plied to the outside. This operation is generally repeated once or twice before the cheese are ready for the curing shelves. It takes from two to four weeks before the cheese are ready to be shipped, when they are wrapped in parchment paper with a manilla wrapper. Some factories use a tin-foil wrapper in addition to the paper wrappers.

I don’t know that I have told you anything in this talk that you didn’t already know, but you have all been very attentive and I hope it wasn’t for the same reason that the little boy paid such strict attention in church. When asked by his mother why he took such good notice of the preacher, he said, “I was watching his Adam’s apple go up and down.”

Mr. Luchsinger: Mr. Chairman, may I make an announcement at this time? I want to announce that we will hold a convention on the 30th and 31st days of January at Monroe, Wis., as the foreign cheese industry predominates there as much as the American cheese, and I wish to invite you all to be with us on those two days at Monroe. As president of the association I tender you all the invitation.

The President: Mr. Fred Marty will be the next speaker on the program and will talk to us about Swiss cheese making.

SWISS CHEESE MAKING.

Fred Marty, Monroe, Wis.

State Cheese Factory, Dairy & Food Inspector.

Mr. President:

Swiss cheese making is again the subject assigned to me. As this has been the subject assigned to me for the last two or three years it would seem as if I was the only Swiss cheese maker able to take up this subject, now let me tell you that we have many very skillful makers in our section of the state who would be able to thoroughly discuss in detail any particular point in the process of manufacturing Swiss
cheese were they to explain themselves in the German language. But with the best efforts of Mr. Baer and myself we have failed to find anybody willing to take up this subject.

This article I have not prepared to describe in detail the process of manufacturing Swiss, but merely to introduce the subject.

It is also my purpose to make some general remarks which I have observed, and causing a great annual loss to our Swiss cheese industry.

However, should any member wish to take up and discuss any particular point in the process of manufacturing Swiss cheese, I would be glad to give my opinion in answer to any question.

In the manufacture of Swiss cheese it is perhaps more so than in any other kind of cheese that only certain condition of the milk will bring about the natural characteristic of a Swiss cheese.

Among the Swiss cheese factories the rule is universally adopted to deliver the milk twice a day which is manufactured into cheese immediately after the milk is received, the hours of delivering the milk are from 6—7 a.m. and 7—8 p.m. each day.

This rule of hauling milk twice a day has become so customary that no second thought is given to the possibility of delivering the milk only once a day. This method was perhaps a good plan in the early days of our cheese industry when the milk producers were unexperienced in handling and caring for milk and the necessity of such for the manufacture of Swiss cheese. The question of delivering the milk only once a day would hardly sound practical to many cheese makers and farmers as they have become so accustomed to deliver the milk twice a day. But I would say right here for an example that any part of the milk delivered once a day to the Monroe Milk Condensing factory could be manufactured into a Swiss cheese equal in quality to that of any average imported Emmenthaler.

Knowledge, experience and better financial condition of our milk producer today would permit them to arrange a suitable milk house and milk cooling system which would enable them to thoroughly care for the milk to be delivered once a day and manufactured into Swiss cheese. Then our hard work-
ing cheese maker after a hard day's work and in place of starting another would be blest with a night's rest. The patron in less than half the time required to deliver the milk could cool down the milk sufficiently to let it remain until morning, and the poor old faithful horse in place of making that dreadful hurry up trip to the cheese factory after a day's hard work would be released of the sweaty harness by several hours.

However a suitable milk house and necessary cooling system as delivering the night's and morning's milk in separate cans would in this case be absolutely necessary and should strictly be enforced. Whether he be a small or large parton of the cheese factory.

The Monroe Milk Condensing factory has 125 milk patrons, any of them keep just as many and as few cows as any cheese factory patrons, these patrons comply with the specification called for under contract such as only feeding certain kinds of feed, milk house, milk cooling system and all barns to be whitewashed twice each year. Any milk containing as high as .20 per cent of acidity is promptly rejected. Since our cheese factory patrons claim that they are getting more per pound of milk than the patrons of the condensing factory and besides get back the whey I fail to see why they cannot build similar milk houses and cooling systems and take advantage of hauling milk only once a day.

While it is a known fact that in the fermentation process of a Swiss cheese in developing the required eyes or holes we find that by far the largest per cent of termed "Glaesler" cheese (a cheese where the characteristic nature of developing the eyes or holes in the cheese has turned into long seams) are found among the morning's make, either due to insufficient lactic acid or ripeness of the morning's milk. While a practical cheese maker wherever conditions were favorable, such as running water, I would set about 300 pounds of the night's milk into the water and hold it over for the next morning's cheese, this method I would practice all season as it would help the fermentation process very much.

It is true that the per cent of lactic acid or ripeness of the milk required in manufacture of Swiss cheese is not known to any maker and it very often occurs that a cheese maker seemingly is getting along very nice with his cheese until to his
surprise he learns that he has for some weeks been manufac-
turining a "Glaesler" cheese of a pasty texture, the body
containing seams running throughout the cheese, the flavor
being good—somewhat of a sweet taste. This cheese is classed
as a No. 11 and manufactured from a very fine quality of milk.

Let it be understood that this particular kind of cheese is
an annual loss to our milk producer of thousands of dollars,
since many cheese factories are known to manufacture from
one-third to one-half "Glaesler" cheese, or Glaesler with holes,
and a so-called blind cheese, the latter however could be
traced to improper temperatures in the fermentation process.
The Glaesler cheese is mostly consumed by the Italian trade
as it seems to answer their peculiar way of preparing it to
consume. The cheese dealer often claims to them that it is
a special make for their request.

If this particular point was known to the maker that the
milk did not contain sufficient lactic acid or ripeness, the manu-
facture of a "Glaesler" cheese could be avoided to a large
extent by working and holding the curd longer before cook-
ing. But as this particular point, knowing just when to
apply the steam to the curd, can not be determined by a test
other than practical experience, is very often the cause of a
"Glaesler" cheese. However, in my opinion, the proper time
to avoid a "Glaesler" cheese would be at the time of setting,
if the proper ripeness of the milk was known.

For the manufacture of Swiss cheese a home made rennet
is used which is made and prepared in two different ways.
One most commonly used is prepared out of three-fifths of
common whey and two-fifths of water, as a rule about from 2
to 3 quarts in all. Sufficient calf stomach is then added with
a little salt so as to give it the required strength. It is then
allowed to stand for either 24 or 36 hours. Another home
made rennet, which method is practiced by many Swiss cheese
makers, is a whey which is heated to 165 degrees F. when a
so-called (sour) whey which has gone through this partic-
ular process and allowed to stand until a very high per-
cent of lactic acid has developed, is then added and heated
to 180 degrees F. Then another precipitation of the whey
will take place. This is the albumen, which is much like the
white of an egg and is in solution until precipitated by the
so-called "sour" and heat, which is then separated from the
so-called precipitated whey and allowed to cool. This whey is then used for the home made rennet and is called a precipitated whey rennet. This rennet when prepared contains a higher per cent of lactic acid and is found to be much purer than the common whey rennet. It also has a good influence on the fermentation process as it produces a more uniform distribution of eyes or holes in cheese, while in the use of a common whey rennet with its ingredients there is a danger of developing abnormal fermentation, and its appliance to the manufacture of cheese very often causes too many and irregular holes also gassy fermentation.

In the precipitated whey rennet again is the danger that during the process of developing the rennet only a lactic acid is developed and is therefore on the same order as a starter, and in many cases where a trifle too much of the liquid is used it destroys the characteristic fermentation of the cheese and turns into a "Glaesler" cheese.

I am, therefore, of the opinion that if the milk patrons of a cheese factory of not more than about 3,500 lbs. of milk a day, could manage to put up a milk house and milk cooling system, then hold their night's milk until morning and deliver it in separate cans for the manufacture of Swiss cheese a commercial rennet extract of uniform strength could be used and the danger of manufacturing a "Glaesler" cheese could be avoided.

The purpose of the common and the precipitated whey rennet is in my opinion only guess work so long as we do not know the required per cent of ripeness of the milk and the amount of rennet to be used accordingly.

An experiment under the authority of the Wisconsin Experiment Station along these lines and under practical conditions in Green County would in my opinion produce valuable information.

---

**DISCUSSION.**

The President: Any questions you would like to ask? We will take up the discussion of brick cheese making first.

Mr. Doane: I would like to ask what particular influence the temperature of the curing room has on either brick or Limburger cheese, whether that temperature be high or low?
Mr. Haskins: I think if we are curing American cheese we aim to get the temperature as low as we can and in brick cheese we also want the temperature as low as we can conveniently have it because I believe it produces cheese of better texture, it does not cure out so fast. The lower you can get the temperature and the slower you cure American cheese the better it will be, and I think the same condition applies to Brick cheese. We also get less shrinkage.

The President: Any questions on the making of Swiss cheese?

Gov. Hoard: I want to ask if the process of excessive stirring does not throw off a great deal of excess moisture, because it is throwing off excess fat?

Mr. Marty: I have had an opportunity of experimenting along that line while engaged with the Wisconsin Dairy School in the breaking down of the fine curd particles in the process of making Swiss cheese. I might also add the rough-age of handling that particular curd is largely the cause of the large per cent of fat expelled from the casein during the process. Dr. Babcock on this same point claims with a number of milks of different per cents of fat, some are expelled from casein through the misuse of the curd; that may apply to American cheese makers as well as to Swiss cheese makers, by so handling of that particular curd, and furthermore due to temperatures, that there are soluble and insoluble fats in milk, while some fats are not subject to that particular heat, other fats are and as you increase the temperature a certain kind of fat, which I am not able to name, will expel from the casein because of the excess high tempera-ture.

Mr. G. Marty: Is it possible to make good Swiss cheese without this extensive stirring of the curd?

Mr. F. Marty: It is hardly possible for the reason that the fermentation of Swiss cheese is of such delicate nature that the Swiss cheese maker scarcely knows where he is at. In Swiss cheese we must keep the little curd particles sepa-rate, entirely separate, not as we often find in American cheese vats, especially when the cheese maker is trying to get a large yield, where you can reach into the vat and pick out a chunk of curd like a bunch of grapes altogether. In Swiss cheese we insist that every little curd particle must be
by itself, form by itself, and one of the most essential points
that we insist on is having a copper kettle and keeping the
curd in continuous motion.

Gov. Hoard: Swiss cheese is more like a skim cheese be-
cause a portion of the fat is taken out of it?

Mr. F. Marty: Analysis of Swiss cheese shows that it has
on an average 32% butter fat. We take out a good deal but
that amount remains.

Gov. Hoard: Then how does that square with the fact
of your losing so much butter fat?

Mr. F. Marty: Perhaps we have less moisture, it is a
firmer cheese, it is more compact, there is more goods there in
the same space. We have less yield in Swiss cheese than in
Cheddar cheese and that may account for the per cent of
butter fat.

Mr. Doane: That question of fat, I think, has some con-
nection with the question raised in Mr. Marty's paper when
he refers to glass. I think Mr. Marty said if the acid was
allowed to develop a little more strongly in settling the curd it
might prevent this. Where do you get your authority for
this statement, Mr. Marty?

Mr. F. Marty: The reason is this. There is a particular
acid (I am not a chemist and cannot tell you the name of the
acid) but that acid is the first chemical reaction and forms
and develops the holes in Swiss cheese, largely due to the
fermentation of the milk sugar. In connection with that it
is due to lactic acid. A great deal of the milk manufactured
into Swiss cheese either contains insufficient lactic acid to
produce that proper fermentation in the cheese, or the cheese
makers insist on using home made rennet, not using the com-
mercial rennet extract, so that they neglect to add a certain
amount of lactic acid to help along that fermentation.

Gov. Hoard: The holes are due to the expansion of the
gas evolved from fermentation?

Mr. F. Marty: I presume I am not answering Professor
Doane's question in regard to fat?

Mr. Doane: What I am trying to get at is whether the
butter fat in the cheese has any effect on whether the cheese
may be glass or anything else.

Mr. Marty: Swiss cheese, we will say, with an excess
amount of butter fat or made from milk with a very high per cent
of butter fat, would have more of a tendency to develop into glass cheese than that with a lower per cent of butter fat.

Mr. Doane: There is another question in regard to the loss of the butter fat in the whey. It is commonly believed that an excess of butter fat is the cause of glass cheese. It is claimed that you cannot make a perfect Swiss cheese with too high a percentage of fat; I believe Jensen says you can make a perfect Swiss cheese with milk containing as high as 4% fat but he does not believe you can make it with milk containing a much higher per cent. I might say right here that I am conducting experiments in Swiss cheese now. We have made Swiss cheese and lose only three-tenths per cent fat in the whey and we followed out practically all the rules and regulations laid down by expert Swiss cheese makers except that we cut our curd with a curd knife and we got a much more even cut, losing very little fat in the whey, but I am a little bit afraid how those cheese will turn out, we are afraid we are going to get glass cheese.

Mr. F. Marty: I say that a great many experiments carried on should be carried on right out in the field where cheese are manufactured. In our territory we find the highest per cent of glass cheese manufactured is in the month of June and July, when any dairyman knows the per cent of butter fat in milk is the lowest, therefore it cannot be due to the high per cent of fat in the milk. It proves that there is another cause. It proves that it is either due to some insufficient ripeness in the milk, which must be the main factor in the milk to have the influence on the fermentation of those eyes or holes.

Mr. Doane: On the other hand, if you are going to have ripe milk you would have it in July if at any time of the year.

Mr. F. Marty: As I said in my paper, the largest per cent of the glass cheese manufactured is made from the morning's milk. You understand that in our territory milk is delivered very early, not later than seven o'clock under any condition and lots of it is delivered from five to six. During June and July, during the harvest time, a great deal of the milk comes before six before the warm sun has had any influence on the milk.
Member: Do you make cheese twice a day, and what time do you get through in the forenoon?

Mr. F. Marty: About 11 o'clock in the morning. At night it is 11 and 12 and sometimes 1 o'clock in the morning before we are through.

The President: What do you do the rest of the day?

Mr. F. Marty: There is no man busier than a Swiss cheese maker, that is the reason that 99% of the Swiss cheese makers are Swiss. One man is doing two men's work.

Gov. Hoard: When do they sleep, Mr. Marty?

Mr. F. Marty: They sleep from 12 to 5 in the morning. As I said, our cheese is a cheese subject to curing, same as brick and Limburger, and it must be washed, turned and salted every other day. Where they make four a day you can see that a man has as much as a couple of tons of cheese on his hands every day between the two makings.

Member: How much do you pay your cheese makers?

Mr. F. Marty: They are paid by the hundred, a certain amount per hundred.

The President: Why do you make your cheese so large?

Mr. Marty: Well our Swiss cheese makers are quite muscular, to begin with, and they would rather put a little more muscle to one large load than to handle the thing twice. Another reason is that we find the fermentation of a large bodied cheese is more uniform than in a smaller one. For instance, a block cheese sometimes has too much rind and the peculiar characteristic of the Swiss cheese, the development of the eyes cannot go on.

Member: Do I understand he says Swiss cheese in his county is more glass in June and July? I am from Dodge County and have made Swiss cheese for fifteen years, as long as we could make it, but now we cannot make it, and we had our trouble in that respect in September and October.

Mr. F. Marty: During that time perhaps your curing room did not contain the proper temperature to get the cheese started in the fermentation process. The temperature in the curing room is a great factor and it requires skill to cure this cheese. It is something we cannot tell a man how to do, he has to get accustomed to that particular sound he must know when he touches the cheese what it is doing. Some cheese have a tendency to develop faster than cheese
made from milk more normal, and such cheese ought to go into a different place. Swiss cheese are at the mercy of the surrounding temperature. If we had three different curing rooms, which all the leading Swiss cheese factories in Europe have, regulated by different temperatures it would be the proper thing; then if one cheese was slower in developing we could have a temperature in one room ten or fifteen degrees higher and put that cheese there; if one was coming faster put in where the temperature was lower and thereby control the fermentation. We have not gone far enough yet so the cheese maker has any control over the fermentation process because the cheese is at the mercy of the temperature.

Member: I believe the finest cheese we have is in May, June and the first week in July, but later on we have trouble.

Mr. F. Marty: I would like to say that some three years ago I brought up this particular point about glass cheese at a convention held here in Milwaukee and I hoped then that some possible means would be brought about on this very particular point, and that some experiments could be carried on under practical field conditions. I do not say the experiment could not be carried out at an experiment station, but there you have not the conditions we have in regard to milk in Green County. Milk delivered ten or fifteen miles is of a different character than that delivered immediately from the cows.

Member: The longest distance I get milk is two and a half miles but I think the trouble is because we make cheese all the year round. We started seven years ago to have the cows coming fresh all the year round, so we have the old strippers and the fresh milk, and they do not make good Swiss cheese at all.

Mr. F. Marty: That is all very true, the stripper milk will not act right with the rennet.

The President: This closes the program this morning, and we will now stand adjourned until two o'clock this afternoon.