in taking samples, I did not get any milk above 60, and he was getting a very fine article of cheese.

The Chairman: Where is that factory?

Mr. Carswell: In Marathon county. It was near Marathon City.

The Chairman: The farther you go up in the woods of northern Wisconsin, the better they do things in cheese factories, the better factories they have there, they are newer, on the average.

CHEESE FROM PASTEURIZED MILK.

J. H. Monrad, New York City, N. Y.

Editorial Staff, New York Produce Review and American Creamery.

Mr. President and Fellow Members: It is hardly necessary for me to say that I am pleased to be with you again. "Fools rush in where angels fear to tread" and hence I have ventured on a path, which is as yet unformed and where the quagmire of ignorance may provide pitfalls for the unwary.

We have with us Professor Carson who can tell us of his personal experience and I shall therefore only give a short review of my second hand knowledge of making cheese from pasteurized milk.

If I am not mistaken, the first practical attempts in making cheese from pasteurized milk, were made by D. H. Burrell of Little Falls, N. Y., in 1890. The milk was boiled in order to coagulate the albumen before adding the rennet, but it was found that even a double quantity of rennet would not coagulate the milk. To overcome this difficulty Mr. J. D. Frederiksen of The Hansen Laboratory suggested the adding of a starter to the boiled milk in order to restore its coagulability and I understand that a process along this line has been patented in 1902.

While the scientists notably Professors Dudaux, Friedenreich, Weigman, Adametz, Russell, and others have for years been studying the action of bacteria in cheese ripening, it was not until after Dr. Storch had practically demonstrated the
value of pure cultures in ripening cream that had been pasteurized, that the question of making cheese from pasteurized milk, ripened with a pure culture, was taken up and practical experiments made, and it was not until about 1896 or thereabouts, that D. J. Olsen first announced as practical the making of cheese from pasteurized milk with special pure cultures, for the various kinds of cheese, and suggested the establishing of laboratories for their preparation.

Meanwhile experiments were also made in Germany by Professors Hamilton, Tiemann, Klein, and others and experiments reported from Prosken in 1897 indicated that the addition of chlor calcium was desirable to get highest yield. Dr. Klein recommended for every 200 lbs. of milk the use of 125 cc. chlor calcium solution of a strength so that 100 cc. contained 40 gramm CaCl₂ with a specific gravity of 1.3 at 15° C. This experience covered “Brick” cheese from separator skim milk and “Rernndon” cheese from whole milk and he claimed an increased yield of 30% ripened cheese!

In 1902 the Chr. Hansen’s Laboratory of Copenhagen, Denmark and Little Falls, N. Y., introduced the Olsen cheese yeasts and process into Denmark where experiments on a large scale were made at a great expense, and on my recent visit to that country I found that the Hansen’s Laboratory had turned over the further experimentation to the government experiment laboratory and Prof. Storch informed me that buttermilk had proven to give fully as good results as the Olsen yeasts. This was confirmed on my visit to the Gisleo creamery, where I found the work to be as follows. The skim milk is heated to 189 dgs. F. and cooled to 93 dgs. F. and enriched by the addition of 3% pasteurized cream (which corresponds to 24% new milk). To this is added 5% buttermilk from culture ripened pasteurized cream.

Six and a half ounces Hansen’s Rennet Extract per 100 lbs. was added and the milk coagulated in 30 minutes. It was cut with a wide, horizontal curdknife (with wires instead of knives), and then with a vertical one, first lengthwise and then crosswise. It was then left for 10 minutes when 50 lbs. of whey was dipped off, heated to about 180 degrees and returned to the vat while stirring, and this slow process of heating was repeated seven times until, after 1½ hours, the curd had been heated to 104 degrees F. when the whey was drawn off. The curd seemed normal in every way and of the right springiness, rather finer but more than usually uniform in size. Twenty minutes later
the curd was salted and put to press, where it remained about 18 hours and was then put in a brine bath for 24 hours.

There is an upper and lower curing room. In the upper the temperature is about 61 degrees and in the lower about 54 degrees. The cheese remain in the upper room about 2 months and are turned and washed every day. In the cellar they are only attended to once a week. The moisture is aimed to be held at about 90%.

When, later, I sampled the cheese from some comparative experiments, I found those from pasteurized milk a little cleaner flavored and with an apparently better keeping quality, though the difference was but small. I got no figures as to the increased yield, but may quote Mr. Frederickson as claiming an increase of 10% for whole milk and 5% for skimmed milk. If even an increase of five per cent (not water) can be obtained, it ought to pay for the expense of pasteurization which should not be so very great if the regenerative system is used; and the increased uniformity and keeping quality in the product should be of some value. Finally I must refer to the Canadian experiments made at St. Hyacinthe Dairy School in 1898 where the cheese turned out good and those reported by Prof. Haen of Guelph in 1900 proving the value of chloride of lime in making the cheese normal yet he did not commit himself to an endorsement of the system for factory use on account of its complication and labor and time. Take it all in all, I have modified my views somewhat and believe in the possible future of the system and hence I hope to see our Experiment Stations arrange for practical tests on a large scale in some cheese factories. Meanwhile I trust Profs. Carson and Baer will let us hear from them on the subject.

DISCUSSION.

Mr. Carson: It seems to me that Mr. Monrad has pretty nearly "let the cat out of the bag." We have been doing some experimental work along the line of pasteurizing milk, and I was in hopes we would be able to spring a bulletin on you before very long on this line of work. However, it is all right

*The Danish Creamery Operators' Association has engaged a special instructor in the making of cheese from pasteurized milk.
and I will give you in outline the work we have been doing in investigating this matter.

Now, we use a continuous pasteurizer; the milk is exposed for about four or five minutes in that pasteurizer to a temperature—whatever temperature you like,—I have tried 140, 150, 160 and 170 degrees. The milk is cooled down again almost immediately, cooled down to about the temperature of 86 degrees or below. As soon as we get it below setting temperature we are satisfied. You understand when milk is pasteurized you destroy the lactic acid germs as well as the other germs, therefore you must add a starter, or else your whey will remain on too long and you cannot get first class cheese; therefore, I was compelled to use a starter. In some cases I had to use as high as five per cent.; in other cases as high as ten per cent starter in order to get the same amount of acid on the milk as there was before it was pasteurized. Now, you understand I had a vat of milk unpasteurized and a vat of milk that was pasteurized, and the two were made up exactly alike. There was one thing in connection with the setting that I wish to mention and that was that the milk that was pasteurized and then starter added to it, would coagulate in half the time that the milk that was not pasteurized would, having the same amount of acid, as determined by the acidimeter, and I was sure that I had the same amount of acidity because my whey stayed on the same length of time, so there was no mistake in that respect. Now, cheese was made up and then scored two or three times. Part of them are now in Mr. Barber's hands, and we have not received the score from him yet, but the other scores have been as follows: Cheese made from pasteurized milk in some cases shows a score of 5 points over the cheese made from milk that was not pasteurized, so that is sufficiently encouraging to say that we should adopt pasteurization. Now, I want you to remember that while this is the result of our experiments, I do not want this to go out as official, because we intend to repeat this experiment, and we want to make sure of what we are doing before I make any official statements. But this has been shown so far. I might also add that in some cases I selected the very worst milk I could get hold of, I selected milk that before it was pasteurized you could smell it all over the building. When this milk went through and was pasteurized, the cheese from that pasteurized milk scored 3 or 4 points higher than that from milk that was not pasteurized, and the score has been all the way from 92 to 98 points.
Mr. Helm: Have you had any experience in leeky flavor in pasteurizing, have you done any pasteurizing in connection with that?

Mr. Carson: No, I have not, I did not happen to get hold of any.

Mr. Monrad: As to leeky milk, pasteurization for butter-making has helped it, did not cure it. A little leeky flavor can be eliminated by pasteurization; but it is so very strong that you cannot eliminate it entirely. I want to ask Mr. Carson whether he approves of my suggestion, whether according to the experiments that you have made you do not agree with me that it would be well to carry out this experiment on a larger scale in a cheese factory under usual conditions?

Mr. Carson: I certainly do approve of your statements and I believe that we get the conditions right at the creamery as nearly as you find them in any factory, because we were getting milk from 130 patrons and I think we get the average from what is taken in at the factory. There is another thing I want to add. I believe pasteurization can be applied to sour milk and milk that really tastes sour can be brought back to the condition in which you can make very good cheese out of it and I am quite enthusiastic over this pasteurization and I believe the time will some when every factory will apply it to cheesemaking as well as buttermaking.

Mr. Carswell: What kind of cheese?

Mr. Carson: All makes of cheese.

Mr. Carswell: I want to say in regard to pasteurizing sour milk that we had a little experience, while we were pasteurizing for brick cheese, we found that a milk that was overripe we had to be very careful with at the start; that being at a temperature of 120 or 130 or 135, we had to rush the heat very fast if the milk was pretty ripe, that we would have to rush it very fast, for in one case we lost a vat of milk, it thickened on us before we reached the temperature of 150.

Mr. Monrad: You heated it in a common vat?

Mr. Carswell: Yes, to be sure, to pasteurize it, we had to use the vats we had. We heated the milk in a common vat and cooled it with spring water; it took until three o’clock in the afternoon to get it cooled back, but it was a case where we had to do that or lose the milk. We were making brick cheese and it was very gassy and the cheese were practically unsalable, they were so extremely gassy. But that corrected the trouble. Mr. Marty asked me a question as to whether it left any flavor.
Now, you all know that brick cheese has such a beautiful aroma that it would naturally cover perhaps any such flavor. We had no experience with cheddar cheese, it was on brick cheese alone.

Mr. Monrad: We have now pasteurizers that will pasteurize 10,000 pounds of milk an hour, so that there is nothing to prevent it practically from being carried out. And I want to make another statement. I had the pleasure of a visit from Dr. Weigmann, from Germany just a few weeks ago, and we discussed this question, and I rather chaffed him a little bit about the bacteriologists pretending to be able to get these species of bacteria for each kind of cheese, referring to Olsen, and he said, "Well, never mind, Monrad, I believe surely the time will come when we will have laboratories where we will present you with bacteria for Swiss cheese, bacteria for limburger cheese, and for all the kinds of cheese in the market." I just throw it out as a bacteriologist's prediction. Personally, I think that the best bacteriologists we have will not get really good milk and use sour lap; the other is all good for manufacture, but is pasteurized to make sure, but if we have good milk we cannot improve on it in the laboratory. It is not as uniform, I grant that.

Mr. Noyes: I would like to ask what the difference was in the curing of the cheese made from pasteurized milk and the other, which cured the best, and if they were cured both in the same room and at the same temperature?

Mr. Carson: There was no difference whatever; everything was carried on under the same conditions as to the curing, but we found that the cheese from the pasteurized milk tended to grow pasty after they were made up, when they were cured at a low temperature. I think we can overcome that by heating to a higher temperature.

Mr. Michels: What effect has pasteurization upon the yield of the cheese, if any?

Mr. Carson: I believe that pasteurization will tend to decrease the yield while we are pasteurizing the milk. Pasteurizing has a tendency to knock out a certain amount of the fat, and I found that in many cases, so that if the milk was very ripe, I would find a lot of fat wasted. Now then, after the milk is pasteurized, you will get a better yield from pasteurized milk than from the unpasteurized milk, but I have not determined yet whether the gain in quantity after pasteurizing will overcome the loss in fat or not.
Mr. Monrad: That question of yield comes up in my paper, and there I have given the experiment by Mr. Burrill in boiling this milk, and the experience was that it increased the yield considerably. At the time they made the failure that was the trouble, they got too much moisture and could not get rid of it. Now, in Germany they have on brick cheese increased the yield 30 per cent according to report, using this chlor calcium, but the last experiments made by the Hansen laboratory, I think Mr. Patterson told me that the increase could be figured at from 5 to 10 per cent, and not in water you understand, but in albumen, which is working the same thing as casein, by incorporating the whole albumen. Of course more moisture comes in in proportion, but the increase certainly is enough to pay for the expense; that 5 per cent will pay for the cost of heating the milk and cooling it.

Mr. Marty: What are the appliances for pasteurizing milk for manufacturing brick cheese? Do you think it will have any tendency to destroy the granule in developing holes in the Swiss cheese?

Mr. Monrad: I do not remember seeing anything about Swiss cheese; besides, you get mighty near pasteurizing it anyhow in your manufacture when you cook to 140 you are mighty near there; but I have never heard of any experiments in that line.

Mr. Noyes: I am glad Mr. Monrad brought out the happy thought that he preferred milk just as it comes from the cow if it can be so obtained and manufactured without all this great machinery, without all this special work. It seems to me if we could begin right at the root and have pure milk, keep it there and manufacture it there, there is where it ought to be, it would save all this great machinery and racking of brains of professors all over the world, if we could only just get pure milk right from the cow.

Mr. Monrad: I don't know whether Friend Noyes was at Sparta, where I read a paper on pasteurization. After I was done, Prof. Farrington got up and made virtually the same remark as Friend Noyes, and my reply was this, as it is now, that I agree with Friend Noyes, that when the time comes that all patrons are angels, then absolutely it is better not to pasteurize, but pending that time, I believe that pasteurization will do for cheese making what it has done for butter making. But do not misunderstand me, we must be sure not to rely on pasteurization as a doctor for all evils, because if we do that we will justify the remark that was made in our Minnesota meeting
when it was said that pasteurization was the doctor, somebody said that the cream that they got in the Iowa Centralized Creamery did not need a doctor, they needed an undertaker.

A Member: It was stated that the cheese from pasteurized milk scored several points higher than that from unpasteurized milk, I refer to this syndicating milk; I would like to ask whether the unpasteurized milk was the same quality as the pasteurized.

Mr. Carson: Yes, the milk was all put in a large vat first and was thoroughly mixed, then there was sufficient for that not to be pasteurized taken out, and then the remainder was pasteurized.

The Chairman: How about salting?

Mr. Carson: We have to use a little bit more salt in the pasteurized milk, because pasteurization tends to make a softer cheese, and tends to make more yield, and that is why we got pasty cheese, or tended to get pasty cheese, because there was more moisture, and therefore we had to use salt to take up that moisture, but by bringing it up to a high temperature we can overcome that fault.

Mr. Carswell: I would like to ask whether the cheese that was made from the unpasteurized milk was considered an average cheese?

Mr. Carson: Some of it was considered average and some of it was considered a great deal worse. Some of it was milk that never should be taken into a factory or a creamery at all.

Mr. Michels: I would like to ask Prof. Carson what the effect would be, or what rennet test you used, what acidity did you give to the milk? Did you make any difference in the acidity of the pasteurized or unpasteurized?

Mr. Carson: I used the acidimeter; I did not use the rennet test; the acidimeter showed exactly the same amount of acidity—it shows the per cent of acidity. I used sufficient starter to bring them exactly to the same amount of acidity, so that the whey remained on exactly the same time, three hours in both cases, so that there was the same amount of acidity in both.

Mr. Radloff: You said you used about 5 or 10 per cent starter; was that new milk starter? Did you figure that starter in when you got more yield? I mean, did not your starter make cheese too?

Mr. Carson: I had to figure that point to get pretty nearly the exact amount of starter to use, and I was able to use sufficient starter to bring it to an acid.
Mr. Monrad: Would you figure in the starter milk in the amount of milk that you used for cheese?
Mr. Carson: Oh, yes.
Mr. Monrad: You added that to your gross weight?
Mr. Carson: You have to figure that in, certainly.
Mr. Michels: Did you use any starter in the unpasteurized milk?
Mr. Carson: No, in very few cases I used starter in the unpasteurized, because the milk was generally overripe before I started, but I have a couple of experiments where the starter was used in the unpasteurized also, but that would be in the case of very good milk, you know.
Mr. Johnston: I would like to know, if he would be able to use a starter in unpasteurized milk, what result would he expect to have? Would he have any better results in scoring the cheese?
Mr. Carson: The purpose of using a starter is to overcome some undesirable fermentation that you have in the milk and a bad flavor. If the whey would stay on three hours, I would use probably no other additions, if the flavor were all right; if, on the other hand, it had so much acidity that the whey would not stay on more than two hours, and I had a very bad flavor, I would put in from one to two per cent starter, and I believe a good starter will overcome very many bad flavors, but you want to make sure it is a good starter.
Mr. Johnston: If you used a starter for your pasteurized milk and none for your unpasteurized milk you used no starter at all, do you think that was a fair test? Don’t you think you should have your milk so that you could use a certain per cent of starter, say, 50 per cent?
Mr. Carson: No, I do not think so.
The Chairman: Did you have any difficulty in getting sweet milk delivered?
Mr. Carson: Yes, we do.
The Chairman: You are right close to the Dairy and Food Commission there.
Prof. Emery: The Dairy and Food Commissioner is willing to co-operate with the dairy school in that matter.
The Chairman: Haven’t you any men in the dairy school that are able to instruct those patrons?
Mr. Carson: We should have, and I have made a practice this summer to go out and visit the patrons and instruct them. I went out this fall just before the dairy school started; I
wanted to get something pretty good before the students came in, and I found out of ninety patrons that I visited there were only ten of them that dumped their milk out before three o'clock.

Prof. Emery: I want to say one thing, that during the summer the Dairy and Food Commission undertook to make an examination of city milk supplies in a number of cities in the state and we intended to make that very thorough, which we did, the report to be published is now in the state printer's hands. We began at Madison; it was said that it was the hottest day in the year that we made these tests. We had the chemist who supervised the laboratory prepare for the various forms of preservatives, we kept it for the public vat here for watering and skimming, and then we used the Wisconsin curd test to determine the quality of the milk, and as a rule the results were excellent, but Madison, as a city stood at the foot of the ladder in the quality of milks furnished as determined by that examination.

Mr. Carson: Before leaving, I would like to announce that any cheesemaker who is willing to co-operate with me, in working out this question of pasteurization I shall be glad to have them speak to me or send their names in, because it is something that we want to bring out, and if they will co-operate with me, I will give them my assistance and go to their factory and do the work with them, as well as carry on the work at the experiment station.

Mr. Helm: If you use a smaller amount of starter and give it time to ripen before setting, would that overcome the tendency to pasty cheese made from pasteurized milk?

Mr. Carson: No, you understand all the whey was on three hours, I would not like the whey on longer than that, because the longer you hold it on, the more tendency there is for the curd to become pasty. My object in the experiment was to get the same amount of acidity. There was another question in connection with it, and that is the fact that pasteurized milk will coagulate in half the time with the same amount of rennet as will unpasteurized milk.

Mr. Helm: But by holding the curd longer in the whey, as you say I believe it would tend to firm the curd more and tend to overcome that pastiness.

Mr. Carson: You mean so as to ripen it? So that you could still run the whey off in two and one half or three hours after setting, ripen it before setting?

Mr. Helm: Well, you can do that all right, but if your whey is not on more than two and one half hours, there is not sufficient
time to get the curd sufficiently cooked and your cheese may get pasty.

Mr. Radloff: I would like to ask Mr. Monrad if the Madison laboratory could not get out a starter that would be large enough so that any cheesemaker or buttermaker would not have to work it or make a larger starter of it; just have a commercial starter, say that large (indicating). You put that in the milk and then go ahead with your work, is not that practical?

The Chairman: Have it boiled down, you mean?

Mr. Radloff: Yes.

Mr. Monrad: I do not think that is practical until we cooperate a little more and the state owns the railroads and express companies; then we might have a chance of sending a full amount of starter ready for use. Until then I think the expense will be so large that the express companies would get the whole profits.

Mr. Radloff: I mean, could not they make it stronger in smaller quantities?

Mr. Monrad: No, I do not believe so, I am not a bacteriologist, so I will not answer that, but I do not believe they will stand much boiling down.

Mr. Carswell: I would like to ask Professor Carson if he infers that in all cases he is not able to get a “cook” without leaving the whey on three hours?

Mr. Carson: No, I do not believe you could get a curd properly cooked through and through, leaving the whey on less than three hours, unless you adopt a much higher cooking temperature. If you do that, you will either have to cool your curd down again, or else your curd is going to be hard.

Mr. Carswell: What temperature do you cook at?

Mr. Carson: I cook according to the percentage of fat. If my milk is about 3.5 fat I cook 97 to 98; if 4.5, 101 to 103.

Mr. Carswell: You do not believe in a higher temperature?

Mr. Carson: I have never adopted a higher temperature than 103 or 104, except in case I had sour milk that I had to make cheese out of, then I employed a higher temperature.

Mr. Carswell: I know that a great many cheesemakers in the state, some of whom are having the best success, are adopting the system of cooking high, cooking at 105 or 106, and that is why I asked these questions.

The Chairman: We are getting a little off the subject.

Mr. Carson: They are bound to ripen the milk down lower, that is their only remedy, to cook higher.
Mr. Michels: Does pasteurized milk not coagulate without a starter?

Mr. Carson: It certainly will coagulate without a starter, but you understand the fermentation of the milk is due to lactic acid germs. If you pasteurize the milk you destroy the lactic acid germs. If you did not put in the starter, you would have to wait until the next day.

Mr. Michels: Why does buttermilk not coagulate readily, heating it up to 150 degrees?

Mr. Carson: Well, milk will coagulate all right when it is run through the continuous pasteurizer. The reason that pasteurization has not been carried out before this is because they thought the lime salts in the milk were destroyed by pasteurization.

Mr. Michels: To investigate that subject at the state fair I made a test for a week and I happened to get hold of a can of pasteurized milk and I could not coagulate it. I put in four ounces of rennet per 1,000 and it would not coagulate, I put in four more and the last time put in ten more and let it stand hours and hours and it was still in about the same condition.

Mr. Carson: If you heat your milk up to 200 it will not coagulate. Probably you had used an intermittent pasteurizer?

Mr. Michels: I could not say as to that. The pasteurized milk was shipped in.

Mr. Carson: It all depends on how that milk was pasteurized. You understand, the milk is not exposed long enough in the continuous pasteurizer to destroy the lime salts, but in the intermittent, where it is held for twenty minutes, it will not coagulate.

Mr. Michels: I think the milk was pasteurized at the dairy school.

Mr. Carson: Well, the continuous pasteurizer does not pasteurize sufficiently to destroy the lime salts, but it destroys the flavor.

Mr. Monrad: Do you use more rennet?

Mr. Carson: No, it does not require the use of any more rennet.

Mr. Monrad: The experiments in Denmark showed conclusively that the best result was obtained by using nearly double the amount of rennet.

The Chairman: Mr. Carson contends it will coagulate in half the time that the raw milk did with the same amount of rennet. There is a difference in pasteurization, evidently in
the length of time that it was exposed to the high temperature.

Mr. Monrad: We use 185°F.

The Chairman: In what length of time?

Mr. Monrad: Oh, in a continuous pasteurizer, but I do not think you used as high a temperature as 185°F.

Mr. Carson: No, I did not dare to go to 185°F., because I was afraid the milk would not coagulate.

Mr. Marty: What was the ripeness of the milk when set?

Mr. Carson: Two tenths per cent of acid.

Mr. Marty: What was Mr. Monrad's?

Mr. Monrad: I could not tell you.

Mr. Marty: There may be a variation there.

Mr. Carswell: When we were making brick cheese from pasteurized milk we never had any trouble from coagulation, only that it required more rennet. We pasteurized at 155°F.

Mr. Carson: This point I brought up about milk coagulating in half the time, it is contrary to nature, and I have asked Dr. Russell and Dr. Babcock the reason for it and they are unable to explain it, but it has happened with me in every case that I have made up pasteurized milk, that it coagulated in half the time with the same amount of rennet.

Mr. Berg: I would like to ask Mr. Carson if the acid developed as fast in the pasteurized curd after it is dipped as it did in the unpasteurized.

Mr. Carson: There was one thing I noticed, that the acid did not seem to come out in the pasteurized milk so quickly at first, but once it did start to come on, it came on very rapidly, but it would have the same amount of acid, provided it had the same amount of acid at setting.

Mr. Chairman: He speaks of after dipping.

Mr. Carson: Oh, after dipping, it seemed to come on just about the same, providing I stir my curds, but there is a danger after you pasteurize your milk, you cannot get the curd to stir, and there may be more moisture left on it.

The Chairman: Mr. Monrad knows a great deal more, and you can get it out of him by asking questions.

Mr. Monrad: No, it is all secondhand goods I am giving you. But I want to say, I think we have had a profitable discussion and I think we have aroused an interest in this question. I am glad to see that Professor Carson offers to co-operate. We need more co-operation and we need co-operation not only between the cheesemaker and the patrons, but also between the schools and factories. I believe if there is any one in this audi-
ence that would like to experiment, that some of these manufacturers will be willing to loan the apparatus so that it would not cost you a cent, because it would be to their interest individually. If we were making pasteurizing machinery, I would be glad to lend a machine in order to get the chance of selling several hundred machines, so that if the experiment can be carried out without any great expense, I believe even possibly the state might be induced in some way to pay a guarantee against any special loss by the experiment. It would be well if that could be done, but if not, I know there are cheesemakers here that will be willing to lose a little money in order to have experiments made.

The Chairman: We have had a very lively and interesting session, and that is the way it is going to be throughout the rest of the convention. They have been talking about educating farmers and making angels of them, now tomorrow morning we are going to discuss the question of how to nail wings on the shoulderblades of those farmers that we could not make angels of by education. We are adjourned until nine o'clock tomorrow morning.