sand delegates for two or three days, and I think we could handle the
convention and the Commercial Club stands back of the movement to
give you a good time.

Pres. Moran: Your invitation will be placed on file and given con-
sideration when the time comes.

THE USE OF ARTIFICIAL REFRIGERATING
MACHINERY IN CREAMERIES

Mr. Hoiberg

Fellow Members of the Wisconsin Butter Makers' Association,
Ladies and Gentlemen: That temperatures are an important factor
in butter making is an undisputed fact; but it is also a fact that
little effort has been used in obtaining and maintaining correct
temperatures in the average creamery which has caused a heavy
financial loss to many a creamery and in some instances to the but-
ter dealer as well.

I said "effort" meaning that the average creamery does not real-
ize that instead of holding their own, so to speak, they are going
backwards for there is no such a thing as a standstill in nature. It
is either an eternal progress or an eternal decay. Therefore, it
seems to me that those creameries which or who use and depend
solely upon natural ice and water for obtaining and maintaining the
proper temperatures so vitally necessary in butter making, are not
holding their own but are on the down grade.

We have with us today a far better and cheaper method of pro-
ducing cold than the ancient water and natural ice way. We have
the "Mechanical Refrigerating Machine," or the Ice Machine in plain
English. The Ice Machine of today is so simplified and so easy to
understand that anyone with average intelligence can operate it
and as to the cost of installing, maintaining and operating an arti-
ficial refrigerating plant in a creamery, say one making 155,000 lbs.
of butter yearly (not a very large factory), I will make the follow-
ing proposition: You establish a creamery on one side of the road
and I one on the other side. You build a substantial ice house on
your property and I will install a suitable artificial refrigerating
plant in my Creamery. You put up sufficient natural ice each year
in your ice house at a cost not to exceed fifty cents per ton. At the
end of five years if it has not cost me less for operating and main-
taining my Ice Machine I will buy you the best suit of clothes and
a silk hat that you can find in La Crosse. It goes without saying that we manufacture the same number of pounds of butter each year, everything being equal except our methods of cooling. Then we come to the most important part of it, namely, the more efficient work we can do in our, that is, in my creamery.

To begin with, we will take a hot summer morning when the cream comes in at a temperature ranging from 60 to 80 degrees Fahrenheit and ripe enough to churn but it must be cooled down first. You can't leave your weigh room long enough to crush ice for cooling and it ought to be cooled immediately clear down to 45 degrees or lower or you will have an acidity of from 6 to 7% in less than two hours. (The little acid producing germs work pretty fast.) You leave it until after dinner and then you go after it with a big hammer and a shovel, but the mischief is done. You have too much acid. You can't overcome that. There is but one way, "dope it." Use lime and kill all the germs by boiling it. If you do not neutralize and pasteurize you will turn out a poor keeping butter. It will show up "fishy" in less than thirty days.

In the meantime, I am receiving cream on the same morning, same temperature as your cream. As soon as I get enough cream in my ripener to submerge the lower half of the coils, I will slip down and start my Ice Machine (only a few minutes work) turn on my brine or sweet water as the case may be, and when my ripener is full or at least shortly after my cream is down to 45 degrees, at which temperature the little fellows (germs) are not very active, they have cold feet. As a rule the temperature of cream thus left in the ripener until the next morning will have risen to from 49 to 50 degrees F. and an acidity of 3 to 4. That will make butter which will taste good and also keep well and therefore will command and bring top prices while yours will bring centralizers prices or even below, label or no label. This is not fiction, gentlemen. I have been there.

Now we have our churning done, the butter tubbed or printed as the case may be and ready for the refrigerator where it is kept between shipping days from two to ten days. You have a box either on the side or on top of your cooling room which you fill every so often with ice. Generally once a week in hot weather. The first day or so after re-filling it, it is nice and cool. Perhaps you can get it down to 45 or so but it soon begins to crawl up and before you know it the thermometer shows 55 to 60. Then the fun begins, for the mold germs one warm day in your refrigerator will start the nice green flowers on your tub linings and if once there they will continue to grow until the butter leaves the often poorly iced re-
ERRATUM.

On page 93 beginning the ninth line from the bottom, the article should be credited to G. S. Dobbie, of Chicago, with the title, "'Why a Creamery Ought to Pasteurize and How a Creamery Can Pasteurize.'"
frigapitor car and you are notified that your shipment of such a date arrived in a very moldy state and you pay the bill. It is true; I have been there also. Thousands of dollars are lost in that way every year.

While you are doing this my machine is working for me and keeping the temperature in my refrigerator ranging from 32 to 40 degrees F. No mold will thrive there and my butter will retain nearly all the moisture while yours will have shrunk from one-half to one pound per tub in a week's time. If you are making say, 1500 tubs during the summer months and lose one pound per tub at 50c per pound, it means a tidy sum of $750.00. You cannot afford to take that loss year after year and the consumer, the people who eat our butter are demanding good butter and they will have it and are willing to pay for it.

There is no earthly use of sitting on the fence and howling at the neutralizing centralizers. They have a right to live but drive them out; beat them at their own game. Don't use these methods but use their machinery. One of their means of success is their absolute control of temperatures. You cannot control nature unless you use machinery. A short time ago I read in a magazine, a very instructive article written by Dr. Edwin E. Slossen, a noted writer and Scientist, entitled "Back to Nature?, Never. Forward to the Machine": and to quote a passage from said article he says:

"Nature is our unsliping foe. It is only by overcoming nature that man can rise." He said further, "Give me the man made machine and I will overcome Nature." In our case, the butter maker's case it is nature we must overcome. Hot weather is natural in Wisconsin and we must use man made machinery to overcome it with. So I will say with Dr. Slossen, "Forward to the Machine" and will add forward with the Ice Machine.

While it will not be a "cure all" of all the evils now existing in the Creamery business, I do believe it will be a mighty step in the right direction for every creamery in the State of Wisconsin to install and operate an artificial refrigerating plant.

Mr. Chairman, Members of Wisconsin Butter Makers Association.

Ladies & Gentlemen: The subject assigned Why a creamery ought to Pasteurize and how a creamery can Pasteurize is an old discussed subject. However the need today of every creamery Pasteurizing is so important that a discussion of this subject should help bring home its vital need.

A great deal of study and research work has been done in order to educate the creamery men to the need of Pasteurizing and also how it should be conducted.
I believe this education has informed and transformed our minds to the extent that we are all of the unanimous opinion that Pasteurization is one of the most important and necessary factors in the successful making and selling of creamery butter.

With your kind indulgence will try and point out,

"WHY A CREAMERY OUGHT TO PASTEURIZE"

At no time more than now, in the history of the creamery business have the times demanded the best grade of butter that can be produced. Competition with so-called (Substitutes) and the high prices prevailing in payment of butter fat has created the necessity for a good uniform grade of butter with good keeping qualities. Such a grade is necessary to secure top market quotations and make it possible to meet competition. It will further bring larger returns to the cream producer and thereby act as an incentive to keep him in the dairy business.

The possibility of importing butter from foreign countries is going to intensify competition and thereby effect the markets in this country. This being true, it behooves us to apply and use all the skill and proper methods available so that we can meet and offset competition of this nature with a grade of butter superior to what might be imported. If we are not awake to the situation, serious losses may overtake us which the industry cannot stand.

From a commercial standpoint of view proper Pasteurization plays an important part in three different ways.

First: It improves the quality of the butter.
Second: It improves the keeping quality of the butter.
Third: It helps to produce a more uniform quality from day to day.

The foregoing indicates the great importance and need of every creamery adopting a practical pasteurization system if they are going to operate successfully. If all creameries adopted and applied a successful system of Pasteurization a great advance would be made in the quality produced in this country.

The medium from which butter is made must be rid of harmful and injurious bacteria in order that a lactic acid starter can properly perform the function for which it is intended. This can be achieved by proper Pasteurization.

If there is one thing the buyer or consumer of butter demands more than anything else, it is that butter must be uniform, in flavor, body, color, salt and neatness. Butter that will score 90 to 91 points uniformly week in and week out will find and retain a market that irregu-
lar higher scoring butter cannot compete in. I believe you understand that I'm not favoring making low scoring butter. If a uniform grade can be made that will score 92 to 93 points, we would have a butter that would capture and retain the best markets. The great important factor in butter making today, is to produce a uniformly good grade of butter. Uniformity should be our watch word. A proper system of Pasteurization is the greatest aid I know of in producing uniform butter.

A uniform grade of butter made from pasteurized cream scoring 90 to 91 will keep much better under the influence of cold storage conditions than irregular higher scoring butter made from unpasteurized cream.

Commission men today are willing to pay a premium to factories that will produce, a good keeping, good uniform grade of butter, made from pasteurized cream. They know too well that pasteurized butter will give them much less trouble and worry, and further they know it brings satisfied customers.

The question facing the creamery man today is not should we pasteurize, but on the other hand, how will I and what equipment must I use in order to pasteurize successfully and economically and this leads us into our second thought, viz.:

**HOW A CREAMERY CAN PASTEURIZE**

There has been and is today a great deal of discussion as to what is the best method or system to adopt to successfully pasteurize cream for butter making purposes. I am in hopes that some day we will be able in a commercial way to pasteurize by the use of electricity. Down to date, however, steam, hot water and cold water have been the mediums used, in varying equipment to serve as the purpose of pasteurizing cream.

Some authorities claim that the heating and cooling of the cream should be done entirely free from the air, because the air coming in contact with hot cream causes the fat therein to oxidize, giving off unclean metallic flavors. In support of this principle machinery has been designed so that the cream during the heating and cooling processes does not come in contact with the air. Good results have been obtained with this class of equipment.

Some authorities claim that the air coming in contact with the cream during the heating and cooling processes does not hurt or injure the quality of butter. They even believe in blowing purified air into the cream during the process of heating. This practice is in di-
rect opposition to the first theory advanced. Some claim to have se-
cured good results through this blowing system.

Some claim to secure the best results using what is known as the
flash system, heating to a certain temperature and cooling immedi-
ately. Some excellent results have been obtained by this system and
especially adapted for creameries where there are large volumes of
butter made.

Some claim to secure the best results by using what is known as the
vat or batch system. This is by heating to a given temperature, viz.,
145° Fhr., holding the cream at this temperature for twenty minutes,
then cooling the cream to churning or ripening temperature. This is
a splendid system and very adaptable to the average or smaller cream-
ery. This is a simple method, requiring no other equipment than ordi-
narily would be a part of creamery equipment in general.

There are a few features outstanding that makes this system of
pasteurization to be more desirable than the other systems alluded to.
In the first place, less steam or heat is consumed due to holding the
cream at a given temperature and less cooling medium is required,
(for the same reason). This system lowers the cost of pasteurizing
and gains desired results very easily without the constant watching
of the temperature as is required in continuous systems. This system
however, consumes more time than the continuous system, and is not
suited to creameries where large volumes of butter are made. It does
not require as expert an operator or pasteurizing man as does the con-
tinuous system and needs less care and attention during the operation
of pasteurizing.

Recording thermometers should be used to indicate exactly the tem-
peratures employed in the process and indicate whether or not the
cream has been held at a given temperature a given period of time.
As holding the cream at a certain temperature for a certain period
is a part of this pasteurizing system, so is it necessary to use a re-
cording thermometer to check up the work and determine how sys-
tematically and uniformly the pasteurizing is being done.

The vat system of Pasteurization is certainly one of the most effect-
ive and thorough systems that can be adopted from a Bacteriological
standpoint of view. The capacity of this system can be increased by
using two or three forewarmed in which to do the heating and hold-
ing and then pump the cream over a tubular or some such cooler and
from there into the vat. This system is very efficient, simple and in-
creases capacity very materially, where needed. For average small
creameries I am strongly in favor of the vat system of pasteurization.

The flash or continuous system is the best proposition for large
creameries where it is imperative to turn out large volumes of butter quickly. This system requires more attention in order to secure uniform results. If the system is properly handled it will bring excellent results and increase the capacity of a creamery very materially.

The foregoing deals to a certain degree with the different systems in use at the present time. In the following I wish to outline in a general manner a few of the details that need to be observed in order to successfully operate either of the systems here alluded to.

The first step and most important one in conducting a successful Pasteurization system is to be positive that all equipment and utensils that the cream comes in contact with are clean and have been thoroughly steamed. The cleaning and steaming of all equipment and utensils used should be thoroughly done as soon as the pasteurizing for that day’s run is completed. The next morning before any cream has been run through the system it should be again steamed and once per week a hot lime solution should be pumped through the system. I want to impress the fact that properly cleaned equipment is one of the most essential steps to be taken and no pasteurization system is efficient or effective unless equipment is so treated.

No matter what system of pasteurization is being used, it is important to use a recording thermometer so that records can be made and filed indicating the class of work being conducted. This also is important and no pasteurizing equipment is complete without a recorder. This class of equipment has a tendency to raise the efficiency of a man that looks after the pasteurizing because of the fact if he feels he is being checked he will secure good charts and thereby increase the effectiveness of pasteurization, thus protecting the quality of the butter.

The next step is the preparation of the cream for pasteurization. If the vat system of pasteurization is being used then the cream can be pumped, or emptied directly into the vat without any preheating. However, if the flash system is being used then the cream needs to be preheated in forewarmers or vats to about 100 degrees Fhr. and if the acidity of the cream is above 16 degrees Manns’ acid test would add enough lime water to reduce the acidity to 16 degrees, lowering the acidity of the cream helps to reduce curdling and losses of butter fat in the buttermilk. Also increases the capacity of the pasteurizer because the cooler will take the cream and distribute it without clogging the distribution holes. It also improves the flavor of the cream and butter.

When starting a flash pasteurizer the cream should be bi-passed back to the forewarmer until the proper temperature has been attained then the flow of cream can be directed to the cooler. Bi-pass—

7—B. A.
ing the first and last cream prevents any raw cream passing through the equipment before proper temperature has been attained, thus protecting it from contamination of the raw or half pasteurized cream and making it possible to maintain efficient, effective pasteurization. It is necessary in order to secure efficient flash pasteurization that there are at least two preheating vats or forewarmers so that the pasteurizer can be fed cream of a uniform acidity and temperature. This is very important in order to secure effective flash pasteurization. If the vat system is being used, it is necessary to draw off some cream at different intervals during the pasteurizing so that the raw or half pasteurized cream in the faucet will be pasteurized.

Pasteurization is of little or no account unless it is done systematically and thoroughly. A little raw cream entering the pasteurized cream will act as a medium to introduce the very germ life that pasteurization is supposed to kill and this occurring makes it harder for a starter to perform the function of developing and maintaining the butter flavor, the markets of today require, viz., a clean, mild sweet flavor.

You undoubtedly have noticed I have not touched on the cost of pasteurizing equipment or the cost of pasteurizing. The cost of pasteurizing per pound of butter is very small in fact so small when considering returns gained, that the question naturally sinks out of sight. The cost per pound of butter for pasteurization varies according to the system being used, existing conditions, price of fuel and volume of butter made. I believe the price will vary from possibly one-eighth of a cent per pound to one-half cent depending on the efficiency of the equipment and management. It is policy to use exhaust steam as much as possible. Doing this will lower the cost. Insulate steam pipes and avoid leaks will also decrease the cost.

The efficiency of pasteurization can be determined through Bacteriological analysis. The yeast and mold count on the butter will serve as a guide of efficiency.

The different systems of pasteurizing will all produce good bacteriological results and good keeping quality when necessary conditions are complied with. Defects in results are usually due to the shortcomings of the operator and not the inherent defects of the method. Convenience, speed and cost of installation are the main choices to be considered when buying pasteurizing equipment.

In conclusion I wish to summarize as follows:
1. The times demand all creameries to pasteurize.
2. Pasteurization is absolutely necessary in order to produce satisfactory butter for the different markets.
3. Pasteurization will help protect the creamery industry against so called substitutes and foreign competition.
4. Pasteurization will help keep the creameries in business and the producer producing.
5. Equipment throughout must be cleaned and steamed daily.
6. Proper handling and treatment of present day pasteurizing equipment will render highest efficiency and net best results.
7. The cost is small, the returns large.
8. Pasteurize.

MOLDY BUTTER AND ITS PREVENTION

BY PROFESSOR E. G. HASTINGS

Butter must possess certain qualities if it is to meet with the approval of the consumer. It must have an appealing flavor and aroma; it must show the crystalline texture which differentiates it from grease; and it must have an attractive color which should be uniform. If the butter is mottled, streaked or discolored, it cannot be classed as a high grade product.

The growth of mold on the butter or its wrappings is certain to impair one or more of its properties and thus lower its commercial value. The degree to which its quality will be injured will depend on the kind of mold present and on the extent of its growth. I am not aware that any data has been collected as to the annual losses in the butter industry occasioned by mold. Those of you who are actively engaged in the manufacture and marketing of butter are far better able to judge of the commercial importance of this trouble, than am I. It is sufficient to say that the reports of those in contact with the market, indicate its great importance. It is likewise evident that moldy butter is increasing in frequency, rather than decreasing. Certain developments in the industry would seem to be responsible for the increase, as will be pointed out later.

Mold on butter can be prevented so easily and with so little expense, that the loss occasioned by it may be looked upon as one which we suffer needlessly. Many butter makers have erroneous ideas concerning the source of the trouble. It is the purpose of this paper to point out the sources from which the molds found in butter may have come, and how such contamination may be avoided.