

BUTTERMAKING
FOR OUR PUPILS.

SECOND EDITION.

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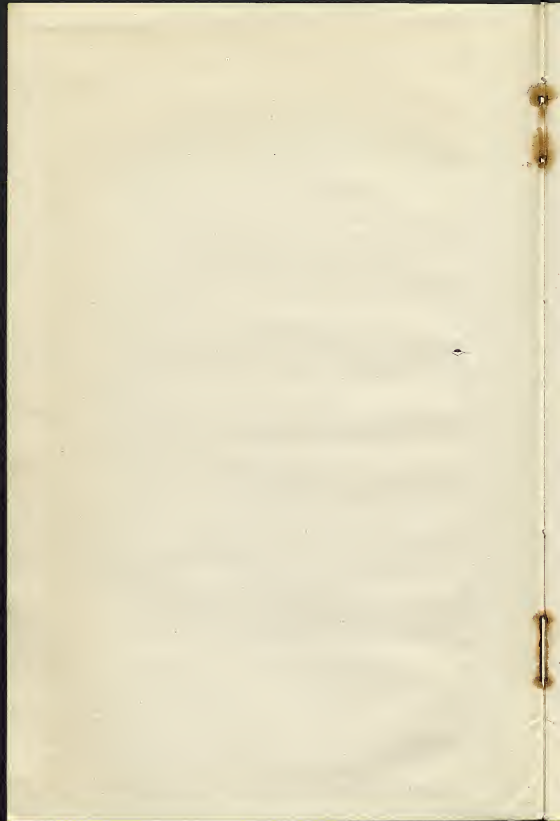
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BUTTERMAKING FOR OUR PUPILS.

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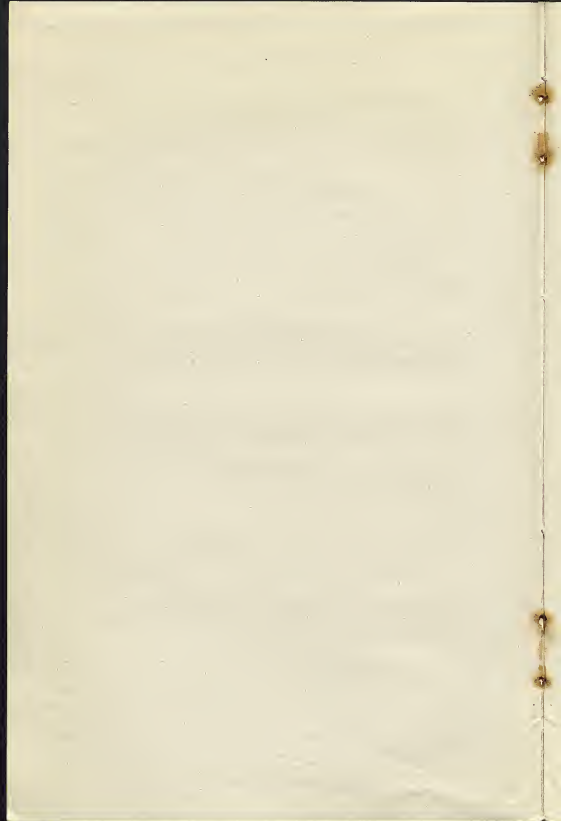
THE MARQUIS OF BRISTOL,

In recognition of the interest taken by his Lordship in the improvement
of the Dairy Industry.

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P R E F A C E

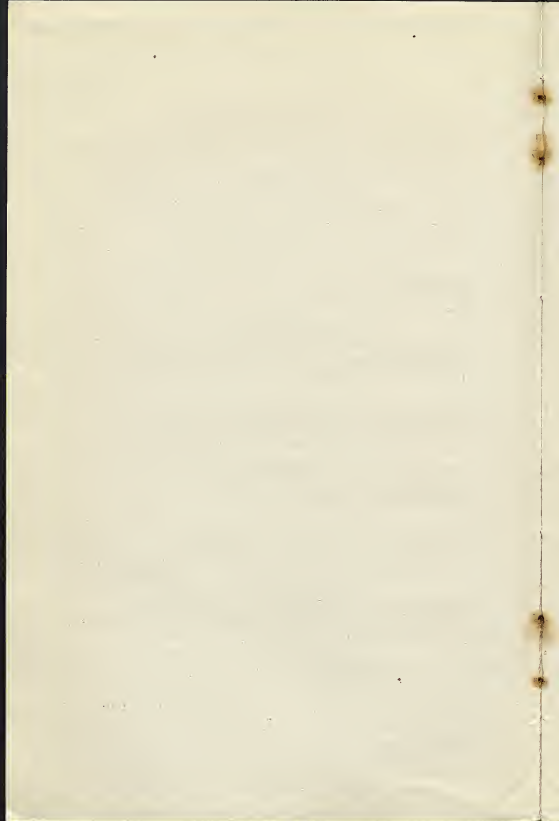
TO THE SECOND EDITION.

The modern development of Dairy Practice is founded upon certain rules which, if carried out in the manipulation of milk and its products, ensure delicious butter, that will please the most fastidious taste.

The advance of foreign competition, points clearly to the necessity for Dairy Farmers to be on the alert to adopt the best Dairy Practice and to improve the quality of our English butter and other dairy products. The difference in value of good and inferior butter, though both produced from milk of the same quality, tells for itself the difference between a good and bad system of manufacture.

This little book first made its appearance in response to a request from many of those whom the authors have been called upon to instruct. The present edition has been carefully revised, and the writers trust that their endeavour to make this book a handy and simple manual may result in continued helpfulness to their pupils and others interested in dairying.

M. & J. B.





BUTTERMAKING.

THE facilities given by the County Councils of England at the present day to the classes organised to receive Technical Instruction in the Art and Science of Dairying, will, it is hoped, result in both milk and its products being so understood as to ensure that much to be desired uniform excellence in the butter and cheese of our British Islands.

The adage that "knowledge is power" is something to be kept in mind in every calling at the present time of keen competition. It may be well applied to the dairying profession. However well the work in this department may have been accomplished in the past, the application of scientific methods, with the use of improved utensils and machinery, will enable us to turn out a better quality of produce with the least labour possible, and consequently to make an increased profit. It is the possession of knowledge that has made successful the present system of dairying in Denmark, and which enables the dairy farmers in Australia and New Zealand to compete against us at home in the production of butter and cheese.

The possession of technical knowledge will show the student that in connection with buttermaking the "rule of reason" must be adopted, and the "rule of thumb" discarded, if uniform success is to be achieved.

Milk is such a delicate and sensitive material that its production, and the manufacture of its numerous and important products, demands the best attention of intelligent minds. The

production of milk must, therefore, be left in the hands of those competent and capable of understanding and directing the carrying out of proper methods of selecting suitable animals, and of judiciously feeding them with food specially adapted for producing effectually and economically the most desirable quality of milk that may be required, whether it be for cheesemaking or buttermaking. But those who have to manipulate the milk and to manufacture its products should understand and carefully attend to the quality of the milk with which they have to work; they should insist upon strict attention to such matters as cleanliness and good ventilation in the cowhouse. The milking must be done thoroughly and in a clean manner. It is surely not too much to ask that milking shall be done with clean hands, and that a dry cloth shall always be kept in the cowhouse for the purpose of rubbing off any adherent dirt there may be on the cow's udder. Unless reasonable care is taken in the feeding of cows, if they have not clean water to drink, and if cleanliness, sweet air, ventilation, and clean personal habits in the workers in the cowhouse are not insisted upon, the milk will be tainted before it leaves the cowshed.

To rid the milk of its cowy odour, aerate or expose it to the air. We can ascertain if a taint is due to the cows, by noticing if the milk is strong smelling or tainted as soon as it comes from the cows.

The adaptation of a room for the subsequent proper care of milk, and for using the best means of abstracting the cream from the milk, requires thoughtful and intelligent care; under general circumstances it is not a new room that is required, but a knowledge of how to make the best use of existing conveniences.

A milk room should be cool, its temperature regular, and no moisture be on walls or floor; its ventilation sufficient to keep the air pure, and its situation such as to ensure freedom from disagreeable odours, for these are most objectionable in connection with milk.

MILK.

Milk is a "complex and delicate fluid." In its natural state it is an important and complete food, containing all the elements required to sustain life. It is composed of water, butter-fat, casein, albumen, milk-sugar, and mineral matters or ash. The water in milk is the necessary vehicle for carrying its constituents through their vital processes. The albuminoids supply nitrogenous materials which are required to form the flesh of animals, and are called flesh formers; they also produce a certain amount of heat and mechanical force, repair waste of nitrogenous tissue, and can supply in themselves most of the requirements of the body.

Fats, after being digested and taken into the blood, are burnt in respiration, giving heat and mechanical force, and hence are called "heat givers." The chief use of fat in the body as a food is said to be to nourish the tissues and prevent waste.

Carbohydrates (sugar, &c.), if taken in excess, are stored up as fat; they are more immediately used for heat and mechanical work.

The ash consists of various salts, chiefly common salt and phosphates of potash and lime; these go to form bone and supply salt to the blood.

The Butter-fat exists as very tiny globules in suspension in the serum of the milk. One pint of average milk is said to contain over 40,000 millions of these globules.

The size of the fat globules varies; and the milk of some breeds of cows—*e.g.*, Channel Island cows—contains larger globules than are found in the milk of other breeds—*e.g.*, Ayrshires. Milk, containing large globules (as Jersey), is the best for buttermaking; that containing small globules (as Ayrshire) for cheese-making. The larger globules rise more quickly and readily to the surface than the smaller ones; some of the latter do not rise to the surface at all, but remain suspended in the milk.

The composition of cows' milk is affected by various circumstances; the milk is poorer when the quantity produced is large,

or the diet insufficient, and richer when these conditions are reversed. The milk first drawn is poor in fat, and the richness increases as milking proceeds, the last drawn milk containing two or three times as much fat as the first drawn. Therefore the operation of milking should be carefully and thoroughly performed. The evening's milk is usually somewhat richer than that of the morning; the assimilation of food taking place to a larger extent between the morning and evening than between the evening and morning milkings.

TEMPERATURE.

Those who have not made a study of milk do not realise how much depends upon the influence of temperature. The cows require the temperature in the cowshed to be at a suitable degree, otherwise a certain amount of food must be consumed to maintain the temperature of the body; and this causes a waste of productive power, and diminishes both the quantity and quality of the milk. To raise all the cream possible, the milk must be carried to the milk-room, and set at a proper temperature. Careful notice of temperature must be taken throughout the whole operation of butter-making. Correct temperature is essentially a controlling influence in the production and manipulation of milk.

TABLE OF TEMPERATURES.

Temperature at which to keep the cowhouse	60°
„ of milk when it comes from the cow	93° to 96°
„ of milk when taken to the dairy should be ...	90°
„ of dairy	55° to 60°
„ at which to separate milk.....	86°
„ at which cream should be put in the churn—	
„ „ „ summer...	54° to 58°
„ „ „ winter ...	58° to 62°
„ at which butter should be worked.....	54°
„ at which butter should be kept	50° to 54°

The Dairy Thermometer, a simple, clean, and efficient instrument, which may be purchased for 1s., should be in constant requisition in the dairy; and wall thermometers are most useful in all dairy rooms and cow houses. When a guide so

cheap and reliable can easily be obtained, there can be no reason for following a misleading, guessing practice. It is advisable to have a good and correct thermometer in stock, so that those in use may be verified to be correct.

CREAM RAISING.

Important elements in cream raising are specific gravity and temperature. The specific gravity of cream is about .985, that of average milk containing cream is about 1.025 to 1.035, water, as a standard, being 1.000. It is the difference in specific gravity between the fat globules and the fluid in which they are suspended which causes cream to rise to the surface of milk that is at rest; a falling temperature has a direct effect in promoting the rising of cream. Three conditions favourable to cream raising are:—Good creaming properties of the milk, no delay in setting, and perfect rest afterwards.

Of all the systems of cream raising practised, the old open pan system is still the most used, therefore, as our aim is to make an intelligent and systematic use of all systems, some useful rules for this method of cream raising should be followed. The first and most important condition is the creaming quality of the milk; it should be carefully strained into the open pans at a temperature of 90°, in a cool milk room. The milk should be set *immediately* after milking; if it is allowed to cool before setting, the upward movement of the cream globules will be retarded, and they will not rise to the surface, but if set in a cool dairy at the temperature named, the cream rises rapidly, and if skimmed at the end of 12, 24, and 36 hours it will be found that all the cream has been extracted that is possible by this system. It should never stand longer than 36 hours. The best cream is that obtained by the first skimming at the end of 12 hours. If any cream is obtained after 36 hours it is a sign of indifferent management, and it will certainly produce inferior butter.

Carefully mix the cream when each skimming is added, for uniformity in ripening is most essential; hence cream of different ages should be thoroughly mixed during ripening.

Many admirable systems of cream-raising have from time to time been brought out and used to great advantage. Among these the "Homer Dorset" Creamer, which is somewhat similar in principle to the "Dorset" and "Jersey" Creamers, gives equally good results in cream, and in much less time. It possesses also the following additional advantages:—

Both milk and water vessels are quite distinct and allow every facility for cleaning, thus obviating the corrosion so apt to take place in double pans, where the vapour and subsequent condensation is confined.

The cover is so constructed that when put on the contents of milk pan are hermetically sealed by water, the rim of cover *being extended below the water level* in outside pan. By turning on the water a continuous stream is kept flowing *over and around* the contents of milk vessel, thus materially accelerating the separation of cream.

To collect the cream either one of two methods is adopted:—

1.—By withdrawing the skim milk and allowing the cream to settle on the bottom of pan as in the Jersey system ;
or—

2.—By using the patent cream scoop, which collects the cream from the top of the milk at one sweep.

One of the most useful of all modern inventions for separating cream from milk is the Centrifugal Cream Separator. By use of this excellent contrivance the cream and milk can be separated immediately upon leaving the cow.

Centrifugal force is a force of nature, by which bodies made to move in a circle tend continually to fly off from the axis of that circle, and the heavier the body the greater will be that tendency. If a vessel containing a liquid body is made to revolve rapidly, the liquid will be forced to the sides of the vessel and will break away from the centre. In the open pan method of cream separation the cream rises out of the milk, leaving the

milk behind. In the centrifugal process, the milk, being heavier than the cream, is thrown by the centrifugal force away from the cream, leaving the cream in the centre of the bowl. In the natural method, owing to the slight difference between the specific gravity of cream and milk, the separation is comparatively slow. In the mechanical method the separation is rapid, owing to the natural movement being increased by centrifugal force. The new milk fresh from the cow is fed in at the top of the "Separator," and falls into a steel bowl, which revolves with great rapidity (at 4,000 to 6,500 revolutions per minute), and in the course of a few minutes the cream becomes separated from the milk.

The cream and separated or skimmed milk coming from the separator are to some extent purified, the impurities being found adhering to the bowl when the separator is stopped and opened.

CREAM RIPENING.

All cream, after having been removed from the milk, should be ripened before being churned. The condition of "ripeness" in cream depends for its success on the skill and intelligence brought to bear on the operation. Cream which has been raised slowly in the open pan system needs very little further ripening, yet this cream gives better and more butter if kept mellowing for 18 to 24 hours at a temperature of 60°. Cream which has been removed from the milk by centrifugal separation, or some of the other speedy systems, requires 24 to 36 hours to ripen at a temperature of 60°. The ripening of cream is brought about by the action of an organism in the milk known as *Bacterium lactis*. Ripeness, so called, is the first stage of souring. When the cream has attained a rich mellow, slightly sour taste, it is ready to churn. Unless ripened, the best results will not be obtained. Always keep a muslin cloth thrown over the vessel containing the cream, to keep out impurities and to permit of ventilation. Cream set to ripen should be stirred frequently, at least three times a day. The uniform ripening of all cream in one churning is essential to obtain the greatest quantity and choicest quality of butter. Decidedly sour cream churns readily, but the flavour of

the butter is deteriorated. Butter made from fresh cream has a delicate insipid taste; butter made from properly ripened cream is the finest flavoured, has the best keeping qualities, and gives the best results in quantity. An aid to determine the degree of acidity is blue Litmus paper; this is turned red by acids, and experience and attention teaches the correct colour desirable before churning; smell and taste, however, are more reliable indications of ripeness to the experienced buttermaker, and even time and temperature will be a guide if carefully followed.

THE DAIRY,

Or room in which butter is made, should have a northern aspect, if possible. It is important to see that the windows are not near anything of a strong smelling nature, and the sun's rays should not be admitted, because they would affect the temperature of the room. Ventilation is necessary to keep the air pure and sweet. Walls lined with glazed bricks for three or four feet high, the remainder being plastered with cement, are very clean, and can be easily washed down. The floor should be of cement or firmly laid with hard blue bricks, the joints being carefully cemented; it should slightly slope to an open drain falling *outside* the building into a trap above a close drain. The chief things to be attended to in a well ordered dairy are perfect cleanliness, ventilation, a steady temperature, and an absence of bad smells. Every utensil should be kept spotlessly clean, and as bright as possible. Cleanliness is absolutely necessary, because milk is very sensitive, and will readily take up any offensive gas. Dairy floors should be kept dry; if any cream or milk is spilt it should be wiped up immediately.

UTENSILS.

Such utensils should be provided as are necessary to make the butter in a cleanly and complete manner. In no part of the process should the butter be touched by the hand. Some of the necessary requisites for the best buttermaking are: Pails, well

tinned or enamelled; a strainer, with fine wire gauze, and a muslin cloth to place over it; a tinned skimmer; thermometer; pans; and a cream-holder that can be easily washed and scalded; a churn made of oak, of whatever shape or make it may be (there are many excellent makes); it should have a large opening, and a good ventilator—to permit the escape of gases evolved in the process of churning; and a piece of glass inserted in the lid is a good and convenient arrangement. A butter-worker, Scotch hands, butter scoop, butter cloth for straining purposes, and grease-proof paper for packing the butter, are also necessary. No vegetable matter should ever be used to wrap butter in when sending it to market. A set of cream testers will also be found useful.

CHURNING.

The churn must be properly prepared for the reception of the cream as follows (it is assumed that after the previous churning it had been thoroughly cleaned): First, rinse with cold water, then well scald with boiling water, rub the churn inside with salt, and again rinse with cold water and bring the temperature of the churn to about the same degree as that of the cream to be churned, or a little below. The butter-worker should be prepared in a similar manner.

In preparing the cream for the churn, if too thick, add cold water or sweet skimmed milk, to bring it to the right degree of thickness, for if too thick it will not churn evenly; then bring the cream to the desired temperature by placing the cream vessel in another containing warm or cold water, meanwhile gently stirring the cream.

Pour the cream into the churn through a coarse straining cloth, the cloth being first dipped into clear water and placed over the opening of the churn; the object is to ensure the cream being of an even consistency and to keep out impurities. The straining cloth should be carefully washed, and kept thoroughly dry and sweet. Do not over-fill the churn. The churn should not be more than half full; indeed, one-third full is preferable. When too full the churning is delayed.

The object of churning is to separate the butter-fat from the cream without injury to its grain. After cream has been ripened the hold of the casein attached to the butter-fats becomes weakened, and if the cream be subjected to agitation at a proper temperature, this foreign matter is dispersed by the concussion to which the fat globules are subjected. The agitation is continued until the union of fats goes on from invisible particles to particles sufficiently large to be called butter. Care in churning is most important, and the speed should be carefully regulated. Commence churning slowly, and ventilate frequently for the first few minutes. Cream when agitated begins to expand and throw out a gas, which, if confined in an air-tight vessel exerts a pressure upon the vessel, and also prevents thorough agitation of the cream. The more sour the cream the more gas. When no more gas escapes, increase the speed of the churn to from 40 to 60 revolutions per minute: the former for a diaphragm or churn with beaters, and the latter for the "end-over-end" churn. When the butter begins to form and appear on the glass in small particles, turn carefully until the grains are distinct though small, then stop churning and add cold water, from one to two pints to every gallon of cream, or sufficient to bring down the temperature (which will have risen three or four degrees from the agitation of churning) to about the same degree as at the commencement of churning. Adding the water hardens, improves, and protects the grain (in winter the water-added should be at a temperature of 57° or 58°, or the grains of butter will be too hard). Then turn the churn gently until the granules attain the size of shot (No. 4). The more tenderly it is treated during the last part of the churning process the better. Churning must now be stopped; it must be borne in mind that if butter is churned into large lumps, no amount of washing or squeezing will afterwards remove the butter-milk from the butter. The churning will probably have occupied from 25 to 45 minutes. With less time there is liability to softness and loss of butter, with longer time injury to the flavour.

Butter well churned, in good grain, may be freely separated, by washing, from the casein held in suspension in the butter-milk. The greater part of the butter-milk should be at once drawn off through a muslin strainer, a pail of pure cold water should then be poured in, and the churn carefully turned twice round, the whole of the liquid should then be drawn off, through the strainer as before, and the washing process repeated until the water comes out clear and free from butter-milk. If the butter is to be brine salted, it requires one less washing than when it is to be dry salted. It is unwise to wash butter too much, and it is advisable to use plenty of water each time the washing is repeated.

SALTING BUTTER FOR IMMEDIATE USE.

For brine-salting butter, use half-a-pound of salt to each quart of water, stir the salt and water until the salt is entirely dissolved, and use as many quarts of the brine as will float all the grains of butter. The brine must be strained into the churn, and the butter remain in the brine from ten to thirty minutes, according to the degree of saltiness required. Under this process each grain is thoroughly salted, and the working is completed more easily and quickly.

To dry salt butter after it is washed, it must be taken from the churn into a strainer with the scoop, weighed and placed on the butter worker, and the salt, in the proportion of $\frac{1}{2}$ or $\frac{1}{4}$ oz. to the lb., sprinkled evenly over the butter, and worked into it by means of the worker, after which the butter should be set in a cool place, and again worked, after one or two hours standing, for the purpose of effectively incorporating the salt. Use fine dry salt, as pure as can be obtained.

The working of butter should be most carefully performed. The object of working is the complete removal of moisture, the thorough incorporation of the salt, and the consolidation of the butter into a compact mass. In doing this great care must be taken to apply a slow, firm pressure, without rubbing or friction, which would injure the grain of the butter.

Butter should be neatly and dexterously made up, with Scotch hands or boards, in the form most approved by the customer.

The granular system of butter making is based upon known facts, and therefore is an intelligent practice. Good judgment, combined with long practice, may occasionally produce good results by the older system, but this combination is too rare to give general success. Ordinary judgment and moderate skill in the application of approved methods will do more than can be done by any chance process.

PACKING BUTTER.

The systems of packing are somewhat varied, and the method selected will depend upon the market or customer to which, or whom, the butter is sent.

Dainty, simple, neat surroundings, and careful packing, with grease proof paper, ought to be a characteristic of butter intended for any customer and for any market.

Butter made for immediate consumption is usually only slightly salted, and has that deliciously delicate flavour and aroma which give it the quality expected of fresh butter; therefore it must be fitted by the protection of its package to withstand any adverse influences to its keeping during the few days that usually elapse between its leaving the dairy and reaching the consumer. For immediate use, butter is generally made up in pound and half-pound pieces, and in such shape that it will present a desirable and attractive appearance to the eye and taste.

The simplest forms of making-up are bricks and round pats.

POTTING BUTTER.

An absolute condition for obtaining good keeping butter is that strict cleanliness and care is taken in the making throughout. The cream must be raised in a pure sweet atmosphere, or decomposition by the action of injurious organisms may quickly take place in the butter, which might not be recognised if the butter

was sold when fresh, but would cause it to become rancid after being kept. The cream must be properly collected and carefully ripened, it must be mellow and slightly acid, but not decidedly sour. Churn the cream at a temperature of 55 to 57 degrees. Great care must be taken in churning and washing the butter. The keeping quality of the butter depends on this and the state of the cream when put into the churn. The churn, after being scalded and cooled, must be brought to the same temperature as the cream.

The butter must be washed thoroughly, carefully, and quickly, in the granulated form, so that the caseine which is broken up in churning may be perfectly washed away. This is most important. The butter must be washed with pure cold water, in which a handful of salt may be dissolved, repeating the washing until the water comes off clear. The last washing must be with brine. To make the brine, add $\frac{1}{2}$ pound of salt to each quart of water, using enough brine to cover the butter. Weigh the butter after taking it from the churn, place it on the butter-worker, and before passing the roller over it, sprinkle $\frac{1}{2}$ an ounce of salt to every lb. of butter, evenly over the grains, move the butter lightly with the scotch hands to mix in the salt, and allow the water to drain off. Pass the roller carefully over the butter a few times, then take the butter to a cool room and allow it to remain two or three hours, so that the salt may be perfectly dissolved, after which it must be brought back to the butter-worker, and worked until quite dry and close in texture. The roller must be passed over it slowly and firmly. As soon as the working is completed press the butter into jars. For this purpose glazed earthenware jars are the best, and they must be well scalded with boiling water, then rinsed and well cooled with cold water, and wiped perfectly dry immediately before use. In packing the butter into jars, press the butter against the sides with a large wooden spoon, keeping the surface concave, or lower in the middle. By thus keeping the centre hollow, the butter will pack more solid, and the operator will the better avoid leaving air spaces round the sides of the jar. Cover the top of the butter

with a piece of muslin, which has been dipped in brine and wrung out as dry as possible, and cover the muslin with a layer of good dry salt, quite an inch thick, pressing it down very closely. The butter should be packed at a temperature of 53° to 56°, and kept in a cool dry place. If well made, it will keep perfectly good for six months or longer.

EASY METHODS OF TESTING MILK.

The important part which cows' milk takes as an article of diet for the young, and also as the groundwork of a very widespread and important agricultural industry, makes it wise to pay attention to its composition, and to the means by which its purity may be easily ascertained.

The practical farmer cannot draw definite conclusions as to the comparative value of different feeding materials upon the produce of his milch cows, unless he obtains some knowledge of the quantity and quality of the milk produced.

In these days of keen competition and agricultural depression, the milk of individual cows should not only be measured or weighed, but it should be tested at regular intervals, in order to find out those members of the herd which are profitable, and those which do not repay for their food and the care and trouble bestowed upon them.

The composition of milk is variable, and depends upon the food, water, and shelter of the cattle; milking, length of time in milk, race and individuality.

The specific gravity of milk is less variable than the percentage of total solids which it contains. The determination of the specific gravity, therefore, is, if made in conjunction with other tests, one of the most valuable means of examining milk. The specific gravity is estimated by means of

THE LACTOMETER.

Most lactometers bear a scale extending from 15 to 40 degrees, which is equal to a specific gravity of 1.015 to 1.040 (specific gravity of water 1.000).

In order to determine the specific gravity, the milk is poured into a vessel a quarter of an inch greater in diameter than the widest part of the lactometer, and deep enough to allow the instrument to float. The lactometer is gradually lowered into the milk to the 25 degree, care being taken that the instrument is entirely wetted by the milk, and that no air adheres to it. When released the lactometer will move up and down, and after a little time become stationary. That degree of the scale which corresponds with the surface of the milk is then noted. When using instruments of ordinary size, the curve will be found to extend to about one-half degree. Lactometers indicate the exact specific gravity at a temperature of 60° Fahr. It is therefore necessary, as soon as the position of the lactometer has been noted, to remove the instrument from the milk, immerse a thermometer, and ascertain the temperature.

THE CREAMOMETER,

Or cream test tube, is a graduated glass cylinder (closed at the bottom). To ascertain the volume of cream, the milk to be tested is poured in at a temperature of about 90 degrees, until it reaches the top line marked, and left standing undisturbed for 12 to 24 hours in a cool place, when the volume of cream is read off. The Creamometer, if judiciously used, is not without merit, and gives a fair idea as to the comparative value of different samples of milk, provided the milk is tested immediately after it has been drawn from the cow.

THE LACTOBUTYROMETER

Is an instrument used to ascertain the quantity of fat contained in milk, and consists principally of a glass tube closed at one end and divided by marks into three divisions, each of a capacity of ten cubic centimetres, and marked "milk," "ether," and "alcohol" respectively. The divisions are meant for measuring the three fluids, the names of which they bear; but it is preferable to use 10 C.C. pipettes for the purpose. 10 C.C. of milk are measured by means of the pipette marked "milk" and discharged into the graduated tube; 10 C.C. of ether are then

added, the tube closed with the thumb, and well shaken until milk and ether are thoroughly mixed; 10 C.C. of alcohol are next added, and the shaking resumed until the caseine is divided into small flakes. The tube should then be tightly corked, placed in water at a temperature of about 104° Fahr., and allowed to remain in it until the fat globules have all risen to the surface; it is then placed in water at about 68° F., and after remaining for ten minutes the extent of the fatty layer may be read off, the graduation giving the volume in one-tenth part of a cubic centimetre. The amount of fat which these correspond to is found by means of a table supplied with the apparatus.

The strength of the alcohol used for the test is of the greatest importance; it should contain 91 parts by volume of pure spirit in 100 parts.

The ether ought to be washed ether, made from pure spirit. Ether being a liquid of highly inflammable nature, the greatest care must be taken not to bring it in contact with or even in close proximity to a flame.

The Babcock Milk Tester is an instrument for rapidly testing samples of milk, to show the proportion of butter fat.

There are other methods for the estimation of fat in milk in which centrifugal force plays a prominent part. As the working of them gives only slight trouble, takes up little time, and can be done without any special knowledge or skill, such methods will doubtless be used more generally than at present, where separators are worked.

USEFUL INFORMATION.

USUAL TEMPERATURES FOR CHURNING.

Temperature of Air. Degrees.	Temperature of Cream. Degrees.
64	54
62	55
60	56
58	57
55	58
50	60
40	62

TIMES AND TEMPERATURES FOR RIPENING CREAM.

Open Pan System. Time.	Temperature. Degrees.	Separation. Time.
12 hours	65	18 hours
18 to 24 hours	60	24 to 36 hours
48 hours	50	60 hours

Composition of milk of average quality. Analysis of cream:—

Water	87.50 per cent.	Water	55.0
Caseine	3.00 "	Albuminoid ..	6.0
Butterfat	3.50 "	Butterfat	36.2
Milk Sugar	4.90 "	Milk Sugar	2.5
Albumen	0.40 "	Ash... ..	0.3
Ash	0.70 "		
	100.00		100.0
	Skim Milk.		Separated Milk.
Water	90.0	Water	90.7
Caseine	3.7	Albuminoid ..	3.3
Butterfat	0.8	Butterfat	0.2
Milk Sugar	4.8	Milk Sugar	5.1
Ash	0.7	Ash	0.7
	100.0		100.0

Thirty to thirty-one pounds of average Shorthorn milk will yield one pound of butter under the ordinary system of setting. By use of a Separator better results are obtained.

The object of scalding and rinsing all the utensils in preparing them for butter-making, is not only to clean them—for they are supposed to have been cleaned after the previous churning and to have been kept clean since—but to so thoroughly saturate and close the pores of the wood that they cannot absorb any fat. Heat renders water more penetrating, and quickens its action.

The cleansing of all vessels *must* follow immediately after their use. It is not possible to cleanse milk vessels easily or well after the dirt has dried on and in them. If a slight delay be necessary, let the vessels be plunged into cold water whilst waiting.

For the first washing of milk vessels, the water should be either cold or slightly warm; hot water should never be first used. Scrub the vessels and then scald them well, leaving them to drain and dry thoroughly.

HOW TO PREPARE A NEW CHURN FOR USE.

The churn should be well soaked with boiling water and soda, changing the water several times so as to remove any colour or flavour from the new wood. Afterwards the soda must be well washed off, or it will prevent the cream churning. This is best done by washing first with cold water, then with buttermilk, and again with cold water. Wooden vessels may be dried in the air, but not in the sun, as it would dry them too much, and cause the wood to shrink and crack.

The rule for time in churning must be a general rule. In summer, when all the conditions are favourable, the time of churning may be from 25 to 45 minutes. In winter when the conditions are usually more unfavourable, the time may be extended a few minutes.

Good grain is given to butter by churning carefully, and at a proper temperature; if too low it will be long in coming, and hard-grained; and if too high it will come too quickly, and be greasy.

When dry-salting butter, a dredger should be used to sprinkle the salt on the butter.

If it is desirable to keep cream longer than usual before churning, salt may be added at the rate of 1lb. to each gallon of cream, but in this case the buttermilk will be of no use.

Poor cream may be churned at a slightly higher temperature than good rich cream.

Water has many uses in dairying. Only pure water should be used. Butter washed in impure water is affected in more than one way.

Stagnant water, mouldy fodder, sewage grass, large quantities of turnips, and strong-flavoured plants in the pastures injuriously affect milk, and consequently the products of milk.

If turnips are given raw, let the cows be fed with them in moderate quantities immediately after milking. If given previously they will certainly impart a strong flavour to the milk.

PLANTS WHICH IF IN THE PASTURE AFFECT COWS AND THEIR PRODUCE.

Name.	Soil or Situation.	Colour of Flower.	Time of Flowering.
Yellow Monk's Hood ...	Hedgerows	Yellow ...	5 7 P.*
Common Monk's Hood...		Blue ...	
Wood Anemone	Wood.....	White ...	3 6
Pasque Flower	Chalky Pasture..	Violet ...	4 5
Black Hellebore	Hedgerows	Purple ...	2 4
Garlick Mustard.....		White ...	3 10 B.*
Wild Radish, Ranch.....			5 8 A.*
Fool's Parsley.....	Cornfields	White ...	7 8 A.
Cowbane	Pond	White ...	6 8 P.
Hemlock	Hedges	White ...	6 7 B.
Marsh Pennywort.....	Marshes	White ...	5 8 P.
Ivy.....			
Corn Chamomile.....	Cornfields	White ...	6 7 A.
Stinking Chamomile.....			
True Chamomile.....	Gravelly Pastures		8 9 P.
Wormwood	Waste Land.....	Yellow ...	7 9 P.
Hawkweed	Dry Pastures ...	Yellow ...	5 7 P.
Wild Chamomile.....	Cornfields	White ...	6 8 A.
Tansy	Waste Land.....	Yellow ...	8 P.
Lousewort	Wet Pastures ...	Purple ...	6 7 A.
Corn Mint	Cornfields.	Rose ...	6 9 P.
Yew			
Crow Garlick	Meadows	Pinkish ...	7 P.
Broad Leaved Garlick...	Moist Places ...	White ...	4 6 P.
Bog Asphodel	Boggy Land.....	Yellow ...	6 8 P.
Water Plaintain.....	Marshes	Rose ...	6 8 P.

* P. Perennial. A. Annual. B. Biennial.

Rules for Buttermakers.

Never

Allow the Cows to have access to bad water, or to be fed with unsuitable food.

Permit them to be roughly treated, or the cowhouse to be dirty.

Omit limewashing the cowhouses once a year.

Allow the milking to be done with dirty hands.

Delay bringing the milk from the cowhouse directly it is drawn from the udder, and strain it immediately to set for creaming.

Neglect to take the cream from the milk in a clean, careful manner; have it properly and intelligently ripened; churn as soon as the right degree of ripeness is attained.

Touch

And prepare all utensils for making butter with judgment; wash with cold water, scald them with boiling water, scour with salt, and rinse again with cold water before using.

Thermometer must always be used to ascertain the temperature of the churn and cream, the proper temperature being from 54° to 58° in summer, and from 58° to 62° in winter.

Ventilation must be frequent during the first few minutes of churning, or until the air ceases to rush out.

Speed at which to churn being for a churn with beaters 40 to 50 revolutions per minute; for the end-over-end churn 60 revolutions per minute.

Churn must be turned steadily until butter comes.

Grains of butter, when churning is finished, must be the size of shot.

Buttermilk must be drawn off, using a fine strainer to prevent the loss of any butter, then the

churn must be carefully washed in the churn, until the water runs off free from buttermilk.

Must be salted with pure good salt, either in the form of brine or dry salt. To make the brine use $\frac{1}{2}$ lb. salt to a quart of water, in sufficient quantity to cover the butter. Of dry salt, use $\frac{1}{4}$ to $\frac{1}{2}$ an ounce to the lb. of butter, according to taste.

Care and skill, slowly work the butter without rubbing, the object being to gently press out the moisture and make the whole a solid compact mass.

Well made butter will cut like wax, without holes, and break like a piece of steel.

Butter in all the process of making should never be touched by the human hand, the temperature of which is usually so high as to have a tendency to make the butter soft, while there is some risk of the flavour being injured by contact with the hand. With the use of the butter-walker and the "Scotch hands," there is no need to let the bare hands touch the butter.

The
Butter
With
Your
Hands

A DAIRY RHYME.

THIS is the Dairy, so fresh and clean,
Butter made here is fit for the Queen.
This is the cream, ripened with care,
To ensure fine batter, well prepare.
This is the churn, nearest perfection,
Carefully turn in one direction.
Scald it, then cool it with water clear,
Using the strainer without a fear.
Here is sweet milk to thin the cream
For fear it should go to sleep and dream.
Now we must find the temperature
In order to make the churning sure;
If 'tis too hot the butter is oft,
Small in quantity, and very soft;
If 'tis too cold, you may churn away,
Perhaps the butter won't come to-day.
In Summer the mercury should wait
Between fifty-four and fifty-eight;
In Winter, be sure that it is true,
It may be as high as sixty-two.
Use the coarse strainer to strain the cream
That it may run in an even stream.
Now that all's ready inside the churn,
Well fasten the lid before you turn;
Ventilate freely five minutes or so,
Thus letting the pent up gases go.

Now once each second revolve the churn,
Not stopping to look at every turn;
But when the glass begins to clear,
The separate grains will soon appear;
First add cold water to cool the grains
To keep them divided take great pains.
Now then begin to turn once more,
But slowly, although it seems a bore;
Soon the glass, quite clear will be found,
To stop directly is worth a pound (lb.)
Draw off the buttermilk in a pail.
To catch each grain we must not fail,
The strainer will help to do this well,
As each grain wasted makes less to sell.
Now wash it once by turning the churn
Twice each way, but not another turn.
This is the salt, the needful dower,
Preserves, improves, with added power
When 'tis deftly used in ounces eight,
To each quart of water, mix it straight,
And pour through strainer clear and clean
On granules for minutes "Sweet Seventeen."
This is the worker of first class make,
Use it slowly for much is at stake.
So "slowly," "gently," press together,
The golden grains and water sever.
Sure 'tis care is still demanded,
Roughly grinding would leave you stranded.

These are the hands so neat and quick,
When rightly used to form the brick.
This is the paper, in which to pack
The butter, with clean and graceful knack.
Here is the butter, gilt-edged and pure,
A primrose pat for epicure;
Dainty and sweet, untouched by hand,
What better product of pasture land.
Such is our system, simply set forth,
Equally good for South and North;
Uniting to form the toothsome dish,
To give us all that heart can wish,
In the work of art, the perfect brand
That is made by rule and skilful hand.

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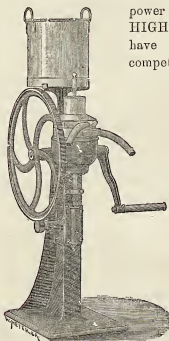
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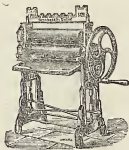
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To hold examinations, grant certificates and premiums, and assist pupils to partake of the benefits of the Institute.

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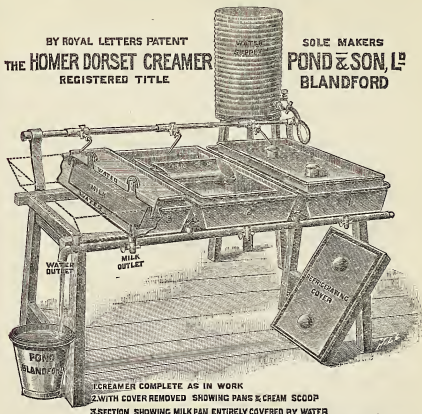
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Entirely prevents waste and saves anxiety.

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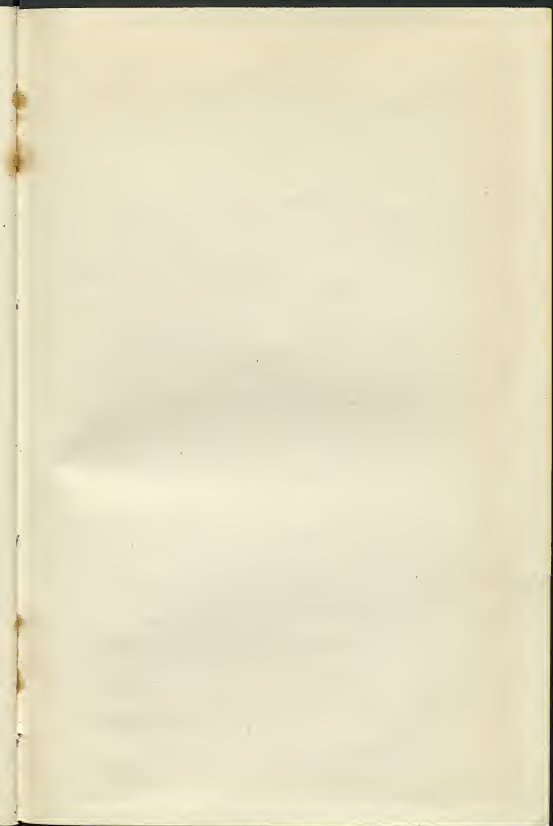
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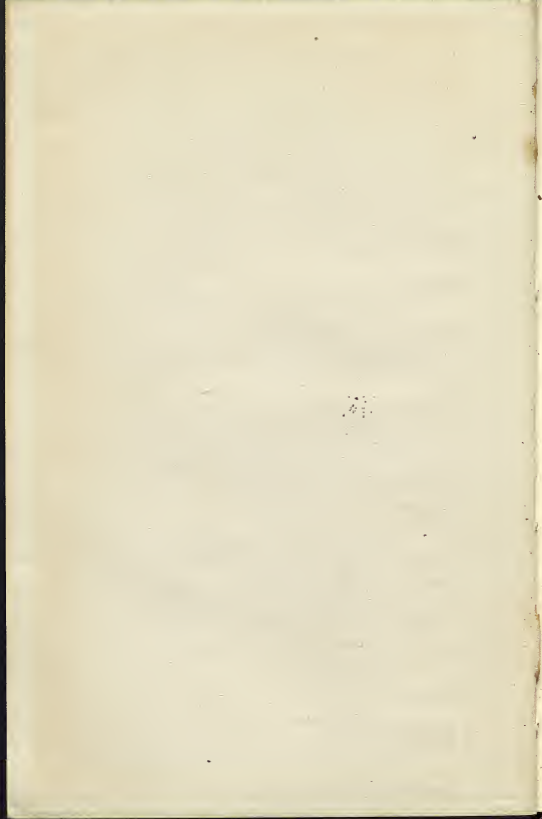
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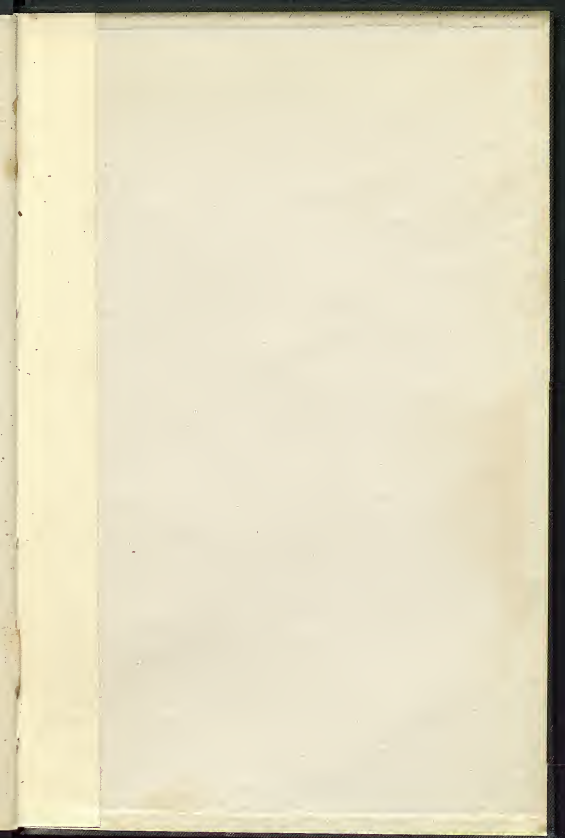
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