heat promotes the formation of the acid, when the temperature of the atmosphere is 65° we act cautiously lest we should make the cheese sour, and, no doubt, our precaution is frequently attended with success. But there are other agents besides heat which promote the souring of the milk, even when the atmosphere is as low as 60°: over these we have no control at the time, besides being generally unaware of their existence until it would be too late to seek a remedy, if any such were known to exist. The instrument, then, which we want is one which will show us the exact amount of acid present, that we may know when to introduce the rennet, and in what quantity. It is true, we have litmus-paper, but this only indicates the presence of acid without measuring the *quantity* present. Whilst searching for such an instrument as this among opticians and chemists for several years past, I have been recommended to try one or two chemical methods, the best of which is by Dr. Cameron, of Dublin. None of these tests, however, are sufficiently simple to be of much use to the practical dairywoman, who wants an instrument effective and simple, by which she can as easily test the amount of acid present, as she can by the thermometer ascertain the degree of heat.

Another desideratum is a chemical knowledge of the constitution of the curd and whey throughout the process. It is not likely that this investigation should be carried out by the unaided efforts of any practical man; but with assistance, such as the Royal Agricultural Society of England could render, this object could be attained, and the result would be that cheese could be made (as it ought to be) upon principles scientific and, consequently, unerring.



3-4ths of an inch to a foot.

The above press is the only one I have in use for 72 cows; the other principal utensils are—cheese-tub, 2 milk-coolers, curd-mill, 6 vats for summer use, 6 smaller ones for the spring and autumn. The press was made by Stokes, of Dean, near Shipton-Mallet, and cost about 9*l.*



The expanding Cheese-vat.

Marksbury, near Bristol.