competition are rather overdrawn, according to the opinion of those who should be qualified to judge, it can do no harm for Canadian dairymen to be apprised of the sentiment and rumors current in the British trade.—Editor.]

DAIRYING IN WISCONSIN.

(Continued.)

Part II.

COW'S MILK—SOME OF ITS CHEMICAL AND PHYSICAL PROPERTIES.

During recent years considerable has been heard about the bad effects of rusty cans upon milk contained in them. All the dairy instructors report a very marked improvement in recent years with reference to the purchase and use of good clean, bright tin milk cans. In our own experience we have found it difficult to get good milk cans. We have tried various firms who have been recommended to us as having a reputation for turning out cans of superior quality. The first lot of cans we ordered would probably be very good, but there has usually been a marked falling off in quality afterwards. Sometimes cans for which we paid an exceptionally good price have leaked the first time they were used. I know of no part of dairy utensils which is more in need of renovating and improving than is the tinware branch. So much shoddy material is now sold that it is very difficult to know when a good article is purchased. From a comparison between tinware as sold in Europe and America, we are free to say that the latter is decidedly inferior. Tinning on copper, we believe to be the solution of the trouble. If copper be so cheap as is now reported, it would seem to be a good time for some enterprising firm to put out a line of good tinned-copper milk vessels, and see how the trade would take to them. We are inclined to think that users of such milk vessels will not readily go back to the old tinned-iron vessels which are now so common, and which so soon become rusty.

All this leads up to a reference to the "Influence of Metals on the Action of Rennet," as reported in the 24th annual report of the Wisconsin Experiment Station. The writer points out that, for cheddar cheesemaking, a short period of coagulation is desirable; the time should not be allowed to exceed 20 to 30 minutes. This is a very important point to be observed in cheesemaking. Anything which unduly delays the coagulation of the milk means loss of fat and other cheesemaking material.

In the experiments made, it was noted that milk in nickel-plated copper vessels required 40 minutes to coagulate; in copper and nickel, 35 minutes; tin and iron, 23 minutes, and glass, 20 minutes. In experiments with rusty pans, it was noticed that the milk in the rusty pan gave evidence of a retarding influence on the rennet action, compared with that in the glass. Wherever there has been a retarding influence on the rennet action, there has also been a retardation of the acid development as well. Milk is frequently hauled to creameries and cheese factories in poorly-tinned or rusty cans. The question may be raised, What effect, if any, have such cans upon the milk delivered to the factory? We know from the above data that nickel, copper, iron, rusty pans, etc., have a strong prejudicial effect upon rennet action. Glass produces an accelerating influence upon rennet action. If the price of rennet keeps on advancing, it may be economy to use glass cheese vats, in the light of the foregoing. What would be lost in first cost might soon be saved in the cost of rennet. Who can tell? Illustrations of rusty cans are given. The comment on a wagon-load of cans, which was photographed, and reproduced in the report, is: "Nearly all of these cans are unfit, and should be rejected." The comment on another lot is: "Cans like the three to the right would injure the milk for cheesemaking." We are pleased that these photos were taken in Wisconsin, and not in Ontario. Further comments are: "Milk kept over night in cans of this kind, when treated with rennet, would require from three to forty minutes longer to coagulate than milk kept in good ones. The reason for a slow or retarded action of rennet, which cheesemakers have often experienced, possibly may be attributed to the acid action upon iron in cans of the above type, and not entirely to the amount of salts present in the milks, as was formerly supposed."

SHRINKAGE AND COMPOSITION OF CHEESE FOUR YEARS OLD.

Some experimental cheese were kept at the Station for four years. The shrinkage on cheese weighing 18 to 25 pounds when new, was 18.5, 15.1 and 17.3 per cent., respectively, for cheese made from milk containing 3, 4 and 5 per cent. fat. The following percentage composition of the cheese is of interest:

CHEESE MADE FROM MILK CONTAINING:

	3 % Fat.	4 % Fat.	5 % Fat.
Water	29.97	28.78	28.52
Protein	31.25	27.38	24.50
Fat	31.67	38.49	42.39
Ash	4.03	4.28	4.12

The comment on this table, showing composition of cheese four years old, is: "As the cheese increases in richness (presumably fat), the water, protein and ash decrease."

That the percentages of moisture in these cheese are not abnormally low is indicated by the fact that two samples sent to us recently tested 23.6 and 29.6 per cent. water. The regular cheese at the College runs about 33 to 34 per cent. moisture when one month old.

SALTY MILK.

Some farmers are frequently troubled with "salty milk." This trouble usually appears when the cows are advanced in lactation. The sample reported on contained 9.52 per cent. total solids and 2.16 per cent. fat. All the solids except ash were low; especially is this true of the fat and portein contents.

HUMAN MILK.

Nineteen samples of milk obtained from the wives of professional men were analyzed. In all cases the infants were reported as not doing well. The analyses showed a great variation in the fat content, 1.26 to 7.8 per cent. The average of the 19 samples showed 87.72 per cent. water, 3.69 per cent. fat, 1.44 per cent. protein, 6.9 per cent. sugar, and .25 per cent. ash. As compared with cow's milk, the samples were low in protein (muscle-forming constituents), high in sugar, and low in ash.

THE CHEMISTRY OF MILK CURDLING.

This is a very difficult subject. Little is known as yet about the question. Every person is familiar with the curdling of milk by rennet and acids, but few, if any, understand it. Cheesemakers see the phenomenon every day; none can explain it. Why and how do rennet and acids curdle milk? The writer refers to the opinion that milk curd is a compound of casein in definite proportions with lactic acid or other acid in curdling milk. The most recent researches have shown that the proportion of acid to casein in curd is not fixed, but varies with the kind of acid, the concentration, temperature, and physcial condition of the curd.

The experiments upon which conclusions are based are of a most elaborate nature. The significance of the facts detailed is to prove that all of the constituents of milk, and not the acids alone, take part in the chemical reaction known as curdling. The whole milk serum is thus regarded as a chemical compound. The elevation of curdling temperature produced by adding one per cent. or less of salt to overripe milk may find useful application in pasteurization or separation of cream or other operation where occasionally overripe milk must be heated.

Casein in milk is under the chemical influence of every other milk constituent, and it may be truly said to be chemically combined with every constituent by attractions of greater or less intensity.

The foregoing extracts will give readers an idea of the scientific nature of the investigations. They are doubtless leading up to a satisfactory explanation of many difficulties at present little understood.

AUTOMATIC CHEESE PRESS.

As a result of experiments, it was found that about 48 pounds per square inch on the end of the cheese is sufficient to close any curd, even if firm, provided that it has been properly handled before pressing. We were ready to exclaim, "Now, there will be no more complaints about 'open' cheese!" but that "provided" clause seems to put us just about where we were before. The press illustrated appears to be an ordinary gang press, having a large pulley, with rope and weight attached in such a way that it gives continuous pressure.

BACTERIA IN MACHINE MILK VS. HAND.

The conclusion from somewhat limited studies of machine milk is stated as follows: "The data, while not large, are sufficient to show that, under such conditions as obtained in these trials, with reference to cleanliness of machine and other utensils, the condition of animals, and the amount of dust in the barn air, the use of the milking machine will produce milk with as low germ content, or even lower than that drawn by hand." We are pleased at this testimony from so reliable a source.

CELLS IN MILK.

This is a most interesting study of milk. We should like to quote largely, but space forbids. In a word, it was found that apparently normal and perfectly safe milk may contain quite a large number of cells; that the number of these cells appears greater in milk of older animals, and that the authors consider the presence of large numbers of leucocytes (white blood corpuscles) are suggestive, rather than final. The conclusions are tentative, based on individual samples, and are not to be regarded as applying to herd milks."

H. H. D.

EASTERN DAIRY SCHOOL, KINGSTON, ONT.

SOME VALUABLE EXPERIMENTAL AND INVESTIGATION WORK.

Although the main object of our institution, as its name implies, is to afford cheese and butter makers an opportunity to obtain a thorough training in the various branches of dairying and allied subjects, such as Bacteriology and Chemistry, yet we have found time, in addition, to do more or less experimental and investigation work. As most of the problems bear upon dairying in a practical way, we would briefly summarize some of the work done, and the results obtained.

NEW CREAM BOTTLE FOR BABCOCK TEST.

During the past year we brought out a modified form of cream-test bottle. The trouble with the old style of cream bottle, which is graduated for reading for 18 grams, is that by the time that 18 grams of cream are taken and a little water and the necessary amount of sulphuric acid added, the bowl of the bottle is so full that there is no room for shaking the bottle and properly mixing the contents; and, furthermore, a sufficient quantity of water cannot be added to insure against charred readings. The new style of bottle devised by us, while it has the same size of bowl as the old, has a smaller neck, graduated to read per cent. of fat for 9 instead of 18 grams. Its advantages are obvious. One can take 9 grams of cream and add 9 c. c. of water and the usual amount of acid, and still leave plenty of room for readily mixing the contents, while the large amount of water added prevents the sample from charring—two decided advantages.

MOISTURE TEST.

For a long time practical dairymen have felt the necessity for a practical moisture test. Mr. W. O. Walker, of the School of Mining, and Lecturer on Dairy Chemistry in our School, and the writer, made a thorough and exhaustive investigation of this subject, and examined the different tests in use, and decided that each lacked, in one respect or another, the essentials of a practical moisture test for curd, cheese and butter. A test, to be practical, must be reasonably accurate, rapid, simple, and inexpensive to operate, easy to clean, durable, easily and cheaply kept in repair, and moderate in price. They undertook to devise such a test, and feel that they have succeeded in doing so. As a full description and cut of it will appear in bulletin form, it will suffice, at present, to say that it is reliable and speedy, easy to conduct, can be conducted at a small cost, and is equally satisfactory for determining the moisture in curd, cheese and butter, while the apparatus is practically all metal, and hence very durable.

THE MAKING OF BUTTER FROM WHEY.

During the session just closed, we made a study of the making of butter from whey, and although we are not prepared to speak finally upon the subject, we feel that we gleaned some information that will prove of interest.

On different occasions we ran our separators with a view to determing the fuel cost of elevating and separating the whey. Water was used for this purpose, as it has practically the same constituency as whey. Each test extended over a period of three hours. We ran the engine to pump the water from the separators, and used steam-turbine separators. The amount of water in the boiler, the steam pressure and the fire were left practically the same at the close as at the beginning of the test. Soft coal slack, at $4.00 per ton, was used for fuel. The cost of elevating the water and running the separators was about 2¼ cents per 1,000 pounds. Taking three pounds of butter as an average yield per 1,000 pounds of whey, the cost per pound of butter for this portion of the work would be ¾c. We are strongly of the opinion that, were an ejector used, instead of a pump, for elevating the whey, the cost would exceed this somewhat.

During the session we conducted a number of experiments in the making of butter from whey. While it was usually of good quality when first made, it did not prove to be possessed of good keeping qualities. It readily deteriorated in flavor. Of course, the milk, and frequently the whey, was old, and this may have had much to do with the keeping quality of the butter. However, it suggests the necessity for a thorough investigation of the whole subject, and this we purpose doing during the season of 1968, under regular factory conditions. It would be wisdom on the part of factorymen to await these results.

Another thing we learned during our experiments was that, by increasing the speed of the separator slightly, you can separate—and separate efficiently—fully 60 per cent. more of whey than the machine is rated to separate of milk; that is, a machine with a rated capacity of 3,000 pounds will readily separate 5,000 pounds of whey. Of course, this calls for a cover with a larger inlet tube.

MAKING OF CHEESE FROM RICH AND POOR MILK.

During the session just closed, we were afforded