The Chairman announced the following committees:

*On Resolutions:*—R. C. Green of Albion, Wis.; John Luchsinger, Monroe, Wis.; Fred Bender, Boaz, Wis.

*On Legislation:*—A. D. DeLand, Sheboygan, Wis.; M. McKinnon, Sheboygan Falls, Wis.; E. L. Aderhold, Neenah, Wis.

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**PREPARATION AND PROPAGATION OF THE PURE COMMERCIAL CULTURE.**

W. A. AUSTIN, SPRING GREEN, WIS.

Upon the successful preparation, propagation and practical application of the Pure Commercial Culture, depends in a large measure the flavor and general character of the cheese. The greatest success will be obtained by a very close observance of minute details all through the life of the starter. Care, caution, and cleanliness should be the watchword in all work applied to the starter. Every pail, can, dipper or agitator, in fact all utensils used should be thoroughly washed and sterilized each time before using, to prevent any outside contamination, and used only in connection with a starter.

The “startoline” can be prepared in the following way: In the morning select two quarts of the best milk you can obtain, fresh morning’s milk is preferable. A tin pail containing the two quarts of selected milk is placed in boiling water and stirred frequently for at least one hour. At the end of the time remove the pail and place it in a tub or tank of cold water and cool rapidly with frequent stirring until the temperature is reduced to 80 degrees, F. When cooled, keep the pail well covered. The contents of a small package of “Lactic Ferment” is then added and thoroughly stirred into the pasteurized milk, as soon as the temperature is below 100 degrees F.

The pail is kept in the water at 80 degrees F., and at that temperature it remains until the next morning, when the milk should be moderately thickened.

If it is desirable to have forty pounds of starter, take that
quantity of clean, fresh morning's milk and heat it to 180 or 190 degrees F. by setting the starter in boiling water. It should be kept at this temperature for at least forty minutes. It is then cooled as rapidly as possible to about 65 degrees F. The milk should be stirred very frequently during the heating and cooling process—stirring in heating, to prevent as much as possible the scorching of the milk on the inside walls of the can, and in cooling, to aid in a more rapid and even decrease of temperature.

When the time for cooling the heated milk has arrived, the "startoline" should be inspected, and if it is still in a liquid form, set it in warm water at about 90 degrees. This will cause it to thicken in a short time.

When the forty pounds of pasteurized milk is cooled to the desired temperature, which is approximately 65 degrees F., the "startoline" is stirred until liquified and of a nice, smooth, creamy appearance, and the proper amount or percentage, which should be about 3 or 4 per cent. in the first propagation, is then added and thoroughly stirred in. This preparation is kept at this temperature (which is approximately 65 degrees F.) until the next morning when it should be just thickened and ready for use.

Each evening a small quantity of this preparation should be reserved in a suitable sterilized vessel and tightly covered. This reserved portion should be cooled and held at about 60 degrees F. until the next day, when it should be properly thickened, when ready for use. This in its turn, constitutes startoline.

It is desirable to have both the "startoline" and starter moderately thickened or lobbered, because it is then supposed to be of an approximately known acidity; this is not, however, an infallible rule, as the coagulating point of the starter may vary considerably, due largely to peculiar local conditions. If an acid test is made, the starter should not exceed .6 per cent. acidity. It is absolutely essential that the acidity should not go beyond this stage, as the starter will be apt to get sharp or slightly rancid, which will not only injure it individually, but will impair its vitality for propagation purposes, as it is a well known fact, a high per cent. of lactic acid will act as an antiseptic, and thus injure the acid producing bacteria.

The exact percentage of "startoline" to be used in the pas-
teurized milk cannot in all cases be given. The same amount does not always appear to serve the desired purpose with all milks, but evidence has shown that the proper amount of startoline will vary from 1 to 4 per cent. of quantity of starter used.

It is well to note that for the first week the lactic acid producing bacteria grow more vigorously with each succeeding generation, and that less startoline will be needed with each propagation, and it may be desirable to lower the ripening temperature of the pasteurized milk.

It is better to remove an inch or two from the top portion of the starter before breaking it up, as there is apt to be some undesirable germs on the top portion, which have gained access to the starter can.

The starter, when stirred, should break up quite readily and appear like smooth, ripe, rich cream when ready for the churn, with a clean, mild, sour or tart flavor that will be pleasing to the taste and sense of smell.

After the starter has acquired its full vigor, it can usually be set at the same temperature and hour each day, and by using the same per cent. of startoline, can be relied upon to be in proper condition at the time of using.

At the first signs of its failing vitality, or as soon as the starter does not ripen to the desired point in the usual time, providing the temperature and other conditions are normal, a new culture should be secured and be built up, as experience has taught, that, when it becomes necessary to raise the temperature four or five degrees in order to have a starter ripen in a given time, that in a few days at most, the starter will be off in flavor and unfit for use.

Should your starter show signs of being slightly coagulated or thickened several hours before wanted for use, its temperature should be lowered to 40 or 45 degrees, as quickly as possible, by placing the starter can in ice-water. Care should be taken not to disturb or break up before using.

The proper percentage of starter to use in cheese making, is that which will give the best results in the quality of the cheese, and usually will not vary far from 1 per cent.
DISCUSSION.

Mr. Dewhurst: How long can you keep your starter without deterioration?

Mr. Austin: That varies somewhat upon what care is exercised in cleanliness and perfect pasteurization and so on. We have been able to carry them several months, while other makers have lost them in a very short time.

Mr. Dewhurst: Would you put .6 per cent. as the highest possible limit? Don't you think you could run it to .7 without danger?

Mr. Austin: It is barely possible, but whenever you reach that acidity, you are approaching the danger line. I am not a bacteriologist, but I presume that acid producing bacteria are about as strong and active at the coagulating point as anywhere.

Mr. McKinnon: What do you mean by the danger line?

Mr. Austin: The lactic acid producing bacteria have developed a certain amount of lactic acid; at that point this production of acid seems to cease and putrefactive bacteria then begin to get in their work. If you run your starter too far, it is apt to develop a sharp flavor.

Mr. Van Leeuwen: Do you use that starter every day in the summer time?

Mr. Austin: Well, yes, we aim to use a small amount at least every day. We aim to reject any milk that comes in too ripe for use, and to use a small amount of starter.

Mr. Van Leeuwen: What is the condition of your milk provided you would set it when it arrives at the factory, how long would it be before you would be able to draw off the whey with one-quarter of an inch of acid on the curd, if you did not use any starter?

Mr. Austin: I couldn't answer that, because we have always used a starter, a small amount of it. We always add our starter to the vat so that the starter is already in before we receive the milk.

Mr. Clark: If your milk has reached a certain ripeness, and your starter contains .6 of one per cent. of acid, won't you get uniform results each day?
Mr. Austin: Why, it should be nearly so.

Mr. Noyes: Can't you manipulate your curds so that you can bring them uniformly every day?

Mr. Austin: I think so.

Mr. Van Leeuwen: I believe you can do that just as well if your starter contains .5 of acidity one day and .7 another day, if you govern the amount of starter that you add accordingly. For instance, you have a vat of milk that shows you a Marshall Rennet test of 4 spaces. It is too sweet for setting. We have tested our starter and we find that it contains only .4 of one per cent. of acidity. So we use more of that starter than if it contained .6, and we will get uniformity just the same.

Mr. Austin: We must have some general rules or principles to go by, and we use .6 per cent., terming it the danger line, so as not to run our starter beyond that point, because there is danger that our starter will become too sharp.

Mr. Wallace: Don't you see what your starter is before making your rennet test?

Mr. Austin: Yes.

Mr. Wallace: Then you would know the exact percentage of starter to use.

Mr. Austin: No, I don't know as we would. We would be governed by the way our curd has been working. We have to govern that the same as you would ripen your vat, and with your rennet test you don't know when you start out the first day in a strange factory how you want to ripen that milk in order to have the required amount of acidity at a given time. Of course, the starter is not a cure for everything in cheese making.

Mr. Van Leeuwen: How long do you aim to have your milk set before the whey is ready to draw, and with what acidity do you draw?

Mr. Austin: That depends somewhat on conditions, too. In most of the vats in the factories where I have been in the last two years, we have self-heater vats and we run about two and a quarter or two and a half hours, but where we have steam, we run them to two hours and reach about the same results. Most of the self-heater vats, I find, we are not able to fire up fast enough.

A Member: Is it not a common practice where they use commercial starters to use 5 per cent.?
Mr. Austin: I think not. Where I was this summer, we used from a half to one per cent., and we found it sufficient. We had enough starter so that half an hour or twenty minutes after our milk was in the vat, it was sufficiently ripened and ready to set. We do not use the starter to hurry the process in order to get done early in the day. We just want to use enough starter to bring it to a desired point at the desired time, we don’t hurry to get through so that we may go to the baseball game, we want our cheese made first, and we don’t propose to allow our cheese makers to use an unsafe amount of starter in order to hasten the manufacture.

Mr. McKinnon: This question grows more important year by year. The gentleman we had from Canada last year was in favor of using a very little starter. The speaker today is in favor of using considerable, and using it all the time. These gentlemen from Canada use just what they believe is absolutely necessary, and they have made a good deal of a study of it, too.

Mr. Austin: I don’t know where Mr. McKinnon got the idea that we use an excessive amount. I said one per cent., and under all conditions we should use just the right amount.

Mr. Wallace: Did those Canadian speakers say that the Canadians brought milk already started?

Mr. Austin: I think not.

Mr. Wallace: I think they did claim that they hauled their milk from great distances, and it came in partly ripe.

Mr. Austin: The point we wish to make is, that we think we can do better than with the average starter that the farmer brings to us.

The Chairman: It amounts to this, that the starter places the milk under your control, and it is your judgment that makes the cheese, and I guess they do that in Canada, too.

Mr. Armitage: It is evident that this starter does not have the same effect with all kinds of milk. I have been using it three years and a half and I have a neighbor close to me who uses it, and he can set his milk at 6 spaces on the Marshall Rennet Test and I can set mine at 4 spaces, and his whey is ready to run before mine.

Mr. Austin: There may be a slight difference in your rennet test. We found last year that when we can set about 40 to
50 or 60 seconds with the Monrad Rennet Test, we can't use the other rennet test under 90.

Mr. Armitage: I don't take any milk but what I can use with my regular amount of starter. If it comes in over-ripe, we send it home.

Mr. Austin: There are times in the year that we do not use anywhere near the amount of starter that we do at others, but we always use some. If we use it one day and then destroy it we are three or four days without a starter.

Mr. Clark: Mr. Armitage said that he and his neighbor changed starters and he could not see that it made any difference. Now, I would like to know if they ever changed their apparatus for taking the Marshall Rennet Test.

Mr. Armitage: We did not, but I took a needle and tested the size of the hole in the glass plug of my test and then took it to his factory and found that the two were exactly the same size. The marks on the sides were exactly the same.

Mr. Austin: I have been working in thirty or forty factories this last season and we never could ripen them to the same point. I know of three factories within three quarters of a mile of each other, and they all have different figures for using the Marshall Rennet Test.

Mr. Noyes: I think Mr. Austin defined this starter business nicely. The starter that he uses, one per cent., is moderate, and I believe the average maker is using about 3 per cent. There is one point that ought to be understood so that cheese makers will not abuse the starter. There are so many cheese makers who claim that they cannot use the commercial starter, and it is simply because they abuse it. No one can make nice cheese with rancid starters, and if you do not know how to make and take care of a good starter, go to some good maker and have him teach you how to make it, because if you will use a pure starter, you will have good cheese. I have seen boys use 5 per cent. starters and then have sweet curds. You cannot be governed by fixing it at one per cent. or two or three per cent., you have to be governed by what milk you have to use, and when you find a man who is capable of using a starter intelligently, you will usually find a good cheese maker. I think that the people of whom Mr. McKinnon speaks—the speakers of last year—under some circumstances, would have to use a ten per cent. starter.
Mr. Austin: Where they have to use a 5 per cent. starter, I think the milk was adulterated with formalin or something else.

Mr. Noyes: No, not at all; I know it was not.

Mr. Austin: In cases where I have known a 5 per cent. being used, the milk was adulterated.

Mr. Johnson: When do you save your startoline?

Mr. Austin: We save it the evening before. That is, we add the startoline to our pasteurized milk, and after it has been thoroughly stirred in, the startoline for the next day should be taken out, put into a proper vessel and cooled down, so that the next day it is just at the thickening point. We take it out before it is thickened, of course.

Mr. Wallace: Do you put water in the milk before pasteurizing?

Mr. Austin: I never had any experience diluting the milk with water.

Mr. Wallace: Do you add your starter in the morning when you first take your milk in?

Mr. Austin: That is a pretty blunt question again. That depends on conditions. We always tell our makers if it has been a pretty warm night to put the starter back. They must use their judgment in using a starter, use just the right amount.

Mr. Wallace: In the morning when I get in two or three messes of milk, I find I would rather have too small an amount of starter than too large. Some of our cheese makers turn live steam into the milk to heat it. Is that a good plan?

Mr. Austin: We think not. It may be in some cases; it would not make much difference if the boiler is perfectly clean but there are apt to be germs get in that way.

A Member: I have a practice of setting mine in deep water and turning the steam on; of course it is quicker to turn the steam in.

Mr. Austin: I would prefer submerging the can in boiling hot water.

Mr. Van Leeuwen: I want to ask Mr. Austin or somebody else if the milk arrives at the great majority of Wisconsin cheese factories in such a condition that they can use a starter? In many places the milk is so ripe that the whey will draw in one
and a half hours with a quarter of an inch acidity. Now, could you use any starter in that milk?

Mr. Austin: We have had such experiences this summer at one factory where we wished to use the starter on account of their having undesirable flavors. In that case we had them cool the milk down as soon as it was milked, to reduce the temperature. Of course it must come sweet and if they reduce the temperature, very little lactic acid bacteria will be developed. We think it could be adjusted so that there could always be a small amount of starter used. We found in this particular case that as soon as we made them cool their milk and be very careful we could use the starter and the cheese was better and we were bothered with less gas.

Mr. McKinnon: I judge by the remarks of the speaker that he has considerable experience and is not confined to one factory, perhaps to a number of factories. The more factories he has had under his supervision, the greater amount of good he can do in this organization. Now, up in our section of the country some of us are using starters. I know quite a number of us are getting quite a lot of acidy cheese; I don't know how far these starters are responsible for this. We have been told by buyers, some of us, that our cheese was a little acidy. I knew it already myself. A buyer went around with me and tried four or five others besides mine, and they were all short, showed the acid. This buyer used a little profane language and said that the cheese showed too much acid. Now, I don't know how far the starter is responsible for this. I believe in the starter myself, but I know that cheese makers want considerable instruction. I believe the cheese can be worked in such a manner that there is no need of their being acidy; I believe that the right kind of starter will add to the flavor of the cheese, but I wish there was some way so that we could get these cheese makers to make cheese that, when they are shipped into Sheboygan or Fond du Lac, or wherever they are shipped, that the cheese buyer won't have occasion to use profane language.

The Chairman: Will you define what you mean by an acidy cheese as distinguished from a sour cheese? Some people get mixed on those two terms.

Mr. McKinnon: I do not claim to be an expert, but what I call an acidy cheese is one that when you draw a plug, it draws
rough and the curds break altogether too soon. The cheese makers like to have a plug that will bend quite a ways before breaking off short when you turn it over a little bit. I don’t know what sour cheese is, although I have had some of it. What we used to call sour cheese way back in the ’60s was a cheese that when you got it onto the shelf it would start to leak whey.

The Chairman: Sour cheese are made out of sour milk and you can have an acidy cheese made out of milk that you can hold several hours. Sour cheese is made out of milk so sour that you cannot control it, but acidy cheese you may get out of perfectly sweet milk. Now, Mr. Austin, what causes acidy cheese?

Mr. Austin: It is an excessive amount of lactic acid. This is a little bit out of my line, but you get too much acid before you get your cook, you develop too much acid in the whey.

The Chairman: That is, you don’t get cook enough for your acid.

Mr. Austin: Either way. You get firmness before you have the proper amount of acid.

Mr. McKinnon: Too much moisture in the curd.

Mr. Austin: I think so. That is, you have a curd that is a little bit moist and perhaps it worked pretty fast and it got just a little bit too much acid. I want to say that in starting makers in on using the starter, we think it is better to use the minimum amount than the maximum, and start them in gradually.

A Member: I have my doubts about sour cheese coming because there is too much acid in the milk. The question is not how much acid you have got in your curd, but how much of the whey and the acid you leave in the cheese. Now, you can press out all the whey and it wouldn’t be sour; in fact, it is not the caseine that would be sour; it is the whey which is mixed in with the caseine that would be sour. That is my idea, and I have had some experience in cheese making from the old country. It is a question of getting out the whey before we get in the cook. Now, about the starter. Last summer I used practically one-half of one per cent. starter, and my milk worked as fast as I could follow it. This winter, in December, I used at least 5 per cent. starter, and yet had to wait until it got ready, and even then I was more liable to have the curd too sweet.
When I have sweet milk and the curd is sweet, I am likely to have sweet flavored cheese. If I have plenty of acid in my milk, and cook all right, the cheese is apt to come out all right.

ECONOMY IN MARKETING CHEESE

H. J. BAMFORD, PLYMOUTH, WIS.

Mr. President, Ladies and Gentlemen: The topic assigned me is "Economy in the Marketing of Cheese." This is an important subject, but yet in these days of cheese boards, immense home trade consumption and improved transportation facilities it is not burdened with the difficulties and discouragements that the cheese manufacturers had to meet in the early years of the industry. Some of us can remember when it was a "joy and delight" to see a cheese buyer drive up to the factory.

To market your cheese in the most economical manner you should look carefully after the various details. We will assume that the cheese are properly made; but before they are cured and ready for shipment the boxes should be at your factory and thoroughly dry. Cheese boxed in wet, unseasoned boxes often reach the buyer in a mouldy and unsightly condition with the probability of loss to the shipper.

SECURE STRONG AND SIGHTLY BOXES.

See that you have a good scale with which to weigh your cheese and then give good, full weights. Many cheese are weighed on old defective scales that are not fit for any such work.

After your cheese are in the boxes cut the edge of the box down even, or a little below the cheese so that the cover will rest on the cheese. By so doing the cheese will reach their destination in much better condition. We have seen cheese that were well made arrive in a puffed and swollen condition when shipped in hot weather, owing to the fact that the boxes had