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ON THE
MANAGEMENT
OF THE
DAIRY.



WRITTEN FOR THE USE OF DAIRYMEN,

BY

C. F. RADDATZ,

Professor of German and History, Baltimore City College.

10815, C^L

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TO
HON. HORACE GREELEY,
OF NEW YORK,

This little work is respectfully inscribed as a token of appreciation
of the great efforts made by him to improve agriculture in the
United States.

P R E F A C E .

If I venture to write on the management of the dairy, I am moved by the following reasons, viz. :

First—The frequently-uttered complaint that good butter *for keeping* is hardly to be obtained, and the prevailing want of system with so many of our American farmers in the management of the dairy.

Second—The desire to give to others the benefit of my knowledge on the subject, partly obtained through my own observations, but mainly derived from conversations I had from time to time with my late father, a North German farmer in one of the most fertile districts on the Baltic, who, in consequence of his excellent improvements in dairy management, was made a member of the first agricultural societies in Europe, receiving diplomas to that effect ; and

Third—To add to the comfort of the citizens of my adopted country by furnishing them with good butter for their breakfast tables.

But one correct method, based mainly upon principles of natural philosophy, is possible. I am not so bold as to assert that mine is such, and I am also aware that not every farmer is able to make his establishment as complete as I would wish to have it. I only ask that this method, acknowledged as first-rate by the most practical dairymen in Europe, be given a trial, and the result will, I think, prove that I have

rendered useful service. The farmer may take from it what best suits his circumstances. Undoubtedly a good many things brought forward by me, my farming friends know already, but whether they are as well acquainted with the causes and influences which effect good or bad results in the matter, as it is desirable they should be, is not so certain. These, therefore, I will endeavor to explain.

I shall always try to be plain and explicit, avoiding all theoretical expressions, which, at the best, are but calculated to tire our honest farmer and make him stick to the rules his father and grandfather followed before him. I will be particularly obliged for any communication or hints from my readers on the principles and methods given in this little book; in fact, would most earnestly solicit them, for in that way a work of value to our foremost citizen, the farmer, might be the result.

ON THE MANAGEMENT OF THE DAIRY.

FEEDING THE COWS.

A good clover meadow is preferable to any other. White clover is again much better than red, because cows give better and richer milk from it. Red clover alone makes the milk watery. Next to it stands a good, healthy grass meadow, free from sour herbs.

If the dairy is particularly dependent upon the sale of milk or fresh butter in small quantities for immediate use, other things, such as timothy, beets, oil cake, meal, or small grain, etc., to produce an increase of milk in the cow, may be used; but if it is the intention to make a butter *that will keep*, I would recommend only clover and good grass on the meadow as well as in the stall. To give grain of any sort to cows, when clover and good hay are abundant, is only excusable where a very advantageous custom for milk and fresh butter is on hand, or in consequence of unusually high prices of butter. *It never makes the butter any better.*

STALL FEEDING.

The greatest regularity and punctuality should be observed in winter stall feeding. Summer stall feeding I have only seen on very small farms. Proprietors of large farms were in most cases opposed to it, particularly from climatical reasons.

HERDING.

The grazing of the cattle in enclosed pastures is an excellent thing where the locality and a high state of cultivation admit of it; else a correct, judicious herding seems to answer better the preservation and advantageous use of the meadow, and is gaining ground among the dairy farmers. I have seen it practised successfully on large farms with numerous herds. It is the following:

The herdsman (a sensible, active man) must have his herd in command as a major his battalion. The herd slowly moves ahead, nearly in a line. This order is got at by the herdsman walking in front and in the centre of the line, his two dogs flanking the wings. If the herd is small, one dog suffices. This is particularly necessary where the meadow is in the neighborhood of cornfields, to prevent their spoliation. The cows soon get used to this order, and all injurious running and chasing becomes unnecessary. Herding in this way has two advantages:

1. The cows, in being prevented from running quickly over the pasture, do not crush more under their feet than they eat. Every grazing animal is much inclined to get ahead of its neighbor. This greediness in them, if not stopped by the herdsman, will cause a useless, hurtful running.

2. The running in hot weather is injurious, because the milk in the udder becomes still more heated, and later would greatly hinder the forming of the cream. This nonsensical running, especially against the wind, is no doubt very often the cause of colic in the cow, and this dangerous sickness seems to attack the best cows soonest, because they eat quickest and greediest.

The herdsman to whom a herd, such a large capital, is entrusted, should be, as I have said before, active and sensible, not old and decrepit. He should have some knowledge of veterinary practice, particularly know all about cows when calving. He should treat

well the animals under his care, not beat, kick, or unnecessarily run them. His implements, such as chains, ropes, etc., must be kept in order, and handy.

THE COW HOUSE.

Strict attention should be paid to all parts of the cow house; sound feed, cleanliness in the stalls, punctual feeding, likewise place the cows according to their temper, not two evil disposed animals together, also as the one or the other loves a warmer or cooler spot. The cow house should be airy, but not exposed to draft. The strewing of straw should be well attended to, the more the better for the cows, particularly in winter, when cold. The stalls must be cleaned three times a week, and the feeding floors or troughs swept twice a day. In fact, everything in the cow house should be calculated to make the animal feel comfortable in it.

CLEANLINESS IN THE COW HOUSE AND OF THE ANIMALS.

Perfect cleanliness throughout the cow house, to keep out the stench, should be the rule, else the milk will suffer from it, even during the milking. And here I would call attention to an unpardonable neglect so often met with at cow houses. I mean the perfect disregard of the valuable manuring fluid which is produced in cow houses and from dung hills, and which so often is left to run into a ditch or creek near by, instead of being caught in some vat or vessel, and used as a most valuable manure. Yet every farmer knows that without manure worn land cannot be cultivated. One must have seen European farms, where they cannot afford to waste anything, to make this great error in some American farms right glaring. Currying cows as an act of cleanliness I would recom-

mend, and the daily washing of the udder must be attended to by all means. All this has considerable influence on the health of the cow, as well as on her productiveness of milk. It now and then happens that a cow, heretofore good, suddenly shows a decrease in her milk. This never should be a reason for neglecting her; on the contrary, she should have a very comfortable, clear, airy but *warm* place, and the best of feed. She will soon recover, provided an actual disease has not set in. In the tending of calves in the cow house, special regard should be paid to those which show the marks of future great milk productiveness, and as such are intended to be added to the stock of the dairy farm.

WATERING.

Fresh, pure water in the stall and on the field is as important as sound feed.

THE MILKING PLACE.

Where the locality admits of it, the milking place should be as near as possible to the dairy. My reason for this is: In the hot season the milk leaves the udder very warm, and in this state, if driven or carried a long distance, easily curdles, a fact very detrimental to the future process of butter-making, as I shall show later. It is even injurious if the object is but to sell fresh milk.

Where circumstances do not permit a near proximity of the milking place to the dairy, a shady and cool spot, where the cows are least bothered by flies should be chosen, else a good deal of milk will be wasted and made dirty by running and beating. The milking place should be strewn with straw, to give the cows that want to lie down a clean and dry bed to keep their udders clean.

THE ICE HOUSE.

Dairy farmers who can possibly afford it should build an ice house. Practical experience teaches, and natural philosophy demonstrates, that the milk must have taken a certain degree of warmth, 56 deg. to 59 degrees Fahrenheit, to produce a good, not cheesy cream, suitable for buttering, and in order to have a thoroughly clean formation of the cream. This process, also, occurs at a higher temperature, but the milk then easily curdles, communicating this to the cream, and the latter again to the butter. The milk must have assumed a certain degree of sour before the cream separates from it, but it should not by any means be too sour. The quicker the milk raises the cream, the better the cream is; consequently, the milk should be brought as quickly as possible to the temperature of 56° to 59° F., (which makes a good thermometer all-important in a dairy). The cooling of the milk is done easiest by taking some large pieces of ice (small ones melt too soon) in a large tub, covered with a cloth, from the house to the milking place, and here distributing them in the large buckets intended to bring the milk home. The milk is then poured on it, to remain, of course, no longer than necessary. To the bucketful a clean wooden plate (flat) of about the same circumference as the surface of the milk is put on it to prevent the spilling of it. The diameter of the buckets at the top should be less than at the bottom. This shape greatly prevents the spilling of the milk while driving. The wagon to which the buckets *are hung* when driving home must be long and consist, in fact, of nothing else but two long beams resting on the axles. The longer the wagon the less apt the milk is to spill. But the best and purest ice, as a matter of course, can only be used. Ice houses above the ground are preferable to those under ground, because the ice remains cleaner and clearer in them and the water from it can more easily flow off. Below the surface of the ground the ice soon gets to smell, hence worthless for our purpose.

The whole process of milking and the transport home must be done quickly. Immediately on arriving at the dairy the milk is taken from the buckets, strained and poured into the bowls.

MILK BOWLS.

Since more attention has been paid to dairy management milk bowls have been made of different materials—iron, tin, zinc, earthenware, glass and wood. All metal bowls, enameled on the inside, have the fault that the enamel easily breaks in some places, the milk penetrates through these cracks, sours from it, and thus becomes useless; besides, they are expensive for a beginner. Earthenware bowls, well glazed on the inside, as used in England, are preferable, because they are cheaper, keep the milk cool, and the glazing is less apt to crack; yet this will happen in carelessly handling them, particularly in stowing them away one in another. Such damaged bowls should be immediately removed from the dairy, as they quickly spoil the milk in them. The shape of these bowls is not exactly what it should be. They are too small at the bottom; but I am aware that it has its difficulties to make the sides as straight as they should be; nevertheless, of late the shape is greatly improved. Glass bowls have also their faults. They likewise, as it seems, cannot be made with straight sides and bottom. They are easily broken and heated, retain heat too long, and take, as I am told, electricity from the air. This last objection I can hardly grant and do not believe it to be of much influence. I rather consider this more the case with metal bowls. As far as cleanliness is concerned, the glass bowls stand highest.

The old straight-sided wooden bowls, in some parts of Germany still in use, are, as to the shape and wear, preferable to any other, but require a great deal of attention and work in keeping them clean. They should be made carefully in every part—no caulking

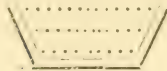
matter whatever used between the staves or bottom. Their material should be hard, well-seasoned oak or beech, without knots, from which the acid has been well drawn. Their in and outside must be worked perfectly smooth, the hoops white and clean. They must be painted inside at least twice a year with the best of oil paint, (linseed oil, red lead and varnish,) and after painting and drying stand from eight to twelve days, filled with clean, cold water, renewing the latter daily at least twelve times. This process of renewing the water (twice or three times a day) should be kept up for three weeks. The dairy man will find it to his advantage to keep always a number of bowls in reserve, else he might be obliged to use some that are not thoroughly prepared. It is astonishing how quickly the milk acid penetrates into the wood, and when this is the case the milk in the vessel is lost.

In drying the bowls in use, after scrubbing and rinsing, they should be placed in such a position as to allow all dampness to entirely evaporate as quickly as possible. In the hot sun they must not stand, as it hurts the wood. With all wooden vessels used in the dairy I would urge the most minute finishing and cleanliness. If metal vessels, they should be scrubbed clean with ashes every day. If the place for cleaning the milk bowls and the other dairy vessels is near the dairy, care should be taken to keep the door of the latter shut while working, to prevent smoke, bad smells or steam from entering it. It is an excellent practice for the manager of the dairy to keep the door of his dairy locked and not allow any one who has nothing to do with it to enter it.

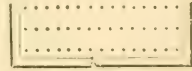
Whatever kind of bowl may be used, before pouring the milk into them they should, cleaned and dried as they have been, again be carefully wiped out with a clean cloth. They should be strictly examined and smelled to be sure that every particle of sour has been removed. One cannot be too careful in this, for, although it does not matter much about the contents of one bowl, the spoiled

contents of one will surely ruin that of twenty and more when in the further process mixed together. Comparing the different kind of bowls, it seems as if the earthen have the advantage. They are cheap, stand a good knock, and are easily cleaned; but one should reject those with bad glazing and too narrow at the bottom.

In some of the first dairies in Germany, as I have said before they never ceased to use the old-fashioned wooden vessel or bowl, objecting to all others, and I will now explain why its shape (equal diameter at top and bottom) is preferable.



Earthen Bowl.



Wooden Bowl.

The formation of the cream in the milk occurs in small globules and fibres, which, as a greasy substance, lighter than the milk when in the proper state for this process, rise perpendicularly to the surface. If this formation is to be uniform, the milk must stand equally deep in all parts of the bowl, from bottom to surface. As this cannot be with the shape of the earthen and glass bowl, (slanting upward and outward from a narrow bottom,) the milk round the sides standing shallower, it is evident that owing to the smaller depth, less cream is contained in it, and will be more quickly carried through the process of cream formation than in the centre. The consequence is a not equally formed cream. This disadvantage may be counteracted by an attentive supervision, since it mostly happens when the process of cream-forming is going on slowly—thus the cream on the sides having completely formed several hours before that in the centre. If in this case the cream on the sides begins to look rough, or even shows small pustules, (which is always a sign of its being spoiled,) then not a moment should be

lost in skimming, no matter whether it has finished forming in centre or not. These cases are rare, and should never happen with proper attention. The size of the milk bowls is in a measure dependent on the extent of the dairy in which they are used; yet bowls too large should not be taken, as they are unhandy to work with. Very small ones, however, are even less desirable, because the milk has too little surface in them, and therefore it does not cool quickly enough, besides they take up proportionally too much room in the dairy. A suitable wooden milk bowl should have about 20 inches diameter, and $3\frac{1}{2}$ inches in height; an earthenware bowl about 15 inches diameter, and $3\frac{3}{4}$ inches in height. Glass bowls are generally taken somewhat smaller, on account of their liability to break.

In hot weather the milk should not stand above two inches deep in the bowl. The cooler the air the deeper the milk may be in the vessel, but rarely much over three inches. An entirely suitable milk bowl, of the shape of the old wooden vessel, of an easily cleaned, not souring material, not more easily broken and not dearer than the earthenware, might yet be invented, and would do splendidly for a prize competition.

THE DAIRY HOUSE.

A suitable dairy must, for coolness sake, be always situated north or northeast. If the locality does not admit of this, shade trees should be planted in front of it. Trees are advantageous before any dairy, to prevent the warm air from entering, and to keep the flies off. Some dairymen are even in favor of a dairy of triangular shape, thus exposing no front at all to the south. The dairy must be airy, roomy, 14 to 16 feet high, distant from the influence of all bad smells, and on a dry piece of ground. It must be built of new, burnt bricks, and have strong walls; clay or rocks I would not

recommend, as the former easily crumbles to pieces, and the latter always retain dampness. Old bricks are no account; they always mold again. The floor of the building should never be more than $1\frac{1}{2}$ or 2 feet below the ground else moldy cellar air will be created. I should advise to have it about two feet above the ground, as a quicker flowing off of the water will be the result, and hence the dairy be kept more easily clean and dry, through the readier fall of all liquids into the draining ditch surrounding the building. This fact is of vital importance. It requires very thick walls to keep out the heat. The walls on the outside might be covered with pieces of turf or other bad conductors of heat, as practised with small ice houses above the ground. The dairy stands with its three sides open to the air, that can strike it from all directions. About a foot above the ground small windows are made, from four to five feet apart. They should be provided with a small apparatus to open them, more or less, according to the strength of the wind. They might, if necessary, have shutters over them, to close them entirely. Above these small windows are common-sized ones, about eight or ten feet from the ground, to give the required light and daily airing. These, as well as the lower, must have haircloth or wire frames to keep out the flies. The frames in the upper windows are not necessary in winter.

The ground area of the dairy is generally taken at from twelve to fourteen square feet per cow. Some dairymen calculate three bowls for each cow, and the necessary passages left. The walls and ceiling must always be kept clean and white, that nothing crumbles off and falls into the milk. In some dairies I have found the ceiling plastered, but consider this an unnecessary expense, and from chemical reasons, anything but advantageous. Plaster is sulphate of lime, which dissolves when moistened, takes up acids and ammoniac from the air, and then smells moldy. I would, therefore, rather advise to place some pulverized plaster on plates fresh

every morning into the dairy, and then take it out every evening with the ammoniac it has absorbed. (The plaster thus used is not thrown away, but makes good manure.)

A solid stucco from time to time painted with oil paint or varnish, and frequently washed, makes the best covering for walls and ceiling. The floor of the dairy should be made of bricks. Flagstones I would not recommend, as they become damp upon a change in the weather. Particular attention must be paid in laying and joining the bricks in the floor. The mortar between them must be kept in good condition, else little holes will be formed in which the moisture, after washing, is retained, and evaporating in warm weather quickly smells. When everything is washed clean, a mop or swab (such as used on ships, I would greatly recommend) is taken to remove the very last of moisture. This should be done well, for an evaporation of water in the dairy is injurious, as it creates sour air. Dry saw dust strewn on the floor and then swept out will be found advantageous in removing all moisture from it. As I have mentioned before, the floor should have a slight inclination towards the draining ditch outside the building to make the water run off quickly. Besides, I would advise to have a few small trough-shaped gutters in the floor, which lead the water to the outside into the draining ditch. The holes through which the water runs to the outside must have metal gratings as protection against vermin. I would urge to have these gratings placed in such a manner that the water runs through them perpendicularly, or rather falls through them. It runs quicker and leaves no dirt particles. The draining ditch must have considerable fall to prevent all dirt or smelling water from accumulating in it. It should never be used as a drain for other purposes. The holes at the gratings in the dairy must be closed after being used. On the inside, round the walls to about two feet from the floor, a bordering of flagstones, or

hard, burnt bricks must run, for should the plastering run down to the floor it soon would be destroyed by the unavoidable splashing of water against it.

The filled bowls must never stand immediately on the floor, but three-cornered pieces of wood of a suitable length and about two inches thick are put, according to the size of the bowls, under them. This is done to let the air strike freely under and on all sides of them, thus preventing the forming of moist, souring angles. The three-cornered shape is the most suitable, because it lies surest, and the bowls are placed best on them, likewise present the largest plane to the air for drying. When the bowls are removed from them they should be turned to let the side which lay next to the floor be exposed to the air and dry again. (Why I object to shelves in the dairy I will explain later.) The newly filled bowls are on account of a better control of the whole, placed separate from the older milk. The passages between the rows of bowls must not be too narrow, or the female workers will sweep with their dresses over the milk and disturb the cream formation. Whenever the milk is in this act it should not be disturbed under any consideration. If, at such a moment, the surface is moved, an immediate standstill in the process is the consequence. The bowls, as well as their wooden rests, should not be knocked against. The draft from the small lower windows should never be such as to ruffle the surface of the milk in the bowls, even in the slightest degree; some draft is nevertheless necessary to carry off the carbonic acid created from the milk. The vapors rising from the milk consist of gasses which, some heavier and some lighter than the air, have to be carried off by the draft from the lower and upper windows, as also by frequent washing of the floor, (which, of course, has to be dried up again immediately.) In summer the upper windows are left open. I have seen dairy houses through which, in stone gutters, a clear, cold stream of water was allowed to run to carry off the gas. This

is undoubtedly very advantageous, but it should then run swiftly, and not have any time to evaporate, as damp air is not admissible. Another advantage gained by it is the cleanliness of the draining ditch outside the building.

CLEANING OF THE DAIRY HOUSE.

In washing and cleaning the dairy house one should not be bound to certain hours, but to necessity. On a still, warm, dry day more frequent washing is necessary than when cold and windy. In this, one should make it a rule to work quickly and dry up immediately, not give the water a chance to evaporate, but only to carry off the gases. If in pouring the milk into the bowls some of it should be spilled, it must be forthwith removed, as also all dirt that may have been carried into the dairy house with the feet. *Cleanliness! cleanliness* and again *cleanliness*—above all, in the house, in all vessels, in the atmosphere, and with everybody about it, is most important in the dairy business. I never saw good butter without it.

As soon as the manager enters the dairy house (which he should do very often, even if no particular business is going on in it) he should use his organs of sight and smell. If he finds anything unusual, he should not rest till he finds the cause of it, and if injurious, remove it. He must not be satisfied with the common exclamation, "I can't understand it." Everything can be understood and explained, and has its natural cause. I insist upon the manager being always clean in body and clothes, to set a good example to his helps. As a matter of course no person subject to chapped, or what is worse, sweaty hands, must be allowed to work skimming and buttering, under any consideration. In some countries, for instance in Holland, they are still stricter.

I would add that the dairy house must not be used as a recepta-

cle for other victuals or dairy utensils. And this holds also good for the butter house. The only article I allow to stand in them is the dry salt used for the butter. Pantries or other provision room should have no connection whatever with them.

NO SHELVES IN THE DAIRY HOUSE.

As I have said before, the filled milk bowls should stand upon the floor, not one bowl upon the other, much less upon shelves which, I am sorry to say, one finds still too often. My reasons for it are:

1. When the milk is in the act of forming the cream, acids and gases are created, which rise more or less high, according to the condition of the atmosphere, and also fall again. It is all-important that these gasses should be carried off as quickly as possible by means of the lower windows in the house, else they will settle again on the milk and cream and sour them, which would be highly injurious to the formed as well as partly formed cream. This cannot be properly prevented if the air is not allowed to strike freely over the milk in the bowls.

2. A quick cooling of the milk is of great importance, and if the bowls are put one upon another it would be interfered with.

3. The temperature is cooler below than above. If the bowls stand in different degrees of warmth, the cream does not form at the same time, which leads to a great deal of trouble. We know that the temperature in a room gets higher as we ascend; consequently the piled-up bowls would stand in different degrees of warmth. Since the cream formation in the milk under a temperature of 56 to 59 degrees Fahrenheit is completest, yet under a warmer one forms, perhaps, quicker, but never so good; the difference in the height of the stand of the bowls will cause an unequal uncertain cream formation. Part of this cream will be bad, and

spoil the good when afterwards thrown together. Besides, I have noticed that the higher one gets in the dairy house the stronger the smell of the milk acid is perceptible if the airing has been neglected, and I conclude from this that some of the gases exhaled from the milk are lighter than the air, and hence rise.

These light, sour gases undoubtedly settle on the upper bowls. If the shelves are around the walls, it is impossible for the air to circulate properly over them, a smaller evil, therefore, if the shelves stand in the centre of the building, but in both cases they remain a nuisance, and one can never give the dairy house the right sort of cleaning. Some dairymen I have known thought they were all right in keeping the milk of each milking on an equal height, but they soon found out that it took too many shelves and room, and, after all, was but a make-shift, which did not add to the getting of fine butter that will also keep, and the latter I consider as not to be obtained as long as these abominable fixtures (occasions of bad smells) are used in the dairy house. I admit that in winter, with the bowls on the floor, good and not too slow cream formation has its difficulties, but then I put them with their three-cornered rests on securely-standing wooden stools, about three feet high, and in this way place the milk in a warmer temperature from that on the brick floor. Large dairy farms should have a winter dairy house, which may be heated.

THE WINTER DAIRY HOUSE.

A large and well regulated dairy should have a summer and winter dairy house—the latter to be heated. It need not be so large as the former—about eight square feet per cow is sufficient. In a northern climate, where nearly to the middle of May cold weather may be expected, such a building is very necessary. Where one house has to answer for both, a heating apparatus

should be attached to it, which always must be applied from the outside. To heat from the inside is apt to bring dirt and smoke into the dairy house, which would spoil all milk in it immediately. During my sojourn in England, in the spring of 1867, I noticed houses built of hollow bricks, through which a circulation of warm air was allowed to run. Heated walls round gardens I have frequently seen on the continent of Europe. At the great international exhibition in London, Prince Albert had a model building erected of hollow bricks comfortably fitted up as a dwelling for working people, and I think this sort of walls might be advantageously applied to winter dairy houses. If the dairy house is large, two small stoves are better than one large one, as the heat is then more equally divided. Whatever plan is adopted, one should be careful that no smoke enters the building. The best way of heating at present in use is by means of steam pipes which run round the floor. A suitable winter dairy house has always paid for itself, as the fresh milk-butter in winter commands the highest prices.

THE CHURNING HOUSE.

Near the dairy house, and connected with it, or not, depending upon the locality, stands the building where the butter is made. It should be as cool as possible, about eight feet high, and with an arched roof. If necessary and large enough, it may also be used as a storeroom for the finished butter, but only if no other place can be found for it. The churning house should in every respect be kept as clean and free from the influence of bad smells as the dairy house. It is also connected, through small gutters, with the draining ditch outside, for the ready-made butter is inclined to take up bad smells from other things.

THE CHURN.

Churns are made differently in shape and movement, but it appears as if the round one, with circular moving paddles, has proved most suitable, because this motion is easiest obtained and the churn better handled, cleaned and made tight. It should never be too high, though, and of small diameter, but about two-thirds height to one-third diameter.

It is necessary to have several churns, to be able to change now and then. By using one continually, particularly on large dairy farms where they churn every day, it is simply impossible to remove the acid entirely from it if not given a chance now and then to dry thoroughly. A small churn for winter use will prove advantageous. The small amount of cream during that season could not well stand long enough until in sufficient quantity to be churned in the large churn. I insist upon the greatest accuracy in making the churn; particularly the inside must be smooth and nicely fitting in the staves. Round the bottom the staves must not form any unnecessary large depth in the chimes, which would be hard to clean; in fact, no sinking places whatever should occur in the wood. The wood must be well seasoned, free from acid, and not taken from the heart of the tree, but from the outside rings. On account of its durability, oak wood is preferred. What I have said of the careful manufacture of the churn applies also to all the other vessels in the dairy, only I would recommend white beech as the material for the smaller ones. The cleaning of the churn, and everything appertaining to it, must be attended to *immediately after churning*—not a moment should be lost.

In some dairies chemical means are employed to clean the churn quickly, more radically, and to destroy the milk acid. This may be right enough, but I should say more expensive, and in the hands of inexperienced persons uncertain. The old-fashioned way—a good

rinsing with hot water, plenty of cold water after it, a careful scrubbing with a clean white brush, not leaving a place untouched, particularly at the bottom, in the chimes, always suffices. This done, the churn is put in the fresh air, exposing it to the wind, (not to the hot sun,) till it is perfectly dry and free from smell. It is an excellent custom to wipe the inside again with a clean linen cloth. That the churn should also be kept clean on the outside is a matter of course. Before putting it to use again the manager should look at it and smell it himself, whether any sour smell can be discovered. This duty he should never leave to others, for he alone is responsible. A manager with weak organs of smell is of no use about a dairy. *Never, and under no consideration,* should the churn be allowed to stand in the dairy house. While being churned the cream creates a large quantity of sour gases, which escaping from the churn would enter the dairy house and settle on the milk in it. This is readily perceived by standing close to the churn and somewhat higher. A very strong, sour smell is noticed then. The locality where the churning is done must be kept as clean as the others, and above all, airy and cool. The temperature should never be above 40 to 50 degrees Fahrenheit, from reasons I will state later.

BUTTER STOREROOM.

The cellar or storeroom where the ready-made butter is kept, should be as cool as possible, dry and free from smell. It should not be used for other purposes. Its size is dependent upon the extent of the dairy, but rather large than too small, as the firkins should stand upright and not lie. Under them wooden rests are put, similar to those used in the dairy house, and strong enough to bear the weight of the firkins of butter.

This closes for the present my descriptions of the buildings and vessels of the dairy, and I will now speak of the actual butter-making.

THE MILKING.

The milking is done early in the morning, and in the evening, shortly before sunset. To milk three times a day I do not think advisable, and have never seen good results from it. With a very abundant feeding and first class cows, more milk is perhaps obtained, but very little more butter, a proof that the milk is not so rich as when milked twice a day. Experienced dairymen are of opinion that milking three times a day, even with plentiful feeding, is too hard on the cow. It appears as if the milk takes a certain time (twelve hours) for its completion. Besides, in milking at noon, during the greatest heat of the day, the milk, in being brought to the dairy house, becomes easily cheesy, and as it, or at least its cream, after that is mixed with the other milkings, it will spoil them also. The manager should always have water at the milking place to wash the udders, in case they should be dirty. In the stall this is always necessary. He should also see that every udder is stripped of the last particle of milk. This is all-important for several reasons:

1. It has been proved that the last milk which comes from the udder is the richest.
2. One has observed that cows which have not been entirely stripped of their milk gradually give less. It appears as if the milk matter in the cow goes to fatten the animal if not drawn from the udder.

To milk regularly at a fixed hour every day I would greatly recommend. The manner in which the milking is done should also be well considered. The teats, slightly moistened, must be taken.

hold of with the whole hand, and not with two or three fingers. This last manner, to which some milkers get accustomed, is undoubtedly hurtful to the cow, and may easily make the udder sore. It is often done when the milker's hand has been hurt in some way; hence the manager should always see that every hand engaged in milking is sound. The milking, carrying home and straining should be done as quickly as possible. The warmer the weather the quicker the milk should be got into the bowls and brought to the state of cream formation, for the more rapidly the cream is drawn from the milk the better the cream, and the better the cream the better the butter. Experience has shown that the more butter obtained from a given quantity of milk, the better the butter. To put as near as possible the same quantity of strained milk into each bowl, a porcelain measure (for cleanliness sake) should be used.

TREATMENT OF THE MILK IN THE BOWLS.

When the milk is in the bowls and put into the dairy house, all dirt and milk which may have been spilled in filling the bowls having been removed, *the time of strictest attention* for the manager begins. The greatest quietness should now reign in the dairy house, that the process of cream formation may go on undisturbed. The thermometer should be consulted frequently, and the temperature regulated by opening or shutting the windows, in order to keep it as near as possible at 56 to 59 degrees Fahrenheit. I repeat again that this degree is the most favorable. Under 56 degrees, the act of cream formation goes forward too slowly; above 59 degrees, fast, but not so perfectly, the cream easily becoming cheesy, because too high a degree of warmth too rapidly develops the acid in the milk and spoils the cream.

The manager should not bind himself to a certain time—that is, he should not take it for granted that the milk must have a certain

time to form its cream completely. This would lead to great mistakes, for the temperature in the dairy house, as well as that at the time of milking and bringing the milk home, besides the state of the atmosphere, such as a sultry heat preceding a thunderstorm, or very dry, etc., would have great influence, so much so that a difference in time of six to twelve hours may occur in the act of cream formation. This is particularly the case where the dairy house is not properly arranged for regulating the temperature. Other and sure signs must show the right time for skimming, and these are the following:

1. When the manager sees that the cream has formed a tolerably thick skin, he must taste it, not with his fingers, but with a small, clean spoon. If the cream begins to have a slight taste of sour not agreeable, and a little biting to the tongue, the time for skimming has arrived. This peculiar taste is hard to describe, but the manager, if attentive, will soon distinguish it.

2. A still more noticeable sign of the completed cream-formation is a roughness of the surface of the cream, and a loosening from the sides of the bowl. Then the skimming must be immediately attended to, for it is the highest time, and even a little too late. This is easily explained. The roughness on the cream has its origin in the too great an amount of acid or fermentation in the milk, and the loosening of the cream from the sides of the bowl is caused by the decrease of the quantity of milk in the bowl, which again is brought about by the acid developing itself more and more, and which makes the milk eat itself. The upper layers of the milk, and especially the cream, are particularly attacked by the acid, hence the manager should make haste to remove the cream from the milk before it sours and grows less in quantity. When the manager is practiced in the above-mentioned tasting, he will not have to wait for the falling of the milk in the bowl, and will get better cream still.

This argues that an attentive and good manager should be ready at any time, late at night or before sunrise, to take advantage of the right moment for skimming.

A proof that the milk has gone well through the process of cream-formation is the soft, liver-like mass at the bottom of the bowl; if hard and tough it has stood too long. I do not believe that there are dairymen now-a-days who labor under the mistake that the thicker the cream the more butter they will get, and who wait till the surface of the cream shows thick, rough pustules of a yellowish gray color. If there are such men still, I can assure them most emphatically that from such cream they will get very little and miserable butter. The trial is easily made, and the result will prove it.

SKIMMING.

The cream completely formed, the skimming commences. To be able to change, two clean tubs, sufficiently high for the skimmer to bring the bowl comfortably and quickly to the upper rim, are ready to receive the cream. To make it still easier for the worker, a little rest for the bowl to stand on during skimming is fixed to the tub. In most dairies these tubs have wooden covers, but I do not consider them so suitable as a cover of a thin linen stuff or hair-cloth, because an evaporation which undoubtedly goes on still, and which is easily smelled in stirring the cream, should be allowed. If there are many bowls to skim, the skimmer should have some one to hand the full bowls to him and remove the skimmed ones. The thick, sour milk which remains in the bowl must be immediately removed from the dairy house, as also the empty bowls cleaned again *as soon as possible*. In some dairy houses I have seen a very good arrangement for quickly removing the sour milk from them. In the inside wall a hole about eighteen square inches large,

with a tightly-closing valve or lid, was made, connecting on the outside with a wooden gutter. During skimming the valve was opened and through the hole a pipe about one foot long was run, on which a tolerably wide funnel had been previously fixed. Into this funnel the sour milk was poured, and carried off by the gutter on the outside. Immediately after using this apparatus the valve should be cleaned and then well closed, to prevent the sour smell from entering. I would mention here that the wooden gutter which carries the sour milk into a large tub, to be used as food for pigs, must be cleaned frequently, as also the tub which contains the food, else the latter will quickly spoil, and create sickness among the pigs.

The tub is easily cleaned by filling it with a strong, hot lye, which is kept hot for several hours by putting heated bricks or rocks into it. A good rinsing with water must follow. Cleanliness here, as everywhere. But to return to the skimming.

The bowl is brought to the cream tub, and the cream nicely pushed off, not with the hand, but with small laths of horn, thin bone, or soft, easily bending wood, respectively 8, 10 or 12 inches long, 1 to $1\frac{1}{2}$ inch wide, and thin enough to bend. With these laths the cream is more easily removed from the milk than with the hand, and they are altogether more cleanly. The short lath is used to loosen the cream from the side of the bowl, and to remove the small remaining pieces of cream. The cream must not stand long before it is churned, and in order to give it the necessary stickiness, capacity of decomposition and sour for churning, it must be stirred frequently with a clean white stick while in the cream tub. It is then poured through a clean haircloth strainer into the churn.

CHURNING.

Where the dairy house is not complete in its arrangements, or during cold weather, the required state for churning of the cream may be brought about by warming it, not by mixing it with hot water, but by slowly warming a few quarts of cream in an earthen-ware vessel, and then stirring it into the mass. If there is sufficient cream to churn every day, all the better, but longer than two days the cream must not stand. For this reason, it is hardly possible that small dairies can furnish butter for keeping and export, because the cream has to stand too long before a sufficient quantity is on hand to make it worth while to churn. In dairies where cheese is made the cream is removed when yet quite sweet. All cream particles still remaining in the milk then go to make the cheese richer. The butter in such dairies is particularly sweet. At least eighty to one hundred cows belong to a profitable and well-regulated dairy.

It is astonishing to see people even now work themselves down for hours, and throw away time and labor, without going to the trouble to think why it churns quicker one time than another, and yet it is so easily understood. It is well known that in a very warm atmosphere, as well as in too cold a one, it churns slowly. Now most people, according to circumstances, pour hot or cold water into the churn, and then work away at it again. Occasionally they happen to succeed, but assuredly a soft, greasy and cheesy butter will be the result, for through the heat an artificial separation of the greasy particles has been hurried on, but not completely developed. The good folks, nevertheless, rejoice in their success, and take it to be the right way. Then again they find this will not do, but having a faint idea that the cream must be too warm, or too cold, more water is resorted to, to the great detriment of the butter, never thinking that it is the atmospheric air which either retards

or advances the churning. Air is necessary for the separation of the greasy particles from the whey or water particles. The stirring and beating of the dasher in the cream serves to crush the greasy globules, and to bring them to the surface to let the air act on them. Before the separation of the butter from the mass, the latter begins to foam, consequently absorbs air. This, no doubt, gave the idea of the atmospheric churn.

Having frequently stated before, that the proper degree to have a complete and healthy separation is 56 to 59 degrees Fahrenheit, *care should be taken that the cream in the churn has this degree.* Then, above all, *the temperature in the building where the churning is done must be from four to six degrees colder than the cream,* for the action of cooler air is indispensable. *These few rules observed, solid, good butter, and quickly made, will be the result.* This is the whole secret. If everything is arranged in the dairy house as I have described it, the cream will have from the beginning the proper degree of warmth. Where this is not the case, I advise to warm the cream gradually by warming a few quarts as described above, and then mix it with the mass. Do not use hot water. The churn itself may, perhaps, be warmed. Cold water or clean ice used in churning, if necessary, does not hurt, but it is a mistake to think that it adds to the excellence of the butter. Some dairymen pretend to say that it sours the cream, but for my part I do not think so, if it is used sensibly. When the above-mentioned conditions—56 degrees in the churn and 50 degrees outside—are fulfilled, no ice is necessary, although I consider its other uses in the dairy of great value.

THE ATMOSPHERIC CHURN.

As I mentioned, the principle of the atmospheric churn rests on the fact of a stream of cooler air rushing through the milk or cream while churning. I am convinced that the use of an atmospheric

churn has its great advantages, since the milk may be churned immediately after leaving the cow, consequently the building of a dairy house and the buying of bowls may be saved. Every common churn, I should say, might be altered into an atmospheric churn. Very likely the trials have not been made correctly, and perhaps the main thing, the right temperature, has not been sufficiently taken into consideration, else this procedure ought to have been employed to a greater extent. Some persons object to the difficulty of cleaning the churn, but I do not admit of these objections, since through the great saving of expense the little trouble of cleaning is more than balanced. As to excellence and amount of butter got from it, opinions are too much at variance for me to allow myself to pronounce upon the subject for the present.

THE SWEET MILK BUTTER.

A method similar to the above is employed at a good many places—I mean the churning from milk which has not gone through the process of cream formation. It is done in the following manner: The milk is poured into a large vessel of the shape of a bucket, but somewhat narrower at the top than bottom, and remains in it until it turns a little sour and begins to slightly thicken. *It must not curdle completely.* The mass is frequently stirred, till it becomes sticky and ropy, when it is ready for churning. A butter thus gained has, if eaten fresh, a still more agreeable taste than that from cream, but it does not keep, and is less in quantity. In winter I would recommend this process, for then there is danger that the cream stands too long before a sufficient quantity is on hand to justify a churning. The reason why sweet milk butter does not keep so well as that from the cream might be explained thus: The milk has not gone through the proper fermentation or cream formation process, the pure grease particles have not separated, and too

much whey remains in the butter, which cannot entirely be removed by working, and which, in standing some length of time, spoils the butter. In cool weather such butter will occasionally keep sweet for a month, but then turns rancid. *After all, the richest and fattest butter is that made from the cream.*

WORKING THE BUTTER.

The solid, good butter taken from the churn is put into a three or four legged tub, the bottom of which has a hole at one end, of a size easily closed by the cork of a common quart bottle. The legs should be arranged to give the tub a slanting position towards the hole, to make the liquid from the butter run off quickly. Under the hole stands a bucket to receive the liquid. The bucket must be frequently emptied and cleaned. The butter is formed into a flat, smooth cake, and in doing this is thrown several times vigorously against the bottom and sides of the tub, to throw off the rougher milk particles still adhering to it. If the quantity of butter in the tub is too large to be handled thus, it is divided into smaller pieces, and each of them worked separately. As a matter of course, the pieces already worked have to be removed from the tub to prevent their being bespattered again. They are then made into one cake, if the quantity is not too large to be handled conveniently, in which case two cakes are made of it. The throwing of the cake against the bottom and sides of the tub may be repeated about six times, as this will suffice to remove first the rougher milk particles, which must be washed out of the tub immediately. I object to having *the butter* washed or water thrown over it, and only admit of it if the locality where the working is done is not sufficiently cool to keep the butter solid, but then only cool, clear and perfectly tasteless water must be used. At any rate, actual necessity only can war-

rant it. The less the butter comes into contact with water the better it is.

The cake is then covered with a clean linen cloth to lessen the influence of the air and to keep the flies off. If the locality is right cool the covering is not necessary. In this state the butter remains for half an hour. This is done to give the still adhering rough milk particles a chance to flow off, and to advance this the cake is frequently pressed with the flat of the hand. The cake should always lie at the upper end of the tub, not touching the sides. The half-hour passed, we salt the butter. The salt used for this purpose must be free from bitter and of fine white quality. It must be well dried and crushed before using it, for the finer and drier it is the quicker it dissolves, and this is exactly what we want. Rough, moist salt dissolves slowly, and is of no use to us, as I shall show presently. One must not stint with the salt, rather a little too much than too little. Five pounds of best salt for the 100 lbs. of butter intended for long keeping suffices. Butter sold fresh takes less. After the butter has been salted it is formed again into a flat cake, and left to lie till the salt is completely dissolved. If the salt has been dry and fine this will be the case within four to five hours, but I would rather advise to wait six or seven hours. The salting of the butter in so short a time after being taken from the churn is very necessary, and must not be neglected, because sufficient moisture is still in it to dissolve the salt quickly, and the dissolved salt is our main agent to help us to expel the milk and whey still in the butter, more completely. We want the pure butter, free from whey, and all injurious substances must be removed. Milk, whey and water particles spoil easily, and give to the butter the fishy, sour taste called rancid. Pure butter, if properly treated, keeps a long time without suffering in the least. The salt being dissolved, the actual working the butter begins.

According to the size of the cake of butter, we take a piece of three or four pounds from it and commence to press it; take it up and throw it against the bottom and sides of the tub, then break it in the middle, to get the inside out, press it and throw it again, continuing thus till the liquid from it is entirely clear and colorless when it is put in a clean bowl. The whole cake is worked in this manner, but lies during the working of its pieces in a separate vessel, to prevent its being bespattered again. The three or four-pound pieces are now taken, two-and-two, formed into six or eight pounds, and worked again as above, to see whether any milk particles are still in them. The liquid from them is tasted, and as long as it has a sour taste or a milky color we must continue to work them, and when convinced that they are free from all whey, we add again two-and-two, making sixteen pound pieces of them, and these are large enough. Very expert dairy-helpers even work the pieces to twenty-four pounds.

Frequently, through too great an ardor in working the pieces, the butter is overworked; by that means we press all moisture and salt out of it and get a dry, crumbly article. Of this good care should be taken, for it is all-important for the preserving of the butter that the liquid salt remains in it, and it is by no means difficult to avoid this error. As I have said before, we should work till the liquid from it is clear, colorless, and free from sour—*not any longer*. The butter must not lose its moisture. With a little attention and experience this is easily learned, if we work sensibly, and I can assure my readers that in following my method this very serious and frequent error in the making of butter will not occur.

The butter is now ready, but to be sure, we taste it again to find out whether perhaps not too much salt has been lost in working it, for it is reasonable to suppose that through the pressing, breaking and throwing about of the cake this could not entirely be pre-

vented. If more salt is needed, it is not necessary to work it into it, but merely take the cakes, of a size according to the quantity on hand, press them flat, and to the 100 pounds add one to two pounds dry, fine salt *between them*, then form the whole into one large cake and put it into the butter tub. Our next duty will now be to keep our butter as much as possible from the action of the air, for, particularly during the hot season, it is injurious. If we have a sufficient quantity to fill a firkin, we must put it into it immediately; if not, we cover the butter with a clean linen cloth, two or three double, which has been previously moistened in a solution of salt and water, and put it into the butter-tub provided with a tight-fitting cover. It must not lie too long in here, and for that reason I would recommend firkins of 50 or 100 pounds, not larger. Of butter-tubs, I would have several on hand, to be able to change. They must be frequently scalded with hot water to keep them from souring.

A good many dairymen, particularly those of the old school, will wonder why I do not employ *kneading*, or their favorite trowel, in my working of butter. I decidedly object to kneading and the trowel. I only allow it at the salting to form the layers, *never* in working the butter. The reason for working the butter is to separate the pure butter from the whey and water. By the use of the trowel and the kneading, exactly the contrary is brought about. The whey and water particles are only pressed the firmer into it, and the butter obtained will be short, waxy and greasy, instead of solid, clear and pure. The use of my method is best proved by the price my butter will fetch.

PACKING THE BUTTER.

To keep the butter from the injurious action of the air, it should be packed into firkins as soon as possible. The firkin must be filled at once, not gradually and at different times. The surface of

the butter in the centre of the firkin must be made a little higher than the sides, because in standing it nearly always sinks there. Firkins holding 50 or 100 pounds, the weight of the wood from 6 to 7 and 12 to 14 pounds respectively, are suitable for every market. In packing, the different flat pieces of butter are firmly pressed into the firkins to expel all air, and when filled, the surface is smoothed by means of a small wooden lath, and covered half an inch thick with coarse, moist salt, gently pressed down on it. Towards the sides the salt may lie a little thicker. The moist salt soon forms a solid mass, thus shutting off the air entirely.

This method has also the advantage of preventing the butter from sticking to the firkin, for the moistened salt gradually dissolves, and running down the staves, keeps the sides of the butter moist.

The heads of the firkins are now put on loose, and the whole placed in the cellar. If they have to stand long, it will be necessary to add, now and then, a little salt round the sides, where it will have diminished. Before putting the butter into the firkin, the bottom of the latter is covered with a layer of dry, coarse salt, about one-fourth of an inch thick. It is a very good practice to fill the firkin, an hour before its use, with a clean, strong solution of salt and water, to remove all fresh wood smell from it. This solution may be used several times, and is not so expensive. Should this, nevertheless, be thought, I would at least have the inside of the firkin well rubbed with moist salt. *To fill the firkins, before packing, with water, and leave them stand for hours, is as useless as it is injurious.* They are made of the outer rings of well-seasoned beech, and perfectly dry, have no acid to hurt, and will only absorb the water, and spoil their nice, clean appearance; besides, the water taken up by the staves would soon smell, and communicate this to the butter.

If the firkins are that badly made that they need water to make them tight, they should never be used; and as to the fresh wood smell, my method mentioned above suffices completely.

Every well-regulated dairy should have, according to its trade, a certain amount of firkins on hand, *for they must wait for the butter, not the butter for them.* They should be kept at a dry, airy place.

The covering of the butter with a solid salt layer may also be advantageously employed in putting up small quantities in earthen jars. After a while the butter will stand perfectly free from the sides in the vessel, moist, and a solid, sweet mass, keeping a long time.

Whenever the firkins are to be sent away, the loose salt is gently removed from the top, and the head put on for good. The salt removed may be used again for the same purpose. *The surface of the butter has now a thin, transparent cover of salt, which must not be meddled with on any account.*

STOWING OF FILLED FIRKINS.

From what I have said of the filling of firkins, it is evident they should stand upright, and never lie. They must stand on strips of wood, a foot from the ground, to admit of a free circulation of the air under and round them, and should never be turned, as it would bring the butter still more in contact with the wood, which we intend to avoid as much as possible. For the same reason, they should not lie.

To leave the butter stowed away too long in firkins, perhaps to speculate on higher prices, I would not recommend, because it would suffer from it; besides, scarcely ever is the cellar large enough to admit of a proper stowage of a great number of firkins. *Dry and cool cellars* are also seldom found. The covering of the inside

of the firkin with paper is nonsense, and does no good whatever, and would never do for the English market.

THE SHAPE OF FIRKINS.

The shape of the firkins must not be heavy bellied, but rather slender, and no long and awkward looking wooden nails should be used in fastening the bottom and hoops. My reasons for this are:

1. In removing the hoops and staves from a firkin of butter in the market, to expose the contents as a sample to the buyer, the slender shape is the most convenient.

2. Those long nails penetrate into the butter and spoil it. They also give the sides of the exposed lump of butter a bad appearance, since they are apt to dig into it while the hoops and staves are being taken off. They hardly ever can be all extracted, as some of them invariably will break off. The stripping of at least one or two lumps of butter of their wood will be pretty much always required by wholesale buyers, and this argues that the finish of the firkins on the inside should be as smooth and nice as on the outside. If this is not the case, the butter will stick to the uneven places, notwithstanding the precautions in packing, and a clean and nice stripping of the wood from the butter can not be accomplished, and the outside of the lump will look uninviting, to the detriment of the seller.

The hoops should look nicely white, and must fit accurately, to do away with those miserable wooden plugs. In forwarding the firkins, a few small iron tacks, long enough to barely fasten the hoops to the staves, suffice completely. The empty firkin should have a weight of 12 to 14 pounds to the 100 pounds of butter. This I have found to be customary in the trade. The bottom, and particularly the head, should not be too heavily made, and I mention

this because some of the buyers will get scared, and judge from it the weight of the other wood. They then would very likely insist to have several firkins stripped in order to weigh the wood. The honest man would rather avoid this suspicion and trouble. The firkin should not be lighter though than the custom of the market calls for; it would lead to trouble and dispute. A good cooper is not apt to make a mistake, and will hit the weight pretty closely. The wholesale buyer in most cases will look to all these things being complied with; and it is foolish to bargain about a few cents in the price of firkins with a good cooper who knows his business. The firkins should not be marked with chalk or other material liable to dirty them, but kept as clean as possible. Dirt on the outside might argue dirt on the inside.

The buyer likes to see the name of the farm plainly and neatly branded on the firkin, and good dairymen consider it an honor to have their names become known in this way, which I consider a very laudable ambition and worthy of imitation.

COLORING OF BUTTER.

The barbarism of coloring the butter is, I am sorry to say, still more or less in use, and since the consumer very often insists upon being deceived, I suppose he has to be gratified. It never should be done though to a higher degree than a nice summer color. Even in Spain and Portugal, where they used to demand nearly a dark yellow butter, they prefer a lighter shade now. Only the best and freshest of Annotta should be used in coloring (most all other materials known to me I consider dangerous). A good article is soft and without smell, and when quite fresh has a slight violet smell. The funny stories about its manufacture are a fable. A trial of its purity and excellence consists in rubbing a piece on white paper, when it should show a fine orange color.

In some dairies I noticed a mixture of three parts of Annotta and one part of Turmeric, which I was told would give the butter a fresher coloring, and this may be so, provided the Turmeric is to be had fresh and without smell. The process of coloring the butter is the following: Four pounds of butter and one pound of Annotta in a porcelain or earthen pot are put on a gentle fire to simmer for two hours, taking care to stir it frequently; it is then strained through a piece of fine linen. If the Annotta is good the mass in the linen has sufficient coloring matter left to add another four pounds of butter and repeat the process. The color gained the second time may be safely mixed with the first. To boil too large a quantity at once gives not so good a color.

There are several ways to mix this prepared color with the butter. I consider best to mix it with the fine crushed salt intended for the salting of the butter and thus transfer the color into it. One should be quick about it though, and rub the salt rapidly and well between the hands, in order to color it equally, else the butter will present a striped appearance. Another method is: Take half pound of the butter to be colored on a dish, mix it with the prepared color, and with it in turn the remaining larger quantity. *This shows that the coloring process must be always done either immediately before salting or together with it, as the mixing is easiest then.* I should say any method is good which prevents unequal coloring or a striped look of the butter.

To give the necessary quantity of the prepared color for a certain weight of butter is scarcely possible, as it is entirely dependent upon the appearance of the butter before coloring and upon the wish of the buyer. As a general thing, three table spoonfuls are taken for the twenty-five pounds, and in case the butter should be very pale, a little more. The color must never be hot when mixing, but only warm, else it will make the butter spotted.

With this I close my treatise on the actual dairy management, and shall now speak of some of the sicknesses to which cows are liable, and what I know of their cure.

In spring, after the first moderate and warmer days, the cows begin to get uneasy in the stall, and this has already a material influence on the milk and butter. As soon as the herd is driven on the meadow the cows eat voraciously of the young green grass, and diarrhœa is the consequence, which soon makes them thin and sick. This state lasts, according to the weather, eight to fourteen days; they get better then and begin to give plenty and good milk. The milk and butter obtained from them during this sickness is bad. I would recommend against it, at least to mitigate it, to give the cows as early as green feed can be obtained, some of it with their dry feed. In the beginning very little, and gradually more, till they are driven out on the meadow entirely. They must not have too much of this mixed feed right away, else they will not eat the dry feed any more.

This method is particularly advantageous for such farms as have an abundance of dry hay and clover to last them till far on in the spring, and where the cows are driven on the meadow for good when the green feed is flourishing.

I am convinced that such a gradual preparing for the green feed will prevent, in a measure, the very dangerous *colic* in cattle. This fatal sickness occurs most frequently on rich clover meadows, but also in the stall, where other feed is used, for instance, those nasty slops from distilleries.

According to the opinions and experience of veterinary surgeons, this sickness is caused by too rapid and voracious swallowing of the feed, overcrowding the stomach too quickly. A sudden generating of sour gasses follows, which, if not expelled forthwith, will swell the animal to such a degree that death must speedily fol-

low. Some veterinarians think that the overcharging of the stomach is not always alone the cause of the swelling up; they have noticed in dissecting the animal that particles of the feed had stuck in the throat, which caused a difficulty in breathing, from which they argue an anxiety in the cow and with it a more rapid working of the lungs, through which the swelling received an additional impulse. Other observations have also shown that the puffing up very often occurs, if in the morning, particularly after a heavy dew, the herd walks against the wind. (Here I would call attention to the herding I recommended in the commencement of my little book, and which I consider a protection against this sickness.) A good many remedies are used to cure the colic, such as the giving, internally, of unslacked pulverized lime (a tablespoonful) in fresh milk; half a pound of white sugar, also, dissolved in milk; oil of tobacco in whiskey, etc. Many things will help. Some people even run the cows, or push them, into water, but I would rather not recommend any such brutality. Experienced dairymen told me that cows which are with calf are apt to miscarry after taking lime. (Lime kept for that purpose on a farm should be kept in air-tight tin boxes, to keep it from the action of the air, else it will not do any good.)

These remedies may all be very useful if the illness is noticed immediately when it begins. Where there is a suitable herdsman this no doubt will be the case, but generally some person is put in such a place who is no earthly account for anything else on the farm, and this is a serious error on the part of the manager. Generally the horrid state of the animal is only noticed when it shows but too plainly, as for instance, when the poor thing, from the acute pain, rolls itself on the ground, and then perhaps some of those remedies are not on hand and very often the manager is not there, and in duty bound a formal report should be made to him, while in the meantime, considering the rapid progress of the sickness, the

cow has entered already upon the last stage of it, and if the trocar is not speedily employed the perhaps very valuable animal is lost. (The best cows are generally attacked by it, from reasons I have stated under head of "Herding.") Even if the operation with the trocar is successful the animal will be sick after it, if not for ever, at least for a long time. I do not reject the mentioned remedies, I only intend to show their use.

I shall now give to my readers a proceeding, as introduced by my father, for the quick cure of colic in cattle (horses included).

The instrument used is a gutta-percha pipe 6 feet long, 1 inch diameter, gradually getting less towards the end, and finishing at $\frac{1}{2}$ inch diameter; it is hollow and closed at the end, which is rounded; about $1\frac{1}{2}$ inch from the lower end it has on the one side an oval-shaped opening (lengthways) 2 inches long and $\frac{1}{2}$ inch wide; two inches farther up, on the opposite side, is another opening like it.

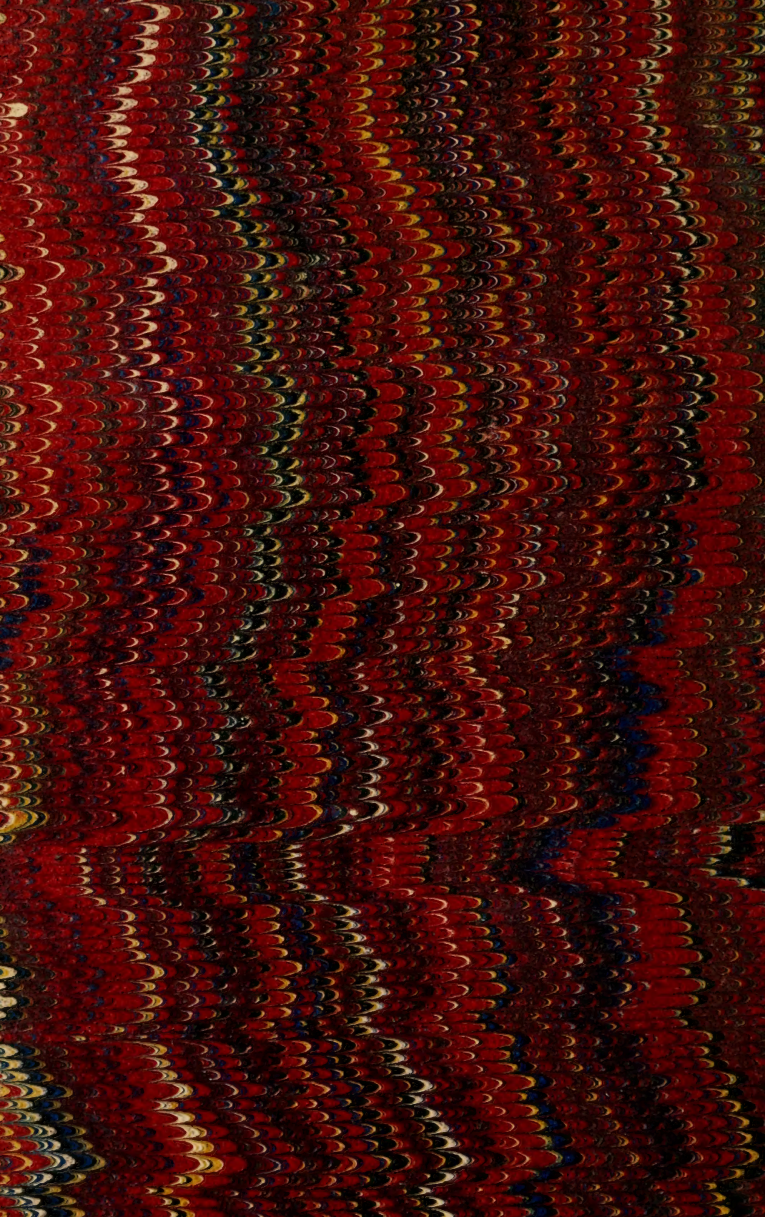
This pipe is pushed (the lower and round end first) through the gullet of the animal into its stomach. As soon as the pipe reaches the stomach, the compressed sour air contained in it escapes with such force that some of the feed particles are driven with it into the pipe. To prevent a stopping up of the pipe, a willow switch, from which the bark has been removed, is inserted into the pipe before the operation, and during it quickly withdrawn. *As soon as the air rushes from the stomach, the animal is saved;* but the cure is not quite finished. The fermentation in the stomach generally lasts several hours longer, and in order to remove it, it is necessary to employ absorbing remedies. The easiest and simplest is one-half to one pound of fine white sugar, dissolved in milk or water, to be given to the cow by little and little for an hour. *During this time the animal must not eat anything.*

To keep the animal from crushing the pipe with its teeth, and to facilitate the adjusting of it, one should use a wooden mouth-piece, (thick enough to keep the mouth of the animal open,) with a hole

in the centre so large as to admit the passage of the pipe freely. It should be long enough to protrude about one or two inches on each side of the mouth, to be able to fasten the ends to the neck of the animal, and keep the pipe and mouth-piece stationary. Immediately after the use the pipe should be well cleaned.

Before closing, I would say a few words about the milk productiveness of some cows. I have asked a good many dairy farmers, here and in Europe, which cow they considered best for the dairy, and found opinions greatly at variance. In Europe, on the dairy lands of the Baltic coast, the Danish crossed with Ayrshire is the favorite. In the neighborhood of large towns, where the sale of fresh milk is the object, the Devon and the large Oldenburg. The last named would do splendidly here. The large Dutch cow, if fed well, gives a great deal of milk, but rather watery, I think. Here, in America, I find the Alderney quite a favorite, and justly so, on the right kind of pasture; besides, she is such a beauty. The Ayrshire and Jersey (and this last one is my favorite) are splendid dairy cows. For richness of cream, I opine the Jersey can not be surpassed.

Dairymen should examine well their young calves, as to future great milk productiveness, before selling them to the butcher. Many a promising calf would not be slaughtered, and many a one that never will make anything would not be carefully raised, to aggravate its owner afterwards.





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