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Editorials

The opinions and ideas expressed in papers and editorials are those of the respective authors. The expressions of the Association are completely recorded in its transactions.

The 1944 Annual Meeting

THE May–June number of the JOURNAL carried a brief notice to the effect that the 1944 Annual Meeting of the Association will be held at the LaSalle Hotel, Chicago, on November second, third, and fourth. A slightly earlier date would have been preferable, but facilities were not available.

The Association did not hold a meeting in 1943, in conformity with a request by the Office of Defense Transportation. Reflecting upon no other organizations which held meetings during 1943, and which will meet in 1944, it appears that a meeting of this Association, after an interval of two years, is now justifiable. Milk sanitarians have achieved noteworthy results, under serious handicaps, during the interval since the last Meeting; but we are not gathering for mutual congratulation. Conditions within the dairy industry are changing rapidly, and these changes present problems in milk sanitation. Furthermore, we are on the threshold of developments of greater magnitude and import than is generally realized. It is the obligation of every member of the Association to learn as much as possible about these anticipated developments, and to prepare himself to take advantage of them, or to oppose and resist them, as the case may be.

Q.E.D. Participation in the 1944 Annual Meeting of the Association is essential to progressive milk sanitation in your community!

From a strictly Association point of view, it is also desirable that the attendance at the Meeting be large and representative. A number of matters and questions affecting the entire membership rather profoundly are scheduled for discussion and appropriate action.

An outline—necessarily somewhat incomplete at this writing—of the program appears elsewhere in this number of the JOURNAL, as do a schedule of hotel rates, and a map of the business district—the Loop—of Chicago. Those who plan to attend the Meeting—and those who are as yet uncertain, but hope to—should write at once to the hotel of their choice for reservations. No group trips, nor banquet and entertainment, are being scheduled; but any member who wishes to visit a specific place during the course of the Meeting may write the President, and arrangements, including transportation, will be made.

The program is meaty, and discussions are certain to be lively. Plan to participate in making this a memorable Meeting. C. A. A.

Expanding Health Programs

ORIGINALLY, health programs were instituted by communities as a defense measure against communicable disease. The mysterious causes of illness were fought with quarantine and disinfection, and later additionally with vaccination. The disease vehicles were miasmas, sewer gas, muddy water, "dampness," "dirt," and in some strange manner, the changes of the seasons. Protective measures were enforced by inspectors, armed with the police power of the communities.

As research revealed more and more the specific causes of disease, health officers could direct their protective measures more effectively. So, new techniques of inspection were developed, requiring an increasing amount of knowledge by the enforcing agents. On and on came newer knowledge and correspondingly newer methods. Nowadays, the inspector has to be more or less professionally trained in order to understand the principles of the techniques that he must use. This training is becoming increasingly technical.

In recent years, we have been recognizing more and more clearly that an enormous aid to the health program has been neglected. This is the public's interest in matters of health. Health workers recognize two prongs, so to speak, of this great potentiality, namely: the public at large and the industrial food handlers. For some years, the teaching of health in the public schools has been showing good results. More recently, efforts have been directed to securing the interest and coöperation of food handlers in commercial establishments. An increasing number of cities is instituting formal courses for food handlers. These are usually conducted on an in-service basis (teaching while employed) although some communities are requiring operators of pasteurizing plants to show that they have been specially trained before employment.

These food-handler courses seem to be following no very definite pattern—except brevity. Oh yes, each one gives the coveted certificate stating that the recipient has taken such and such a course—technically trained, by gorra! We note that one large city gives a course of two lecture-demonstrations with tendency to reduce this to one. Others run as long as several sessions. There seems to be a tendency to make their informative content cover general sanitation as well as food handling itself.

Some of the states and several universities and colleges are now offering short courses in limited fields of sanitary supervision. New York is taking the lead again by providing an Institute of Food Technology, particularly set up for returning service men. We guess that many an employee of food plants will patronize it.

All of this activity in teaching food handling is certainly accomplishing two things: it is indoctrinating the personnel and management with the idea that the public health to a large degree is in their hands, and it is building up a technological consciousness in industry that later may be expected to demand food engineering. When this infant reaches adulthood and secures recognition by the professional and industrial mighty, then the food industry will be developed to a somewhat similar degree that has made our chemical industry so outstanding. Such technical growth insures improved products at lower costs. Heaven knows that we need this in the food industry.

J. H. S.

A New Modification of the Frost Little Plate for the Detection of Heat Resistant Bacteria in Milk*

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ARMY contracts and milk ordinances contain an item specifying the maximum allowable bacteria count of milk. The reason for this is obvious, since a healthy cow's milk, that is handled in sanitized utensils and properly cooled and stored, has a low bacteria count. Any deviation from this permits either the entrance of bacteria to milk or the growth of those that are present. In each case a high bacteria count of the milk results.

The majority of the bacteria, in nature, that may find their way into milk are readily destroyed during the pasteurization of milk. On the other hand, milk may become contaminated on the farm or in the pasteurizing plant with bacteria that are heat resistant. The heat resistant bacteria may be thermoduric—be able to survive pasteurization but not able to grow at that temperature, or thermophilic—be able to survive and grow at pasteurization temperature. The presence of excessive numbers of heat resistant bacteria results in a high bacteria count of the finished product and indicates a defect in the system of milk production or processing. In either case corrective efforts should be started. The need for a rapid yet accurate means of detecting the presence of heat resistant bacteria is obvious.

Laboratory pasteurization test for the detection of heat resistant bacteria

The only reliable method for detecting heat resistant bacteria in milk has been the laboratory pasteurization test. Briefly, this test consists in determining the bacteria counts before and after laboratory pasteurization. This technic is being used extensively and is an excellent means of tracing the origin of these organisms. The data of Table 1

TABLE 1

THE EFFECT OF CLEANING FARM DAIRY EQUIPMENT AS MEASURED BY THE LABORATORY PASTEURIZATION TEST

	Before Cleaning		
	Bacteria Count of Milk		
Producer	*Raw*	*Lab. Past.*	*Percent Reduction*
1	3,000,000	15,000	99.5
2	1,500,000	500,000	66
3	800,000	500,000	38
4	300,000	8,000	97.5
5	100,000	75,000	25
Composite	850,000	300,000	65
	After Cleaning		
1	70,000	500	99.3
2	10,000	300	97
3	45,000	100	97.8
4	30,000	450	98.2
5	15,000	80	99.5
Composite	50,000	280	99.5

show the poor bacteria count reduction on pasteurization of milk of three producers and demonstrate the detection of the producer's milk containing heat resistant bacteria. The milk of these producers is responsible for a high count of the composite pasteurized milk of one small dairy. This is typical of many data at hand. The beneficial results of a thorough cleaning of the dairy equipment on the farms are shown in the second part of the table.

The pasteurization test is very satisfactory for use in small dairies with few producers but it is not readily ap-

* Journal article No. 718 (n.s.) from the Michigan Agricultural Experiment Station.

plicable to dairies with many producers on account of the amount of equipment necessary for conducting the standard plate counts. To overcome this, Meyers and Pence (2) have developed a loop measurement and oval tube technic. The tubes or plates must be incubated for 48 hours before counting. This two-day delay in obtaining the results is an important drawback in correcting the trouble by eliminating the source of the heat resistant bacteria. A need therefore exists for a quick yet efficient cultural method for the detection of heat resistant bacteria in milk.

Frost little plate for determining the numbers of living bacteria in milk

In 1942 Bryan and coworkers (1) reported "The incubation of Frost little plates at 37° C. in a moist chamber for four hours yielded bacteria colony counts of milk and cream comparable to the standard plate count." Thus, a Frost little plate can be prepared from the raw and the laboratory pasteurized milk to locate the milk containing heat resistant bacteria within a period of a few hours. The technic of preparing the Frost little plate has been modified to permit the detection of heat resistant bacteria in milk with a minimum of equipment.

MODIFIED TECHNIC

Instead of discarding the tube containing the milk-agar mixture after making a little plate for the raw count it is placed into a water bath and held at pasteurizing temperature for 30 minutes, returned to the 50° C. water bath (to prevent solidification of the agar by cooling), and a second little plate is immediately prepared for the laboratory pasteurized count. This saves all of the time and equipment of preparing a second tube of milk-agar mixture after pasteurization. The bacteria counts of Table 2 are typical of many obtained upon the laboratory pasteurization of milk; they were obtained from the raw and pasteurized milk by

TABLE 2

A COMPARISON OF BACTERIA COUNTS OBTAINED BY MAKING STANDARD PLATE AND FROST LITTLE PLATE EXAMINATIONS OF MILK BEFORE AND AFTER LABORATORY PASTEURIZATION AND THE BACTERIA COUNT AFTER PASTEURIZATION OF THE MILK-AGAR MIXTURE OF THE MODIFIED FROST PLATE METHOD

Sample		*Bacteria per Ml. of Milk* *Raw*	*Lab. Past.*	*Percent Reduction*
		Heat Resistant Bacteria Present		
1	Standard plate	10,000,000	900,000	91
	Frost little plate	8,500,000	800,000	90.6
	Modified Frost	8,500,000	850,000	90
2	Standard plate	100,000	40,000	60
	Frost little plate	120,000	45,000	58.8
	Modified Frost	120,000	48,000	60
3	Standard plate	30,000	15,000	50
	Frost little plate	40,000	12,000	70
	Modified Frost	40,000	18,000	55
		Heat Resistant Bacteria Absent		
4	Standard plate	15,000,000	10,000	99.9
	Frost little plate	18,000,000	10,000	99.9
	Modified Frost	18,000,000	15,000	99.9
5	Standard plate	50,000	1,200	97.6
	Frost little plate	65,000	900	98.7
	Modified Frost	65,000	850	98.8
6	Standard plate	25,000	500	98
	Frost Little plate	30,000	450	98.9
	Modified Frost	30,000	600	98

the standard plate and Frost little plate methods, and compared with those obtained in the modified technic. As a result of the agreement of results these cultural methods can be used interchangeably for the detection of heat resistant bacteria in milk.

Further to check the comparison of the laboratory pasteurization test and the modified Frost technic, a series of 1375 milk samples was subjected to both examinations. The results that were obtained are presented in Table 3. The close agreement of the percentage of reduction in bacteria count as obtained by the two methods is an item of real practical value. That is, it allows the substitution of the modified Frost technic for the laboratory pasteurization test, thereby permitting the use of a culture method that requires very little agar and equipment, and yields results in a period of about *five hours* (incubation and time necessary for performing technic) instead of the 48 hours required for the plating and oval tube methods.

TABLE 3

A COMPARISON OF RESULTS OBTAINED UPON EXAMINATION OF 1,375 MILK SAMPLES FOR HEAT RESISTANT BACTERIA BY THE LABORATORY PASTEURIZATION TEST AND THE MODIFIED FROST METHOD

	Percent Reduction of Bacteria Count Upon Heating				
	0–25	*26–50*	*51–75*	*76–95*	*96–99*
Laboratory pasteurization test:					
Number of samples	200	100	125	350	600
Percentage of samples	14.5	7	9.5	25.5	43.5
Modified Frost method:					
Number of samples	188	110	112	360	605
Percentage of samples	13.5	8	8.5	26	44

THE MODIFIED FROST TECHNIC

1. Place a test tube rack, containing enough sterile tubes for the number of samples to be tested, into a water bath at 45 to 50° C.
2. Place 1.0 ml. of milk into a sterile test tube in the water bath. Do not allow more than 15 minutes between step 2 and completing step 4.
3. Add 1.0 ml. of sterile tryptone-glucose-extract agar, cooled to 50° C., into each tube in the water bath, and mix by shaking.
4. Using a sterile pipette place 0.1 ml. of the agar milk mixture onto a sterilized microscope slide (sterilized in the naked flame) and spread evenly over an area of 4 square centimeters with the tip of the pipette. (Two or three such films can be put on the ordinary microscope slide.) (See Fig. 1.)
5. Place the tube containing the milk-agar mixture into a water bath at pasteurizing temperature for ½ hour.
6. Remove to a 50° C. water bath and prepare a second little plate immediately (this will give the living bacteria count after pasteurization).

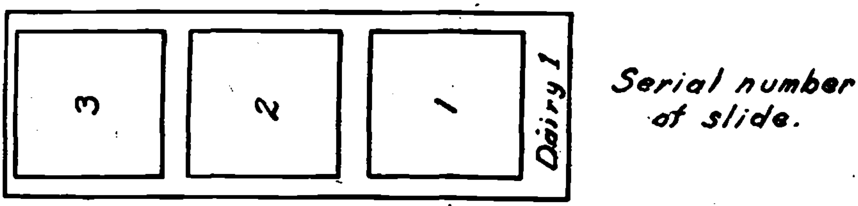

FIG. 1—*Guide for making Frost little plate. Transfer 0.1 ml. of the milk-medium mixture on to the slide and use the tip of the pipette to distribute evenly over the 4 sq. cm. area outlined.*

7. The little plate is allowed to harden and then placed into a moist chamber at 37° C. for a minimum of *four hours of incubation for milk and cream.* The incubation period may be extended to 24 hours without materially affecting the bacteria count. A moist chamber can be made out of any container with a tight-fitting cover by filling the container approximately ¾ full of water. A wire platform must be built above the level of the water to hold the slides during incubation. The proper temperature of bath is maintained by leaving the moist chamber in the 37° C. incubator at all times.)
8. After incubation the plates are dried over a flame, in an incubator, or in a drying oven at a temperature slightly under 100° C. (Agar should not melt; plates should be dried slowly to prevent cracking the medium.)
9. Stain for approximately 1 minute with a methylene blue solution. (To prepare, add 10 ml. of a saturated alcoholic solution to 90 ml. of 30 per cent alcohol.) This should stain the colonies deeply and leave a faint blue background.
10. Wash slides to remove excess stain, being careful not to wash the film off the slides. (Best results are obtained by allowing the water to strike the reverse side of slide—enough water will flow over the preparation to remove the excess stain.) Dry preparations.
11. Examine by using lower power (if few colonies), high dry power or oil immersion (if many colonies) to determine the average number of colonies per field (count *50 fields* when few colonies are present, and *10 fields* when many colonies are present) and note bacteria count by referring to Table 4.

SUMMARY

A rapid and accurate modification of the Frost plate technic is presented for determining the presence of heat resistant bacteria in milk. This is accomplished by pasteurizing the milk-agar mixture after a Frost little plate has been made and then making a second little plate for the pasteurized count.

The results of the modified Frost technic compared favorably with those of the pasteurization test upon examination of a series of 1375 milk samples. In addition, the final results were ready within five hours as compared to 48 hours in the laboratory pasteurization test.

LITERATURE CITED

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2. Meyers, R. P., and Pence, J. A. A Simplified Procedure for the Laboratory Examination of Raw Milk Supplies. *J. Milk Tech.,* 4, 18–25 (1941).

TABLE 4

FROST LITTLE PLATE COUNTS

(This table can be used with all microscopes having a factor of 300,000 in the direct microscopic counting of bacteria in milk)

Low Power Objective			*High Dry Objective*			*Oil Immersion Objective*		
Colonies	*Fields*	*Bacteria per cc.*	*Colonies*	*Fields*	*Bacteria per cc.*	*Colonies*	*Fields*	*Bacteria per cc.*
1	50	50	1	1.6	30,000	2	1	480,000
1	25	100	1	1	42,000	3	1	720,000
1	12.5	200	2	1	84,000	4	1	960,000
1	5	500	3	1	126,000	5	1	1,200,000
1	2.5	1,000	4	1	168,000	6	1	1,440,000
1	1	2,500	5	1	210,000	7	1	1,680,000
2	1	5,000	6	1	252,000	8	1	1,920,000
4	1	10,000	7	1	294,000	9	1	2,160,000
6	1	15,000	8	1	336,000	10	1	2,400,000
8	1	20,000	9	1	378,000	15	1	3,600,000
10	1	25,000	10	1	420,000	20	1	4,800,000

The Laboratory Control of Added Water to Milk

A Discussion of the Cryoscopic Method

M. A. Nussbaum

State Board of Health, Jackson, Mississippi

The increased demand for milk has prompted a few unscrupulous producers to add water to milk. Unfortunately, the routine milk control tests used in most public health laboratories are unable to detect this practice of adulteration. The usual milk control tests to detect adulteration, such as the Babcock tests for butterfat and lactometer readings for the specific gravity have been used in various formulae (i.e.,

$$\% \text{ added water} = 100 - \frac{\text{lactometer reading} - .8 \text{ of fat} \times 100)}{36}$$

to indicate the percentage of added water. This indirect method is unreliable and most often will not detect small amounts of added water. Also, it will not reveal adulteration by skimming and subsequent watering. On certain occasions a cow may give milk containing less than 8.0 per cent solids-not-fat; is the milk abnormal or watered? The analyst should resort to an accurate quantitative technique to answer that question; butter fat and total milk solids will not give sufficient information. Most mixed herds will yield a milk of which the butter fat and total solids values are above the standard requirements (i.e., 3.25 per cent and 11.25 per cent) and to variable extent (10 — 20 per cent) watering of the mixed milk can be tolerated without reducing butter fat and milk solids below the official figures.

However, there are approved quantitative techniques to determine watering. There are two official procedures for determining the quantity of added water, namely; by the use of an immersion refractometer to measure the refraction of the milk serum and by the use of the cryoscope to measure the freezing point of the milk. It was felt that a clarification of the standard and reliable cryoscopic method of testing for added water was needed to assist the many newcomers to the milk laboratory. This discussion is not intended to replace the official procedure as detailed in *Methods of Analysis* of the Association of Official Agricultural Chemists and the American Public Health Association's *Standard Methods of Milk Analysis;* its purpose is mainly to acquaint milk technicians with the principles and difficulties of the accurate determination of added water by this method.

The cryoscopic method for measuring added water to milk has been known for more than fifty years, but not until 1920 has an official agency in this country been concerned with this technique. In the early 1920's, a great deal of investigation [1] was carried out to standardize the appartus, procedures and interpretation of the freezing point determination of watered milk. The result of this work was the official approval by the Association of Official Agricultural Chemists of a standard procedure for the determination of added water to milk by the use of the Hortvet Cryoscope. With the improvement of milk quality in the past two decades, methods for measuring watering of milk fell into disuse. The dairy literature in American journals of the past five years has almost no references to watered milk and the cryoscopic technique. At the present time, the need for a reliable, simple method to determine added water has been emphasized by two factors; namely, the increase in watering induced by milk shortages, and secondly, by the increase in educational efforts to sell milk as a nearly perfect food. Any adulteration of a food will gradually bring that food into ill repute and thus vastly reduce its significance in a nutrition program.

PRINCIPLE OF METHOD

Normal whole milk, regardless of butter fat and solids content, has a constant freezing point which is defined as the temperature at which the liquid begins to crystallize out of solution. The freezing point of normal milk depends primarly upon the osmotic pressure of the secretions of the animal; this osmotic pressure is a constant value in milk.

If there is a deficiency in milk sugar, the metabolic processes of the animal causes an equivalent increase in another constituent, usually sodium chloride, which readjusts the osmotic pressure of the milk and raises this pressure to the normal level.

Freezing points of pure substances are definite single points on a temperature scale. However, milk is a colloidal suspension of solids in a liquid and its freezing point is not a single value. Early work on the freezing point of normal milk gave the range of — 0.529° C. to — 0.566° C. The point — 0.550° C. was accepted as the best expression of a single freezing point value and it is used in all calculations. Using this value, — 0.550° C., the cryoscopic method has a maximum error of 3 per cent. Should you determine the freezing point of the milk of a particular herd, the method can detect as little as 0.5 per cent added water to the milk.

As milk is diluted with water its freezing point approaches that of water and depressions less than 0.550° C. will be observed. The addition of water to milk raises the freezing point; the temperature at which the mixture of milk and added water begins to freeze is higher than for whole, unadulterated milk. This is a simple statement but is a source of much confusion for the beginner inasmuch as the freezing point values are on the negative side of the temperature scale and raising of the freezing point is exhibited by a reduction in the whole number. The following table gives the freezing points of a few milk and water mixtures:

Substance	*Freezing point*
Pure milk	—0.550
5% added water to milk	—0.552
10% added water to milk	—0.495
20% added water to milk	—0.440
Pure water	0.000

Thus the only measurement necessary to determine added water is to find the freezing point of the sample. To make a freezing point test, an instrument is required to produce first a freezing temperature, and secondly to measure accurately the exact value of the freezing point. The first requirement is accomplished by the evaporation of ether (forcing air through ether) and the second requirement by a special sensitive thermometer having a range of only 3° C. divided into hundredths of a degree and which can be estimated to the nearest 0.001 of a degree. This thermometer is similar to a standard reagent used in analytical chemistry; it should be carefully and frequently calibrated to check it against a known thermometer maintained in the Bureau of Standards.

STANDARDIZATION OF THERMOMETER

The Bureau of Standards Thermometer gives the following results:

Substance	*Freezing point*	*Freezing pt. depression* (S—W)
Water (±W)	+0.079	....
7% sucrose (—S)	—0.343	—0.422
10% sucrose (—S)	—0.542	—0.621

The laboratory test thermometers have been very carefully manufactured and calibrated. But they are not perfect instruments and will vary with age, room temperature, humidity, and other uncontrollable factors. Consequently, they must be repeatedly standardized by comparison with the Bureau of Standards thermometer. This standardization or calibration requires the determination of three freezing point values, namely, that of recently boiled distilled water, 7 per cent sucrose, and 10 per cent sucrose. The detailed methods of operation of the cryoscope are not given in this paper; but standard texts, such as *Standard Methods for the Examination of Dairy Products*, 8th edition, 1941, American Public Health Association, and the *Official and Tentative Methods of Official Agricultural Chemists,* 5th edition, 1940, give the exact procedure.

Any deviation of the test thermometer from the perfect (Bureau of Standards) thermometer is corrected by a factor obtained as follows:

sample of milk, using thermometer # 1:

Freezing point ° C. of boiled water + 0.056.

Freezing point depression ° C of 7 per cent sucrose 0.425.

Freezing point ° C. milk sample — 0.458.

Correction factor of thermometer # 1 1.015.

The freezing point depressions are the algebraic difference between the freezing points of the recently boiled distilled water and the sample of milk, and the algebraic difference between the freezing points of the water and the sucrose. The word depression implies degrees below the freezing point of water (0 ° C.). Consequently, it is always a negative value even though it is expressed without the negative sign. For example, the freezing point depression of the 7 per cent sucrose solution using thermometer # 1 is: — 0.369 — (0.056) = 0.425 ° C. The freezing point depression of the milk sample is — 0.458 — (0.056) = 0.514 ° C. To obtain the corrected freezing point depression of the milk sample, it is necessary to adjust this value to the Bureau of Standards thermometer, as given by the following procedures:

Freezing Point Values Recorded

Thermometer	*Water*	*Freezing Point Depressions ° C.* 7% Sucrose	10% Sucrose	Interval
Bureau of Standards	+0.079	0.422	0.621	0.199
Test thermometer No. 1	+0.056	0.425	0.621	0.196
Test thermometer No. 2	+0.022	0.422	0.622	0.200

Correction factors:

No. 1 — 0.196 equivalent to 0.199

$0.196X = 0.199$

$X = 1.015$

No. 2 — $0.200X = 0.199$

$X = 0.995$

Calculation of Results

The conversion of the freezing point obtained on the milk sample into the percentage of added water is a tricky calculation. The seventh edition (1939) of *Standard Methods for the Examination of Dairy Products* inadvertently omitted a portion of the cryoscopic method which deals with the calculation of results. The eighth edition has corrected this error.

Assume the following values on a

1. Subtract freezing point depression of 7 per cent sucrose as determined by # 1 thermometer from the freezing point depression of the milk sample.
2. Multiply by correction factor.
3. Add freezing point depression of 7 per cent sucrose as determined by

Bureau of Standards thermometer. For the above milk sample:

1. .514 — .425 = .089.
2. .089 × 1.015 = .0903.
3. .422 — .090 = .512 ° C.

This *true* freezing point depression of the sample is converted to percentage of added water by the use of reference tables which appear in the *Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists,* or by the formula:

$$W=\frac{100\,(T-T^1)}{T}$$
$$=\frac{100\,(-0.550-(-0.512))}{-0.550}$$
$$=6.91\%\text{ of added water}$$

W=% of added water

T=average freezing point of normal milk (—0.550)

T^1=true freezing point of given sample

Normal cows' milk never gives a freezing point depression appreciably lower than 0.53 ° C. (or a freezing point higher than —0.53 ° C.); a freezing point depression lower than 0.53 ° C. (or a freezing point higher than —0.53 ° C., i.e., —0.51 ° C.) indicates a watered milk.

Presence of acidity or formaldehyde causes an increase in the depression. It was found (2) that for each 0.01 per cent increase in acidity the magnitude of the increase of the freezing point depression is approximately 0.003 ° C. In a recent report (3) it was stated that for every 100 p.p.m. of formaldehyde present, 0.009 ° C. should be subtracted from the observed depression. This increase in depression due to formaldehyde is unaltered by storage for seven days at 48 °—50 ° F. and 70° — 72 ° F.

SUGGESTIONS

1. Examine thermometer for any mercury that may adhere to glass at the top of the stem. Dislodge, if necessary, with the rubber mallet.
2. Discard any results in marked disagreement with the average.
3. Investigate erratic results by recalibration of test thermometer and by repeating the test on the sample.
4. To be assured of reliable results, determine true zero position of recently boiled distilled water and the depression produced by a standard sucrose solution each time the apparatus is used if there are long intervals between use.
5. Keep the standard (test) thermometer in an upright position.
6. Use fresh, sweet, unpreserved whole milk; those samples which show an acidity above 0.18 percent expressed as lactic acid and those with preservatives added should not be analyzed, unless acidity and concentration of formaldehyde can be determined.*
7. Calculate results with care.
8. In order to use tables for determining percentage of added water, the true (corrected) freezing point depression must be calculated first.
9. Prepare samples of milk with known amounts of water added (by volume) and determine the freezing points to check accuracy of the cryoscope.

The detailed procedure should be followed to the letter as the rate of cooling and the degree of supercooling are of extreme importance to secure accurate and reproducible results. The following precautions are given as reminders:

1. The temperature of the cooling bath (ether) should not be more than 3 ° C. below the freezing point of the milk.
2. "Maintain the temperature of the cooling bath at —2.5 ° C. and continue the manipulation of the stirrer until a supercooling of the sample of 1.2 ° C. is observed'.

* *The Analyst*, Vol. 68, June, 1943, gives a method for determining formaldehyde in milk samples.

3. The stirring should not be too rapid and should be uniform; a rate of one full stroke per 2–3 seconds usually suffices.

4. The thermometer should be tapped with the rubber mallet repeatedly before taking a reading.

5. The size of the sample should be between 30–35 ml. of milk.

CONCLUSION

An essential adjunct to the control of the adulteration of public milk supplies is a reliable technique for detecting added water. The method should be easy to understand, to perform, and to interpret. The cryoscopic method is both reliable and practical for routine use. The practice of watering milk is increasing during our present emergency. The frequent and intelligent use of an official quantitative method will help toward halting this adulteration.

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Cheese Regulation

STATE OF CALIFORNIA

DEPARTMENT OF AGRICULTURE

A. A. BROCK, Director

Sacramento

June 16, 1944.

CIRCULAR LETTER

TO: Cheese Manufacturers

Subject: New Legislation on Cheese

Assembly Bill No. 45 passed during the 55th (4th Extraordinary) Session of our State Legislature was signed by Governor Warren and as it carried an urgency clause, it is now a law. It adds section 540 and amends section 547 of the Agricultural Code.

Briefly, the measure provides that all cheese sold in California to the retail trade shall be pasteurized or manufactured from cream, milk, or skim milk which has been pasteurized, except cheese which has been allowed to ripen or cure for a minimum period of sixty days from date of manufacture.

The measure further provides that all cheese, except processed or emulsified cheese, must be labeled at the factory where manufactured to indicate: the variety, that is, whether Cheddar, Monterey, Colby, etc.; the grade, whether whole milk, part skim, or skim; the factory number; State of origin; and date upon which the cheese was manufactured.

Cheese manufactured in any State where factory numbers are not assigned must be labeled with the name and address of the plant where manufactured.

Cheese manufacteurers are requested to give immediate compliance to this measure with respect to proper labeling and dating of the product and it is suggested that all cheese made from pasteurized products be labeled to indicate that it was made from pasteurized milk.

Your cooperation in observing the provisions of this law will be appreciated.

Very truly yours,

O. A. GHIGGOILE,

Chief, Bureau of Dairy Service,
Division of Animal Industry.

Variability in Quality of Cotton Lintine Disks Used for Determining Extraneous Material in Milk

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NOT infrequently rather striking variations in the quality of cotton lintine disks used for the milk sediment test have been observed. Casual inspection has revealed variations in thickness, in distribution of cotton within the disk, and irregularity of cut.

It seemed advisable, in view of recent efforts directed toward standardization of the procedure for determining the presence of extraneous material in milk, that the magnitude of the variations in quality of cotton lintine disks be measured (1)(2). This is a report of measurements so made.*

Members of the Committee on Applied Laboratory Methods (1943) of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS were requested to submit six boxes of disks acquired from the stock of different dairy plants in their respective areas. Disks were obtained from Pennsylvania, Oklahoma, Wisconsin, Ontario, and Michigan. The disk containers bore three different brands and distributors' names.

The boxes with few exceptions contained 100 cotton disks. All were 1.25 inches in diameter. These were weighed, after being uniformly tempered for 30 days, in groups of 100, 50, 25, 10, and 1. Each of the groups of less than 100 disks were selected from the approximate center of the pack. The weights of the groups of disks is presented in Table 1.

* This report is submitted on behalf of the 1943 Committee on Applied Laboratory Methods of the International Association of Milk Sanitarians. The assistance of Edward Parrot, and Pvt. Jerry Clark in making this study is gratefully acknowledged.

TABLE 1

WEIGHTS OF VARIOUS NUMBERS OF COTTON LINTINE SEDIMENT TEST DISKS

	Number of Lintine Disks Weighed				
Box No.	*100*	*50*	*25*	*10*	*1*
	Weight of Disks in Grams				
1..........	18.3960	9.1350	4.5535	2.0170	0.2305
2..........	21.0905	10.5443	5.3105	2.1515	0.2198
3..........	21.5279	11.2173	5.6144	2.2559	0.2233
4..........	21.2851	10.5586	5.1589	2.1390	0.2193
5..........	18.4254	9.2941	4.7584	1.8389	0.1902
6..........	19.1379	9.5336	4.7584	1.8617	0.1857
7..........	....	8.4500	4.2305	1.7000	0.1685
8..........	18.9000	9.5076	4.8093	1.9200	0.2000
9..........	16.2581	8.0122	4.0519	1.6039	0.1518
10..........	....	8.1534	4.0082	1.6412	0.1764
11..........	16.0000	8.0337	4.0419	1.6466	0.1631
12..........	....	8.457	4.2236	1.6720	0.1714
	Maximum Variation, Using Lowest Value as a Base				
	34.54%	38.37%	38.90%	40.65%	51.84%

The weights of each disk within each box also were determined. The results presented in Table 2 are representative of these measurements.

TABLE 2

WEIGHTS OF SEDIMENT TEST DISKS FROM ONE BOX IN GRAMS

.2159	.2186	.2053	.2146	.2044	.2032
.2294	.2287	.2117	.2033	.2096	.2134
.2165	.2204	.1985	.2105	.2056	.2086
.2073	.2220	.2072	.2015	.2151	.2125
.2049	.2180	.2164	.2009	.2006	.2096
.2015	.2284	.2074	.2024	.2248	.2058
.2050	.2173	.2045	.2009	.2162	.2218
.2258	.2149	.2000	.2004	.2116	.2162
.2034	.2104	.2056	.2077	.2128	.2087
.2077	.2134	.2132	.1926	.2054	.2204
.2005	.2128	.2088	.2088	.2027	.2252
.2088	.2094	.2193	.2176	.2027	.2139
.2010	.2081	.2157	.2176	.2084	.2034
.2178	.2042	.2164	.2189	.2080	.2034
.2125	.1955	.2252	.2167	.2002	.2146
.2058	.2014	.2187	.2136	.2031	
.2186	.2089	.2078	.2151	.2106	

Maximum Variation, Using Lowest Value as a Base=19.10%

square centimeter. Measurements were made of the thickness of the disks at their centers and on opposite sides equidistant from their edges. The measure-

The thickness of a number of lots of the disks was determined by means of a machinist's micrometer having a flat pressure surface area of 0.306 ments of 20 disks from each of three boxes are presented in Table 3 as representative of a larger number of measurements.

TABLE 3

THICKNESS OF DISKS AT THEIR CENTERS AND SIDES (IN MILLIMETERS)

Box 1			*Box 2*			*Box 3*		
	Sides			*Sides*			*Sides*	
Center			*Center*			*Center*		
1.03	1.06	1.12	0.77	0.66	0.72	0.82	0.87	0.87
1.20	1.06	1.17	0.77	0.78	0.83	0.93	0.85	0.93
0.98	0.96	1.04	0.73	0.72	0.77	0.85	0.78	0.84
1.03	0.99	1.01	0.83	0.83	0.79	0.83	0.75	0.85
1.07	1.06	1.04	0.69	0.65	0.72	0.92	0.96	0.92
1.07	1.02	1.08	0.79	0.65	0.76	0.96	0.91	0.86
1.07	1.03	1.03	0.77	0.79	0.80	0.97	1.00	0.94
1.03	0.98	1.00	0.77	0.84	0.77	0.94	0.88	0.99
1.07	1.07	1.02	0.82	0.86	0.80	0.91	0.92	0.80
1.07	1.00	1.07	0.85	0.84	0.77	0.94	0.84	0.98
1.12	1.14	1.14	0.82	0.82	0.85	0.99	0.93	0.94
1.09	1.08	0.99	0.62	0.63	0.68	1.12	1.11	1.14
1.15	1.16	1.08	0.82	0.76	0.77	1.01	1.01	0.91
1.01	0.99	1.02	0.80	0.81	0.78	0.96	0.96	0.98
1.04	0.96	1.04	0.85	0.81	0.82	0.94	0.91	0.85
1.02	1.05	0.97	0.67	0.64	0.66	0.92	0.96	0.92
1.07	0.91	1.09	0.77	0.77	0.80	0.80	0.83	0.77
1.02	0.90	1.03	0.82	0.81	0.77	0.82	0.76	0.89
1.03	0.96	1.07	0.84	0.83	0.81	0.86	0.83	0.94

Maximum variation, using lowest value as a base=92.3%

In most cases the thickness of disks from given boxes varied some 5 to 10 percent, although extremes of 25 percent were encountered. The difference in thickness of different disks from different boxes was striking, and amounted to as much as 25 to 50 percent, expressed in terms of the thinner of the disks. The extent of differences in thickness of stacks of 25 disks as taken from boxes is illustrated in Figure 1. Differences in thickness of individual disks are illustrated in Figure 2.

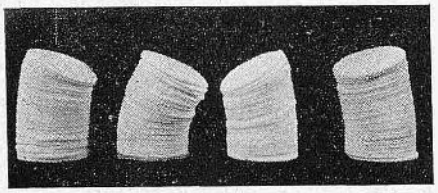

FIGURE 1

Illustration of Differences in Thickness of Stacks of 25 Cotton Lintine Disks as Taken from Containers

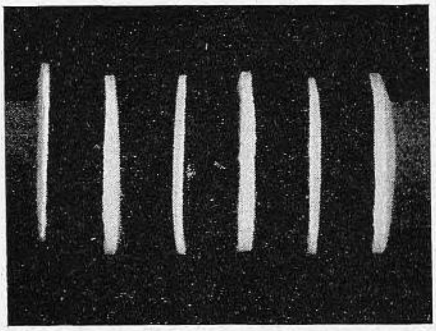

FIGURE 2

Illustration of Differences of Thickness of Individual Cottol Lintine Disks

Inspection of boxes at random indicated that in nearly every instance a number of disks could be selected having definite irregularity in diameter perhaps best expressed as being oval in shape. The deviation from round amounted to as much as 6 millimeters in some disks. The extent of the variation in diameter of selected disks is illustrated in Figure 3.

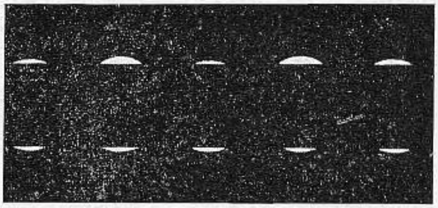

FIGURE 3

Illustration of differences in diameters of cotton lintine disks. Photo made by aligning one edge of disks along straight edge, and placing black paper strip over centers of disks. Differences in extent of protruding upper edge indicate differences in diameters.

Whether or not the variations in the qualities of the disks as measured are significant is perhaps dependent upon the type of tester used and the form of the irregularity. Upon placing disks in water there is a distinct difference in the rate at which they become wetted. Disks of irregular thickness when wetted did not recover to a uniform thickness, indicating that the irregularities were not compensated for by swelling. When the off-the-bottom type of sediment tester is employed, irregularities in the diameters of the disks appear to be of significance. Disks that are not round do not appear to fit properly in the depressed disk seat of the sampler. Probability exists that some by-passing of milk and material occurs when the disks are irregular in shape and do not seat properly. Despite the rapid swelling properties of most disks when wetted with milk, it frequently has been observed that disks of different weights and of uneven thickness fail to reseat properly upon the screen of an off-the-bottom type of tester in which milk is drawn past the disk into the barrel when the down discharge stroke is made. The rapidity or completeness of reseating of disks in this type of tester is probably affected also by the pressure exerted when the discharge stroke is made. The sediment-retaining properties of disks of different thickness and of different weights were compared by use of water containing varied but measured amounts of graded peat moss plus Tergitol wetting agent, in a series of 10-gallon milk cans. An off-the-bottom type of sediment tester was employed. The variables of degree and time of stirring of the sedimented water, the method and rate of withdrawal of sample, and related factors were made uniform insofar as possible. The results of the tests indicated that the maximum variations in the quality of the disks as measured in these studies were sufficient to result in differences in sediment-retaining properties recgonizable macroscopically. These observations were confirmed by use of the pressure type sediment tester. Lesser differences in the quality of the disks (weight and thickness) could not easily be demonstrated to have an effect on retention of the extraneous material as determined macroscopically.

As a result of these studies it appears that there are available upon the market sediment disks having marked differences in important properties of weight, thickness and regularity of cut, and that under specific conditions of use these irregularities can have significant effect upon retention of extraneous material when a sediment test of milk is performed. In view of the efforts to attain uniformity in the procedure of making sediment tests of milk, immediate attention should also be given the attaining of greater uniformity in the quality of sediment test disks. It appears probable disks of different but specific qualities are desirable to meet with the requirements of different sediment testers now available.

REFERENCES

1. Committee Report. Report on Studies on Measurement of Sediment in Milk. *J. Milk Tech.*, **5**, 281 (1942).

2. Weckel, K. G. The Status of Regulations and Practices in Determining Extraneous Material in Milk. *Ibid.*, **6**, No. 3 (1943).

Winter Course in Dairy Manufacturing at University of Wisconsin

This year the Winter Course in Dairy Manufacturing at the University of Wisconsin will start on September 25 instead of a date in October and will run for 18 weeks. The course will carry an extra week of instruction in dairy sanitation. It is now possible for a student to take all four dairy manufacturing courses which are offered in the second semester. The latter are open only to students who have had the first semester's work.

The total estimated average cost for the 18 weeks of the Winter Course is $261.00, including meals, room, tuition, fees, books, and all other necessary expenses.

Send inquiries to Professor H. C. Jackson, Department of Dairy Industry, University of Wisconsin, Madison 6, Wisconsin.

USPHS Restaurant Sanitation Ordinance

The Restaurant Sanitation Ordinance recommended by the United States Public Health Service (or one based thereon) is in effect in 11 entire States and the District of Columbia, as well as in 108 counties and 178 municipalities located in 25 other States. It has been adopted as State regulations in 22 States. A list of these can be obtained by writing to the Sanitary Engineering Division, Milk and Food Section, U. S. Public Health Service, Washington, D. C.

Post-War Planning on Dairy Equipment*

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Chicago 7, Illinois

MUCH thought is being given these days to post-war problems and naturally the dairy industry is vitally concerned with what type of equipment will be available after the war and what are some of the new developments which can be anticipated. Individual dairies, dairy machinery manufacturing concerns and industry as a whole are actively considering these problems.

This is all very good and worthwhile, however, at the same time we must not forget that the War is not yet won and that is our first consideration. The dairy industry can be proud of the contributions it has made and is making towards the winning of the war not only from the standpoint of producing food and machinery necessary to feed the people of America and her allies, but also because many concerns who normally manufacture only dairy and food equipment are turning out large quantities of direct war goods. These may vary from parts of airplane motors to submarine and torpedo parts. The industry has gone all out for doing its share in the War Effort.

In view of the laws in some states regarding fortune tellers and soothsayers, it is rather dangerous for an individual to try to prophesy just what may be ahead in an industry like ours for certainly no one knows exactly what the future may bring forth. We do know, however, that the old saying of "coming events cast their shadows before" has a certain amount of truth in it and if we do not take ourselves too seriously, it probably will not be out of place to speculate somewhat about the future.

In spite of newspaper articles and much discussion concerning how our industries are to be revolutionized by the use of plastics, or electronics as the case may be, we do not believe that our dairy industry will be revolutionized over night. There is no question, however, but what there will be many new developments and improvements after the war, both as a result of our experience in the use of new materials and methods during the war, and as a result of the gradual completion of research and development work, much of which was under way before the start of the war.

We believe that the process of placing these new developments into commercial operation will be orderly and, for most items, will take some period of time, as it takes time to make drawings, new jigs and fixtures, and train field erection men.

The dairy industry has learned to work together much better during the present war emergency and should take pride from the fact that it was the first branch of the food industries to cooperate and so organize its efforts and present its problem to the W.F.A. and the WPB that an industry wide orderly plan of supplying dairy equipment on a yearly planned basis during the emergency could be worked out as embodied in the War Production Board Order L-292.

We believe this cooperative effort and spirit will be continued and will assist greatly in the reconversion from war-time to peacetime operation when the time comes. It is significant that

* Presented at Wisconsin Dairy Manufacturers' Conference, University of Wisconsin, March 31, 1944.

through the machinery set up under L-292 the industry has been able to go along reasonably well for war-time conditions. The allotment of materials and equipment for certain uses has been adjusted where necessary to prevent hardship and to meet a real need. For example, when the industry found that they needed more 10 gal. milk cans to handle the amount of milk the country needed, data were collected and the facts presented to WPB at Washington and an adjustment promptly made which allowed the manufacture of sufficient milk cans to take care of the situation. This same principle was applied more recently in a number of instances, as for example when the allotment of soaker type bottle washers was increased to take care of a need in small plants where there was an acute shortage of help. Equipment manufacturers are still faced with the problem of acute shortage of labor and some purchased materials and supplies which cause serious delays in the production of authorized equipment.

In discussing the post-war aspects of our problem we might consider the following points:

(1) The amount of equipment which will be needed.
(2) The demand for improved quality of dairy products.
(3) The interest in processing efficiency.
(4) The improvement in materials and fabrication.
(5) The training of technicians.

INCREASED DEMAND FOR EQUIPMENT

In considering the amount of equipment which will be needed immediately after the war closes, most individuals in the industry agree that the need for replacement of equipment will be at least 50 percent greater than normal on account of the extreme wear and tear during war-time due to long hours of operation, to handling products of lower fat contents, and due to operation by less experienced and less competent help due to manpower shortage and shifting of workers to higher paid war industries. Of course, some items of equipment will be less in demand, spray dryers may be a drug on the market because of the large number which were built during the war, and unless the powdered milk and powdered egg industries can find some way of marketing on a large scale during peacetime, there will be an over supply of these items. On the other hand, take the matter of ice cream freezers. A great many of these will be badly worn because so few new freezers were obtainable during much of the war period and the wear and tear was much accentuated due to the operation on such large quantities of ices and sherbets which lack lubricating properties.

We also believe that there will be a considerable increased demand for dairy equipment, particularly for ice cream, market milk, and butter manufactured in order to take care of the natural increased demand resulting from the fact that many of our population have learned for the first time during the war of the advantages of liberal use of dairy products. If we are to believe the stories which come back to us from boys at the front and in the Army telling of their interest in ice cream and milk, we can look forward to a greatly increased demand in civilian use when these men are again at home. We are reminded of the story of a young naval lieutenant whose ship was sunk near Guadalcanal and who spent about 36 hours in the water before being picked up and taken to shore. After a few days on the island he and his buddies were sent to a hospital ship and were told that they could have either ice cream or a beautiful nurse, whichever they wished. Believe it or not, he stated that they all chose the ice cream.

We believe that improved merchandising methods which are available to the dairy industry will be made use of in stimulating greater sales of dairy products. These greater sales, however, will not come automatically since the dairy industry is going to have to compete with other industries for a part of the food dollar and wide awake merchandising methods must be used by our industry in order to obtain our share of the post-war business.

QUALITY IMPROVEMENTS

Dairy machinery manufacturers are very conscious of a definite interest on the part of industry in equipment which will give finer tasting and more healthful products, as we recognize that this will help the sale of more milk products. Dairy machinery is continually being improved with this in mind.

We look for a continued active interest by public health agencies in the quality of dairy products. Dairy machinery manufacturers appreciate the constructive suggestions of public health organizations, sanitarians, and dairy products manufacturers, and look forward with interest to further cooperative efforts to rationalize and standardize new developments, where practical.

In the improvement of quality of dairy products time and temperature of processing play an important part. Manual control is often inaccurate and unreliable and with the improvements that have been made in automatic control we look forward to a much wider adaptation of automatic control to pasteurizing equipment, washing equipment and the like. Just previous to the war a number of improvements in automatic controls, as for example the flow diversion valve, for use on high temperature short time pasteurizers was developed and many were used. This apparatus has great possibilities for further improvement of certain processes. In connection with ice cream freezers there are numerous opportunities for better and more accurate controls. The same is true in the manufacture of butter.

The dairy industry has advanced perhaps more than any other food industry in the adoption of sanitary type construction which enables every piece of equipment which comes in contact with the product to be thoroughly and completely cleaned. Much remains to be done along this line and in some parts of the country much of the old equipment will need to be replaced with the newer type, which can be more readily and completely dismantled. Efforts are being made to simplify the construction of sanitary equipment where possible in order to make the work of assembly and disassembly as easy as possible. The use of stainless types of metals will undoubtedly be much greater than at the present time, thus making equipment easier to clean. Studies are being conducted at the present time on the use of glass tubing which can be left in position and thoroughly washed by circulating special cleaning solution through the line. Some very promising results are obtained, and we can see numerous instances where this type of construction would be advantageous due to the saving in labor required in the normal dismantling of pipe lines.

Pasteurization of milk products is so commonplace these days that we are tempted to think of its being universally adopted. There are many parts of our country besides many other places on the earth where raw milk is still sold. We look for many of these places to adopt pasteurization after the war.

It has been shown in many instances that farmers who make it their principal business are in general, producers of better quality milk. This is logical because they are in the business on a scale sufficient to justify the necessary investment in good equipment and facilities for properly handling their milk. There will always be large milk producers and those who sell only a few gallons of milk or a small amount of cream per day. However, with the continued emphasis upon milk quality it appears that the trend will be toward more of the dairy farms who make the production of milk their main business.

Refrigeration is one of our fastest growing industries. We expect this trend to continue and with the availability of the small individual type low pressure refrigeration units, there will undoubtedly be more widespread use of artificial refrigeration on the farm and for cooling milk during transit. We expect the use of quick-frozen foods to increase and more people will have refrigeration facilities for storing frozen foods all the time, thus keeping their dairy products in better condition.

People have become more vitamin-conscious during the past few years and this had been aided by the government's program with the Armed Forces and war workers, in which the benefits of the use of vitamins have been stressed. Much thought has been given to the preservation of natural vitamins in milk and we look for considerable effort in post-war periods, too, so process milk and milk products that the natural vitamins are preserved to the utmost. Important studies are going on at the present time to determine further the advantages of dairy products from this standpoint and we are hopeful that the findings of these researches will give added reasons for people to use milk and milk products rather than cheap substitutes which have been brought forth, many of them as a result of the war.

The flavor and keeping quality of milk have long been associated with metallic contamination. The experience of the past few years together with new information obtained during the war concerning the advantages of the use of stainless steel for equipment surfaces coming in contact with milk become more and more apparent.

Emphasis upon improved keeping quality of dairy products has become great and due to the rigid requirements of the Armed Forces and Lend-Lease, we have learned a great deal regarding the preservation of dairy products. It appears that such factors as exposure to copper, freshness of the product when processed, preheating to develop anti-oxidant qualities of the product, deoxygenation are all important. Studies of improved packages for preventing contamination of dairy products and keeping them from exposure to air will also be important.

PROCESSING EFFICIENCY

As mentioned before, dairy products must in the final analysis compete with other food products from the standpoint of cost although they have some enviable sales advantages which gives them consumer preference. Emphasis must, therefore, be placed upon the production and processing of dairy products as efficiently as possible. We will not at this time consider the detailed cost of production of the dairy products; however, it is of note that the cost of production of milk is greatly influenced by the output of milk per cow. The average cow in a cow testing association which is a measure of just an average good cow, produces over 300 pounds of butter fat per year, yet the average cow in the United States, consuming about as much feed as the good cow, produces only approximately 140 pounds of butter fat per year. This striking difference indicates the possibilities for reducing the cost of milk by the single item of improvement in the output per cow.

One of the factors in the operation of a milk plant is that if having equipment which can be used for a number of different purposes. We find, for example, that in some plants they have a different vat for handling cream and another for handling milk, etc. There are available today several makes of vats which, due to special type agitators might be called multi-purpose vats which can be used for any one of these purposes and thereby add great flexibility to the operation of such a plant with a consequent reduction in overhead cost. We also find that plants are being built today and being planned for the future, for flexible operation which will enable them without much change in equipment to turn out any one of a number of finished dairy products, as, per example, sweet cream, butter, cheese, ice cream mix, or powdered milk, all in the same plant giving the plant manager an opportunity to turn his product into the particular channel for which there is a demand at the time.

Continuous operation is an intriguing thought in connection with all of the dairy processes, as compared to batch type operation. It is a fact that most small scale operations are carried on with the batch process, however, in industry in general, whether it be in the manufacture of chemicals, food products, oils, or the like, it has been found that continuous operation offers decided economies in cost of operation, provides more accurate control and higher recovery of finished goods in most cases than does the batch method.

We have seen the development of continuous ice cream freezers, the continuous pasteurizing system, continuous spray dryers and continuous evaporators. Improvements have been made in these different processes and manufacturers have been working diligently to make all of the major dairy processes continuous. We can now report that the manufacture of butter by the continuous process is a post-war certainty. Experimental size continuous buttermaking equipment gives an entirely satisfactory product and justifies the hopes which were held for it by providing extreme sanitation, improved composition control, perfect uniformity, and greater operating efficiency. When it is considered that this is the first major change in the method of producing butter from cream since recorded history, it appears to take on added significance. It is an inspiring sight to see cream go into one end of this machine and butter ready to package come out of the other end. There is no reason for the product being touched by the human hand at any time during the process since automatic packaging equipment is readily attached to the discharge of the machine. This does not mean that all plants will change over at once after the war, for it will take time to build the machines. Furthermore, there are many plants which are better adapted to batch operation; there will always be a demand for churns.

Proper illumination of dairy plants and equipment offers real opportunities in improvement in processing efficiency. A cooperative study by the Illuminating Engineers Society, International Association of Milk Dealers, and Dairy Machinery Supplies Association has turned up a wealth of information on this subject which can be made use of in the post-war period. Good illumination makes it easier to operate machines correctly and to make certain that proper washup and cleaning of the parts has been accomplished.

Automatic control as mentioned before under quality improvement will also play a part in the increase of operating efficiency since real economy is possible when temperatures, pressures, weights, etc., involved in processing are brought under accurate control. This is possible only when it is done automatically. Electronics will undoubtedly play a more important part in the automatic control of our equipment. Liquid level controls operated by electronic principles are already being used to great advantage in the industry.

Plant losses in products assume rather large proportions in some instances. We expect to see considerable reduction in these plant losses by the use of automatic control of machinery, and equipment which is better draining.

IMPROVEMENTS IN MATERIALS AND FABRICATION

The dairy manufacturer can look forward to quite an improvement in the materials and fabrication of his postwar dairy equipment. There will undoubtedly be wider use of stainless steel, and of other wear and corrosion resistant alloys, such as cast white metal, which will make equipment stand up longer under the heavy duty services it is subjected to in larger plants.

Plastics probably will not be used as much as we are led to believe from press releases, however, we do expect plastics to serve a real purpose in the construction of small parts such as handles, decorative trim and the like. It has even been suggested that a plastic milk bottle may be possible.

We look for the design of equipment to take into account the comfort of the workman or operator such as reduction in noise, exposure to water or splash and to ease of getting to the working parts of the equipment.

Much has been learned about the prevention of corrosion which is one of the greatest enemies of equipment in dairy plants. Through the use of non-corrosive type metals, coatings and treatment we can look to improved conditions in this respect.

We hear much about the streamlining of dairy equipment and there is no question that efforts are being made to provide equipment with improved appearance, which is at the same time simplified. We are of the opinion that the mere covering of pipe and parts with a sheet metal coating is not the answer to streamlining and unless the covering of exposed parts really serves a good purpose, we believe that is hardly justified. We know personally of several instances where railroad locomotives were covered with sheet metal to give a streamlined appearance, before the war, and when help became scarce, the sheet metal streamlined covering was all removed so that the parts were more readily accessible for servicing. We believe that streamlining in its true sense means not only smooth, clean appearance, but also simplified design.

TECHNICAL OPERATORS

At this point we should like to mention that with the more wide use of machinery in the dairy industry and the technical problems involved in operating a milk plant today, it seems evident that the dairy industry is going to need more individuals who are well trained in the fundamentals of dairy technology and engineering, if we are to obtain the best results from our plant equipment. We also see an increasing importance of the plant engineer in the operation of dairy plants. Some of the most successful plant superintendents we have known have also a good, practical understanding of engineering problems and cooperate very closely with their plant engineers. A man with such interests will find it much easier to take care of modern dairy equipment and to make it perform and function with the utmost efficiency.

In summary it appears that our first interest must be to spend every effort to win the war at the earliest possible date. When this has been accomplished we will then be able to put into operation a number of the ideas and developments which have come along in the past few years. More equipment will be needed by far than we have ever seen before. Quality improvement of dairy products demands better control, better metals, more wide use of refrigeration, conservation of vitamins, and wider use of pasteurization in the country.

New dairy equipment in the post-war period will be instrumental in increasing the processing efficiency and reducing costs through the use of continuous processes, improvement in materials of construction, simplified design, true streamlining, and multi-service type equipment.

Finally, this equipment will be better operated by technicians who are better trained in the fundamentals of dairy science and engineering.

A Northeastern States Code for Milk for Pasteurization*

WALTER D. TIEDEMAN

*New York State Department of Health
Albany, New York*

Much has been accomplished by health officials and others during the past thirty years in improving the safety and quality of milk. Some enforcement officials have reached the same goal as others but by different methods of approach. There has been a friendly spirit of rivalry between authorities in different areas each claiming the ideal milk supply. This competition was helpful in the early development of safe milk supplies as was the use of the grading system. However, in milk sanitation as in many other things as we approach the ideal we reach the zone of diminishing returns. That is the place where a great amount of effort will accomplish a very minor improvement. Furthermore, there is a tendency at this stage to demand improvements in appearance only and to consider them to be of equal importance with items that have an effect on the quality of the milk and even with items directly affecting safety.

Either in an honest effort to make the milk supply of one city or state better than that of a neighboring city or state, or with a view to establishing a difference on paper, the stringency of standards has been increased and new requirements have been added to milk codes. Less attention has been given in some instances to improving compliance with essential regulations than to multiplying the requirements or otherwise raising standards. Of course there have been some exceptions to this practice but it has been difficult to break down an archaic precedent.

It is quite generally acknowledged that the ultimate goal is to supply every consumer with safe milk of good flavor, appearance and keeping qualities. Experience has shown that the community with the most stringent regulations does not necessarily have the best milk. Is it not time to reevaluate our multifarious and sometimes divergent regulations and enforcement procedures with a view to simplifying them? Then more effort could be and should be devoted to improving the enforcement of these fundamental requirements designed to make all milk supplies safe and of good quality.

Beyond this point is the field of esthetics. If consumers want esthetically perfect or almost perfect milk it could be supplied at a price under super-regulations established and enforced by the industry. It is outside the field of public health. Health officials should make it clear to parents with low incomes that it is neither necessary nor advisable for them to deprive themselves of essentials in order to supply their children with a "De luxe" grade of milk while the standard grade is safe and nutritious.

The testing of milk on the receiving deck or platform of milk plants as well as the laboratory examination of samples collected there has made it quite evident that the results of farm inspections or farm scorings are not reflected in the quality of the milk delivered at the plant. Since the ultimate purpose of dairy farm control is to secure the

* From Seventeenth Annual Rept. N. Y. State Assoc. Milk Sanitarians, 63 (1943).

delivery of safe milk of high quality at the receiving station, it would seem to be sound policy to stress farm requirements that have been shown to have a direct bearing on either the safety or quality of the milk and to eliminate those which have been demonstrated to have no such bearing. Also in enforcement it is advantageous to place more emphasis on examining the milk and somewhat less on inspecting the dairy farms. A dairyman generally is willing to cooperate in improving equipment or changing practices when it is shown that the old equipment or practice has resulted in the delivery of milk of poor quality. Otherwise he is inclined to take the attitude that the requested change is unnecessary and that the inspector is arbitrary and capricious.

It appears that in this time of war when it is important to conserve materials and man power it is especially important that we do everything possible to simplify dairy farm regulations and their enforcement. The value of such action becomes even more evident when we consider that this can be done without harming and with a strong possibility of improving the sanitary quality of the milk delivered.

With this objective in mind Lester T. Tompkins, Director of the Division of Dairying and Animal Husbandry of the Commonwealth of Massachusetts in 1942 instigated a series of meetings of [1] officials responsible for the work in milk sanitation in the six New England states and in New York and New Jersey. At the final meetings representatives [2] of the United States Public Health Service, the health department of the City of Boston and the New York City Health Department participated.

The group formulated the appended set of farm regulations relating to the production of raw milk for pasteurization. They are modifications of the United States Public Health Service ordinance which, without modification, was believed to be too stringent and not applicable in some respects to this area. It is understood that milk produced under these regulations when properly enforced in territory outside their jurisdiction is acceptable to the various states and cities represented in so far as local legal restrictions will permit.

The work done also included the preparation of a manual for the guidance of inspectors in enforcing these regulations which is based on the United States Public Health Service Code. It is too lengthy to publish here.

The Northeastern States regulations with the addition of some requirements such as the use of chlorine rinses on utensils, cows' udders and milkers' hands were adopted by the United States Public Health Service as [3] Emergency Sanitation Standards for Raw Milk for Pasteurization.

The drafting of the simplified Northeastern States code is a first step in a broad program to rationalize the sanitary control of dairy farms. Further steps might logically be the general adoption by the States concerned, of these or even more simple regulations as peace time standards; the general inspection of all dairy farms producing milk for human consumption in any form by the state authorities with emphasis on enforcement on an area basis regardless of the destination of the milk; and the inauguration of a system of surveying the results of inspections by each State so that such results may be freely accepted by other states without duplicating dairy farm control.

The adoption of such a system would overcome many inconsistencies in our present more or less complicated programs for sanitary control within this area. While it is recognized that this would break down artificial state barriers allowing the free flow of milk, this is an economic rather than a health consideration. Under this program arguments about conflicting farm requirements or procedures by adjacent health agencies would be eliminated. It would make it impossible for a slovenly dairyman to find a market for his milk for any edible product. It would make it easier for the vast majority of dairymen in this area to meet essential health requirements and establish stable markets for quality milk. It would make it easier to prevent the transfer of diseased cattle from one dairy herd to another. In general it should lead to safer supplies of milk and milk products of high quality.

Northeastern States Emergency Sanitation Standards for Raw Milk for Pasteurization

ITEM 1r. COWS, TUBERCULOSIS AND OTHER DISEASES

Except as provided hereinafter, a tuberculin test of all herds and additions thereto shall be made before any milk therefrom is sold, and at least once every 12 months thereafter, by a licensed veterinarian approved by the State livestock sanitary authority. Said tests shall be made and any reactors disposed of in accordance with the requirements approved by the United States Department of Agriculture, Bureau of Animal Industry, for accredited herds. A certificate signed by the veterinarian or attested to by the health officer and filed with the health officer shall be evidence of the above test: Provided, That in modified accredited counties in which the modified accredited area plan is applied to the dairy herds the modified accredited area system approved by the United States Bureau of Animal Industry shall be accepted in lieu of annual testing.

Cows which show an extensive or entire induration of one or more quarters of the udder upon physical examination shall be excluded from the milking herd. Cows giving bloody, stringy, or otherwise abnormal milk, but with only slight induration of the udder, shall be excluded from the herd until reexamination shows that the milk has become normal.

For other diseases such tests and examinations as the health officer may require shall be made at intervals and by methods prescribed by him, and any diseased animals or reactors shall be disposed of as he may require.

ITEM 2r. DAIRY BARN, LIGHTING

A dairy or milking barn shall be required and used, and in such sections thereof where cows are milked, windows shall be provided and kept clean and so arranged as to insure adequate light properly distributed, and when necessary shall be provided with adequate supplementary artificial light.

ITEM 3r. DAIRY BARN, AIR SPACE AND VENTILATION

Such sections of all dairy barns where cows are kept or milked shall be well ventilated and shall be so arranged as to avoid overcrowding.

ITEM 4r. DAIRY BARN, FLOORS

The floors and gutters of such parts of all dairy barns in which cows are milked shall be constructed of concrete, tight wood, or approved impervious and easily cleaned material. The floors shall be graded to drain properly. Floors and gutters shall be kept clean and in good repair. No pigs or fowl shall be permitted in the barn used for milking. Horses and calves shall be separated from the milking part of the barn by stalls or pens.

ITEM 5r. DAIRY BARN, WALLS AND CEILINGS

The walls and ceilings of all dairy barns shall be whitewashed once each year or painted once every 2 years, or oftener if necessary, or finished in an approved manner, and shall be kept clean and in good repair. In case there is a second story above the part of the barn in which cows are milked, the ceiling shall be tight.

ITEM 6r. DAIRY BARN, COW YARD

All cow yards shall be graded and drained as well as practicable and kept clean.

ITEM 7r. MANURE DISPOSAL

All manure shall be removed and stored or disposed of in such manner as to reduce the breeding of flies and prevent the access of cows to piles thereof.

ITEM 8r. MILK HOUSE OR ROOM, CONSTRUCTION

There shall be provided a milk house or milk room in which the cooling, handling, and storing of milk and milk products and the storing of milk containers and utensils shall be done. (a) The milk house or room shall be provided with a tight floor constructed of concrete or other impervious material, in good repair, and graded to provide proper drainage. (b) It shall have walls and ceilings of such construction as to permit easy cleaning, and shall be well painted or finished in an approved manner. (c) It shall be well lighted and ventilated. (d) It shall have self-closing doors which, in the case of screen doors, shall open outward, and all other openings shall be effectively screened unless other effective means are provided to prevent the entrance of flies. (e) It shall be used for no other purposes than those incident to the handling of milk, and shall not open directly into a stable or into any room used for domestic purposes.

ITEM 9r. MILK HOUSE OR ROOM, CLEANLINESS AND FLIES

The floors, walls, ceilings, and equipment of the milk house or room shall be kept clean at all times. All means necessary for the elimination of flies shall be used.

ITEM 10r. TOILET

Every dairy farm shall be provided with one or more sanitary toilets conveniently located and properly constructed, operated, and maintained, so that the waste is inaccessible to flies and does not pollute the surface soil or contaminate any water supply.

ITEM 11r. WATER SUPPLY

The water supply for the milk room and dairy barn shall be properly located, constructed, and operated, and shall be easily accessible, adequate, and of a safe, sanitary quality.

ITEM 12r. UTENSILS, CONSTRUCTION

All multi-use containers or other utensils used in the handling, storage, or transportation of milk or milk products must be made of smooth nonabsorbent material and of such construction as to be easily cleaned, and must be in good repair. Joints and seams shall be soldered flush. Woven wire cloth shall not be used for straining milk. Single service filters shall be used.

ITEM 13r. UTENSILS, CLEANING

All multi-use containers, equipment, and other utensils used in the handling, storage, or transportation of milk and milk products must be thoroughly cleaned after each usage.

ITEM 14r. UTENSILS, BACTERICIDAL TREATMENT

All multi-use containers, equipment, and other utensils used in the handling, storage, or transportation of milk or milk products shall between each usage be subjected to an approved bactericidal process with steam, hot water, chlorine, or hot air.

ITEM 15r. UTENSILS, STORAGE

All containers and other utensils used in the handling, storage, or transportation of milk or milk products shall be stored so as not ot become contaminated before being used.

ITEM 16r. UTENSILS, HANDLING

After bactericidal treatment no container or other milk or milk product utensil shall be handled in such manner as to permit any part of any person or his clothing to come in contact with any surface with which milk or milk products come in contact.

ITEM 17r. MILKING, ABNORMAL MILK

Abnormal milk shall be kept out of the milk supply and shall be so handled and disposed of as to preclude the infection of the cows and the contamination of milk utensils.

ITEM 18r. MILKING, FLANKS

The udders, teats, flanks, bellies, and tails of all milking cows shall be clean and free from visible dirt at the time of milking.

ITEM 19r. MILKERS' HANDS

Milkers' hands shall be washed clean immediately before milking and kept clean and dry during the process of milking. Wet-hand milking is prohibited.

ITEM 20r. CLEAN CLOTHING

Milkers and milk handlers shall wear clean outer garments while milking or handling milk, milk products, containers, utensils, or equipment.

ITEM 21r. MILK STOOLS

Milk stools shall be kept clean.

ITEM 22r. REMOVAL OF MILK

Each pail or can of milk shall be removed immediately to the milk house or straining room. No milk shall be strained in the dairy barn.

ITEM 23r. COOLING

Milk must be cooled immediately after milking to 60° F. or less, and maintained at that temperature until delivered and dumped, except morning's milk delivered before 9 A. M. Standard Time and night's milk delivered before 8 P. M.

ITEM 24r. TANK TRUCKS AND TANK CARS

Milk tank trucks and tank cars shall be of approved sanitary construction. They shall be thoroughly cleaned after each usage and subjected to an approved bactericidal process before being used. After bactericidal treatment they shall be so stored and handled as not to become contaminated. While containing milk or cream they shall be marked and sealed in an approved manner. For each tank shipment a bill of lading containing all necessary information shall be prepared in triplicate and shall be kept on file by the shipper, the consignee, and the carrier for a period of 6 months for the information of the health officer.

ITEM 25r. MISCELLANEOUS

All vehicles used for the transportation of milk or milk products shall be so constructed and operated as to protect their contents from the sun and from contamination. All vehicles shall be kept clean, and no substance capable of contaminating milk or milk products shall be transported with milk or milk products in such manner as to permit contamination.

The immediate surroundings of the dairy shall be kept clean and free of health nuisances.

BACTERIAL STANDARDS

The plate count or the direct microscopic count of clumps of raw milk for pasteurization as delivered from the farm shall not exceed 200,000 per milliliter, in more than one sample out of the last four samples taken on separate days. The corresponding limits for milk received at a pasteurization plant from a receiving station shall be 400,000 per milliliter. The count of raw cream for pasteurization shall not exceed 400,000 per milliliter at the place of separation, nor 600,000 per milliliter at the pasteurization plant if shipped from the place of separation.

Counts shall be determined in accordance with the current edition of Standard Methods for the Examination of Dairy Products of the American Public Health Association.

RECEIVING STATIONS

Receiving stations shall comply with the standards of the Milk Ordinance and Code recommended by the United States Public Health Service.

FREQUENCY OF INSPECTION AND SAMPLING

Each receiving station shall be inspected at least monthly. Each producing farm shall be inspected at least annually and samples for bacteriological determination shall be taken from each producer and examined at least monthly.

REFERENCES

1. Participants included H. E. Bremer of Vermont, H. C. Goslee of Connecticut, C. P. Osgood of Maine, A. B. Pike of New Hampshire, W. W. Scofield of New Jersey, A. Simonini of Rhode Island, L. T. Tompkins of Massachusetts and W. D. Tiedeman of New York.
2. A. W. Fuchs of the United States Public Health Service, F. E. Mott of Boston and Sol Pincus of New York City.
3. *Journal of Milk Technology,* 101, March–April 1943.

KEENAN WITH STANDARD CAP AND SEAL

Dr. John A. Keenan, national authority on milk and dairy products, has been named executive vice president of Standard Cap and Seal Corporation.

Dr. Keenan comes to Standard Cap and Seal from The Carnation Company, where he created and for three years occupied the post of Director of Nutritional Research. Prior to this connection he was for six years production manager of the Whiting Milk Company, in Boston, where he headed up cost, processing, and distribution.

A chemistry graduate of the University of Wisconsin, he took his doctorate there in Biochemistry and Nutrition, specializing in Vitamin B complex and Vitamin D. For two years thereafter he was associated with Drs. Steenbock and Elvhjem at the Wisconsin Alumni Research Foundation, going from there to the Whiting Company.

Dr. Keenan is a member of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS and the Institute of Food Technologists. For the past three years he has served as associate editor of the *Journal of Milk Technology*, and as chairman of the committee on milk and dairy products of the American Public Health Association.

He will make his headquarters in the Chicago offices of Standard Cap and Seal Corporation.

The following four papers were presented at a conference on high-temperature pasteurization, held at the University of Connecticut, Storrs, on June 16, 1944.

E. O. ANDERSON,
Associate Professor of Dairy Industry.

Short-Time High-Temperature Pasteurization*

R. E. OLSON, *Manager*

Sales Engineering Department, Taylor Instrument Companies
Rochester, New York

SHORT TIME PASTEURIZER CONTROL SYSTEM

AUTOMATIC Temperature Control equipment is a very important part of a Short Time Pasteurizing system, and as such, deserves careful and regular maintenance. The usual installation, aside from indicating thermometers employs:

A—A steam pressure controller, for maintaining a constant supply of steam to the diaphragm valve of the water temperature control under conditions of forward flow.

B—A temperature controller for maintaining the circulating water at the correct value.

C—A Safety Thermal Limit Recorder which serves three functions:

(a) Provides record of temperature of milk leaving the holder tube;

(b) Electro-pneumatically actuates Flow Diversion Valve; and

(c) Records whether Flow Diversion Valve is in forward flow or diverted flow position, depending on whether bulb of Safety Thermal Limit Recorder is above or below desired cut-out temperature.

DESCRIPTION OF A TYPICAL SHORT TIME PASTEURIZER CONTROL SYSTEM AS SHOWN IN FIG. 1

The milk temperature is controlled indirectly by maintaining the water inlet temperature at a given value by controller B with its bulb located in the outlet from the water circulating pump. Controller B actuates diaphragm valve D, thus regulating the quantity of steam necessary for maintaining a constant water temperature.

When starting up and during periods of flow diversion, solenoid valve 9 shuts off air to Flow Diversion Valve M. Pressure controller C receives its air supply from 9. Therefore, during these periods valve C_1, which is a direct acting, air-to-close type, is wide open.

This allows full boiler steam pressure to be applied ahead of valve D to accelerate heating while milk is diverted to the float tank. As soon as the pasteurization temperature is reached and forward flow takes place, air supply is admitted to C which then controls the steam pressure at the optimum predetermined value.

Safety Thermal Limit Recorder A with its bulb in the milk outlet from the holder tube records the temperature of the milk leaving the holder. If the milk temperature falls below the predetermined minimum, it actuates solenoid valve 9, bleeding the air from the top of Flow Diversion Valve M, the disc of which moves upward to divert the milk. It also provides a record on the outer edge of the chart of the frequency and duration of the flow diversion. This is accomplished by a solenoid-operated pen inside the case, which is actuated by the micro switch on the Flow Diversion Valve.

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* Summary of a talk to Milk Inspectors and Processors given at the University of Connecticut Conference on June 16, 1944.

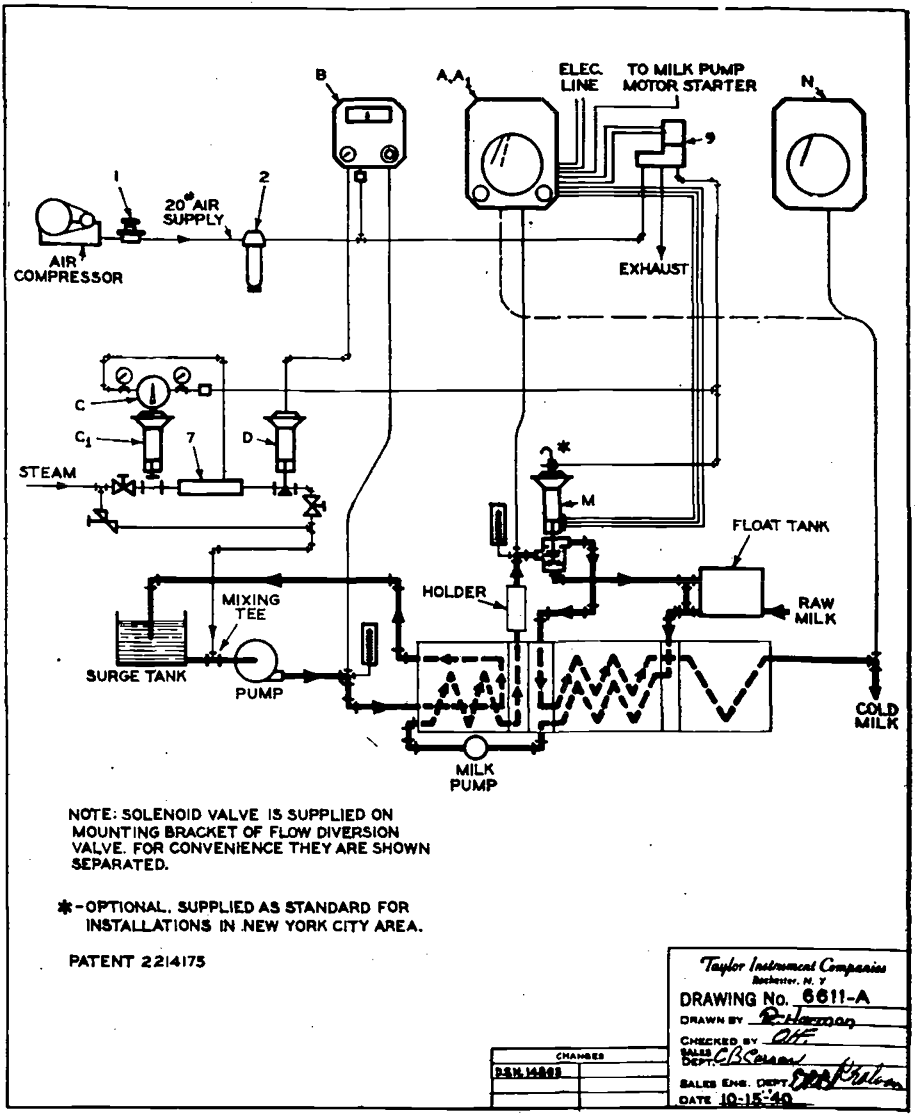


FIGURE 1
Layout of Air-operated Control System for Short Time Pasteurizer

A_1 is an alternate instrument which may be used instead of A, and which besides performing the duties of A also records the cold milk temperature.

The Flow Diversion Valve stem clip must be in place, and the stem connected; otherwise, the milk pump will not run.

Recording Thermometer N records the cold milk tempertaure.

DESCRIPTION OF FLOW DIVERSION VALVE

Fig. 2 is representative of a Flow Diversion Valve such as used with most Short Time Pasteurizing systems and many 30-minute holders. The sectional view on the right shows the disc in a diverted position. The construction of the valve is such that if improperly assembled, forward flow of milk cannot be obtained unless two conditions are satisfied; i.e., the temperature of milk at the bulb of the Safety Thermal Limit which operates it must be above the output point, such as 161° F., and key 18 must be correctly inserted. Key 18 connects push-rod 5

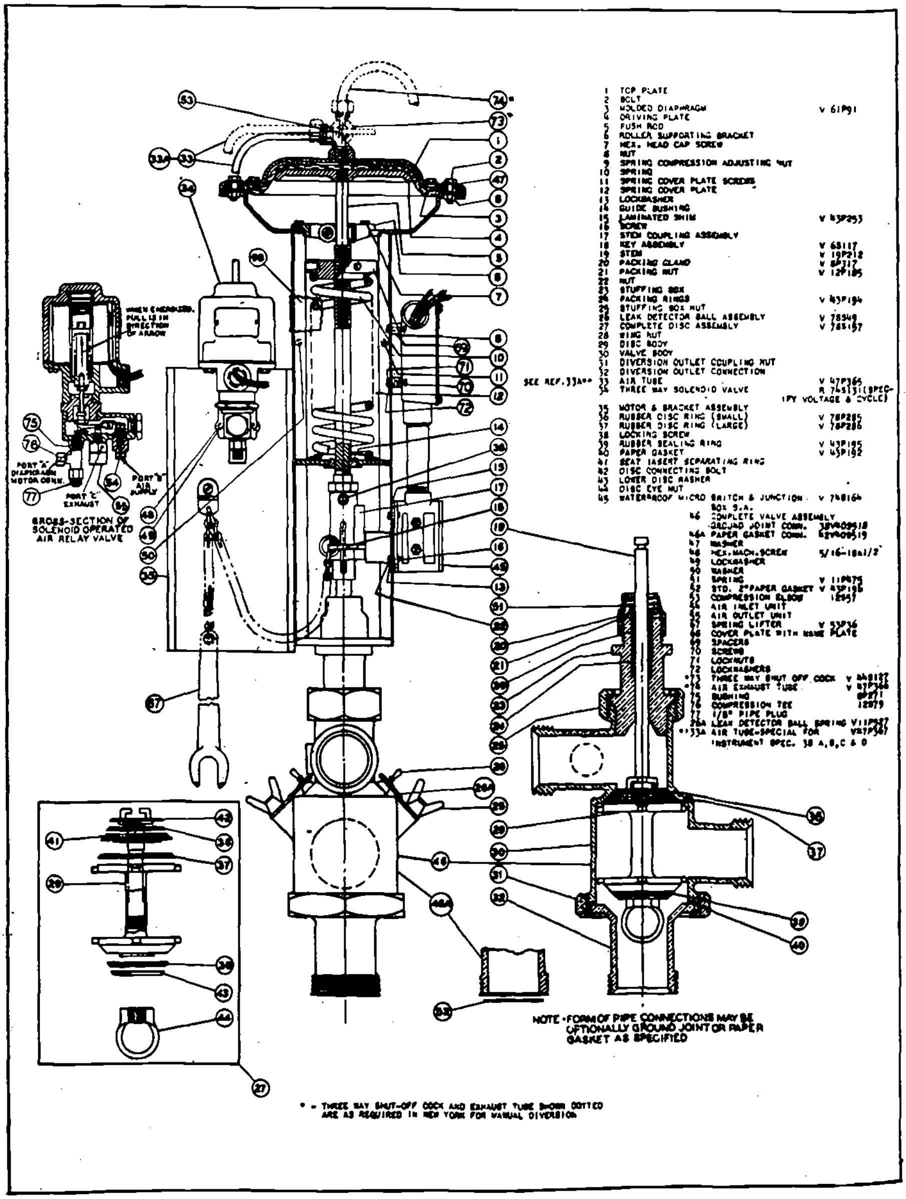


FIGURE 2
Flow Diversion Valve

which when pushed downward by air pressure applied to the top of rubber diaphragm 5 causes the valve to assume the forward flow position. When air pressure is relieved from above the diaphragm through solenoid valve 34, spring 10 moves the stem upward, closing the forward flow port, thereby causing diversion. Unless key 18 is correctly in place micro switch 45 fails to operate which in turn prevents the milk pump from starting, when the temperature is below the set point of the Safety Thermal Limit Recorder.

If the valve has been correctly assembled and the milk pump fails to start, the micro switch should be examined to make certain that its rounded end actuating plunger extends far enough toward key 18 to be moved at least 1/16″ by the beveled edge of the latter when the valve stem moves downward. If this condition does not exist, the micro switch may be moved closer to kep by removing one of the laminated shims (15).

Description of Safety Thermal Limit Recorder

Fig. 3 shows a typical instrument of this type with chart plate removed. This instrument operates the flow diversion valve by opening and closing an electrical circuit to the solenoid valve mounted on the Flow Diversion Valve itself. This solenoid valve in turn admits compressed air at 20 to 25 lbs. pressure to cause the Flow Diversion Valve to assume a forward flow position. When de-energized it releases air causing diversion.

The Safety Thermal Limit Recorder requires no maintenance other than that necessary for recording thermometers. Quoting from the U.S.P.H.S. Code: "The cut-out and cut-in milk temperatures shown by the indicating thermometer shall be determined daily by the plant operator and at least monthly by the health officer, and entered upon the recording thermometer chart. This test may be made at any time during the day's run by reducing the steam supply to the heater so as to slowly reduce the milk temperature (not over 1° F. per each 30 seconds). If the flow stop (Safety Thermal Limit Recorder) operates of its own accord at any time during the day's run the above test may be omitted for that day, since the recording thermometer will automatically record the cut-out and cut-in response." Thus it will be seen that an accuracy check of the instrument is regularly obtained. The speed of response or the thermometric lag of the instrument must meet definite requirements as set forth in the U.S.P.H.S. Code. Instruments that are initially built to conform to this specification usually do not change unless pen friction becomes excessive due to the pen bearing too hard against the chart. Periodic checking for thermometric lag is recommended in conformity with directions given in the U.S.P.H.S. Code.

Cold Sterilization

In some localities, cold sterilization of the forward flow lines and the regeneration section of the heater is permitted. In order to have the Flow Diversion Valve in the forward flow position while the temperature is below the setting point of the Safety Thermal Limit Recorder, a micro-switch in the water temperature controller is used to energize the Safety Thermal Limit Recorder relay which in turn applies air to the Flow Diversion Valve diaphragm motor through the solenoid air valve. The water temperature controller set point is lowered to 110° F. or below, which action actuates the micro-switch. As soon as the set point is raised to the temperature necessary for pasteurization, the micro-switch circuit is opened, and the Flow Diversion Valve is under complete control of the Safety Thermal Limit Recorder. This arrangement is permissible in some communities on the basis that an operator would not attempt pasteurization at 110° F. or lower. If this practice is not allowable, the alternative is to remove the Safety Thermal Limit

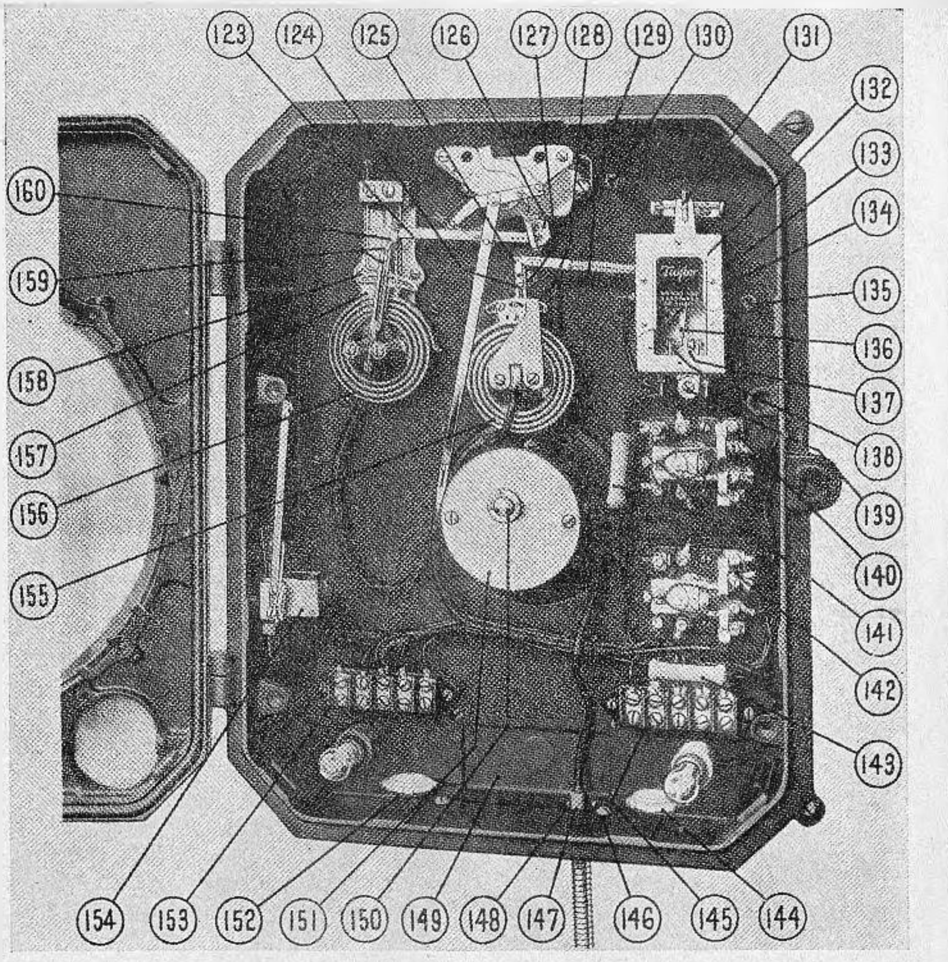


FIGURE 3

List of Parts

Ref. No.	Description	Part No.
135	Sealing Plate Post	9P885
136	Contact Arm	
137	High Contact	
138	Low Contact	
139	Pivot Screw	#8-32x⅜"rd.hd.br.screw,B.N.
140	Relay	220V., 60 cycle – 74S152 110V., 60 cycle – 74S151
141	Resistor	220V.–4000 ohms, 10 watt, IRC Type AB wire wound resistor 110V.–500 ohms, 10 watt, IRC Type AB wire wound resistor
142	Relay	220V., 60 cycle – 74S152 110V., 60 cycle – 74S151
143	Resistor–220V. only.	4000 ohm, 10 watt, IRC Type AB wire wound resistor
144	BX Ell, ¾"	
145	Terminal Block	
146	Screw (4)	#10–32 rd.hd.steel screw, cadmium plate, two ⅜" long and two ¼" long

Ref. No.	Description	Part No.
147	Case Fitting	
148	Case Fitting Screws (4)	#6–32x¼"rd.hd.br.screw,B.N.
149	Tube System Mounting Plate	6S121A–white; 6S121B–black
150	Clock Hub	
151	Clock (12 hour)	Same for 110V. and 220V., 60 cycle – 83S96-2A
152	BX Ell, ¾"	
153	Terminal Block	
154	Frequency Pen Solenoid	220V., 60 cycle – 66S117C 110V., 60 cycle – 66S117A
155	Bourdon Spring – Contact Arm	
156	Bourdon Spring – Pen Arm	
157	Sub-base	
158	Sub-base Screw (2)	#8–32x½"Fil.Hd.Iron Screw (Cadmium plate)
159	Pivot Screws (2)	9P232
160	Pivot	

bulb and immerse it in water above 160° F. to obtain forward flow.

ROUTINE MAINTENANCE OF SHORT TIME PASTEURIZER TEMPERATURE CONTROL SYSTEMS

It is well to establish a routine for periodically checking over vital points in a short time control system. Even though unsatisfactory performance of any kind has not been experienced, there are definite benefits to be derived from what might be termed "precautionary service."

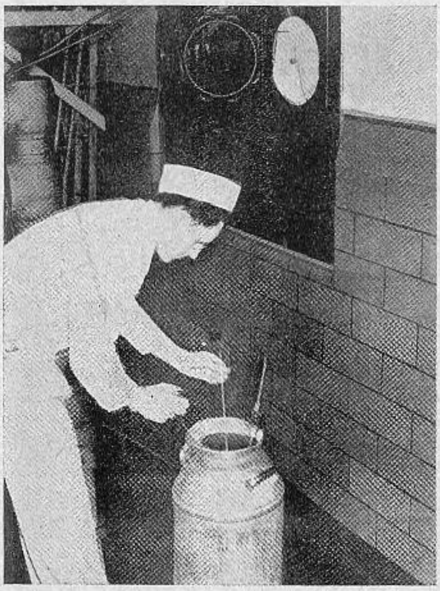


FIGURE 4

The following procedure is recommended:

A—Clean air valve in pressure controller.

B—Blow out all air filters (recommended as a daily operation).

C—Clean air valve in temperature controller B.

D—Check accuracy of Safety Thermal Limit Recorder pen. A regular 40 quart milk can makes an ideal test bath for this purpose. Place can at same elevation at which bulb is located in service. A steam hose is useful to bring the water up to temperature. See Fig. 4. Fully immerse the bulb along with a test thermometer of known accuracy. Vigorously agitate the water with a wooden paddle or similar stirring device, and after a period of at least 2 minutes, or until the recorder pen comes to rest, compare the pen indication with that of the thermometer. Quickly reset the pen position to agree with the temperature indicated by the standard thermometer by means of the micrometer screw provided on most makes. For best results this operation should be carried out by two persons, one reading the test thermometer and stirring while the other adjusts the recorder. An etched stem thermometer made according to specifications of the U. S. Public Health Service is made especially for this purpose. It is calibrated for 4″ immersion with a range of 138° to 165° F. graduated in 1/5° divisions. For testing at temperature above and below this range, use a general test thermometer with a range of 30° to 220° F. in 1° divisions.

E—Check condition of rubber disc rings in Flow Diversion Valve and replace if wear is evident. Leakage through forward flow port will be indicated by milk running down the body from leak detector balls when valve is in diverted position.

F—Examine all air piping connections for leaks.

UNSATISFACTORY PERFORMANCE TRACEABLE TO CONDITIONS AND INSTRUMENTS

(See specimen chart, Fig. 5.)

Lag in Reaching Final Milk Temperature

A—If milk temperature becomes slower in reaching that required to cause the Flow Diversion Valve to assume a forward flow position, it is probably due to insufficient steam pressure. Particularly is this true if, after reaching the forward flow point, the milk temperature suddenly drops causing diversion, and then again repeats this performance.

Wandering of Final Milk Temperature

B—"Wandering" of milk outlet temperature can sometimes be accounted for in several ways. The milk flow should be checked to see that it is steady. A change in head of the raw milk supply, if too great, will cause variations in the milk flow rate which will be reflected in the final milk temperature, as shown on the Safety Thermal Limit Recorder chart. Another possible contributing factor may lie in the air supply to the controllers. This should be constant, within 1 lb., and if it varies more than this, the operation of the temperature controller may be adversely affected. Sudden changes in milk inlet temperature may also cause a disturbance in final milk temperature.

Continuous Fluctuations of Final Milk Temperature

C—"Hunting" or rapid fluctuation of the final milk temperature may be due to too high a steam pressure, or may be accounted for by erratic action of the pressure controller itself. For best operation, the steam pressure should be *steady* and should not be more than about 5 lbs. above that required when the unit is operating with regeneration. A cleaning of the air

(Continued on page 309)

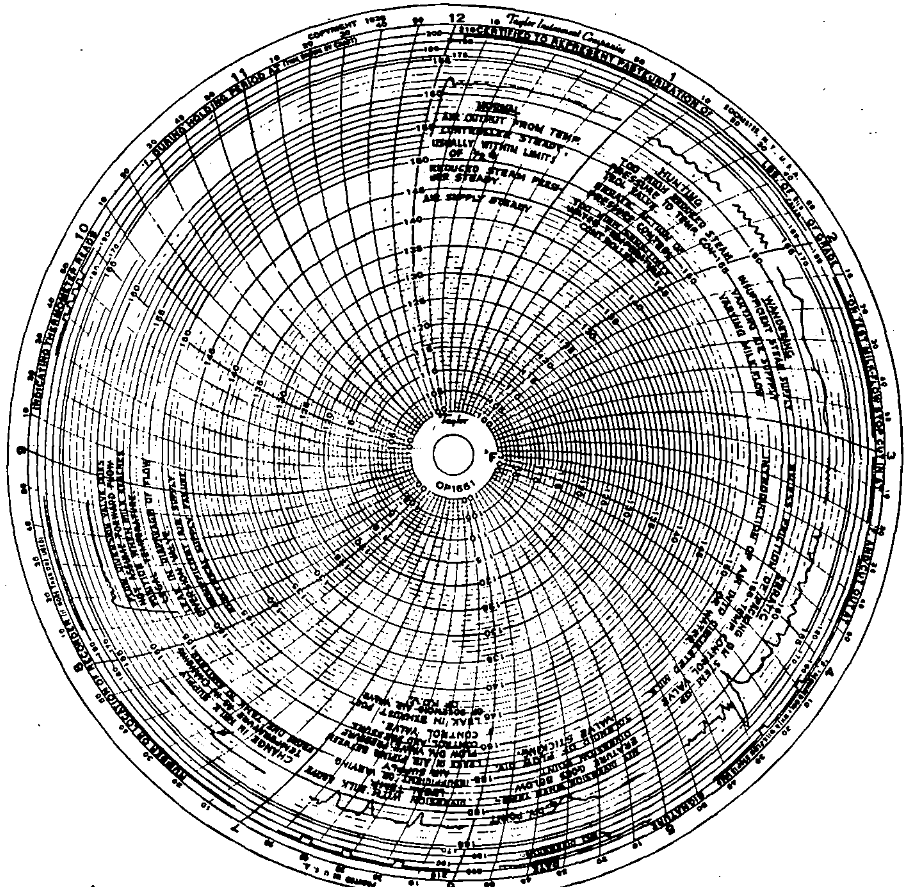


FIGURE 5
Illustrative Chart—Various effects in connection with short-time pasteurization of milk.

The Trumbull Electro-Pure Pasteurizer

A. M. Palmer

Trumbull Electric Mfg. Company
Plainville, Connecticut

The Electro-Pure Pasteurizer utilizes the method of pasteurizing generally known as high-temperature short-time, in which every particle of the fluid being pasteurized is heated to a temperature of 160° F. or more, and maintained at such temperature for at least 15 seconds.

The various types of equipment using the high-temperature short-time method may be divided into two groups as regards the heating process, one group using electricity and the other using hot water.

The Electro-Pure, as implied by its name, uses electricity. The essential parts of this equipment are the electrode chamber where the milk is brought up to the desired temperature, and the automatic electrical control which operates to maintain a constant temperature at the desired point, regardless of ordinary fluctuations in power supply or the variations usually found in the raw milk supply, such as changes in temperature, mineral content, or butter fat. The pasteurizer is designed as a complete unit, and in addition to the electrode chamber and the control includes:

A plate regenerator giving an added economy of operation by effecting a heat exchanger between the cold raw milk and the hot pasteurized milk.

A plate cooler giving rapid and efficient cooling of the finished product.

A ballast tank which regulates the flow of raw milk to the unit from the supply tank, and insures a constant head on the milk pump.

A motor-driven, positive type milk pump which sucks the raw milk through the regenerator and pushes it through the rest of the system at a steady, constant flow.

A tubular holding section designed and engineered to accomplish the required holding period.

A recording thermometer equipped with flow diversion control. An all-electrically operated flow diversion valve in which the metal parts of the valve are all stainless steel.

The cabinet to house the control, and the necessary piping to connect the previously mentioned parts into one complete unit.

Although not widely known until recent years, electric pasteurization is not a new idea. A complete history would take too much time, but it is interesting to note that electrical pasteurization was performed in England by J. M. Beattie and F. C. Lewis in 1911, and that in 1914 two electric pasteurizers were in operation in the United States.

These early electric pasteurizers showed the need for an automatic temperature control and a means to prevent underheated milk from being bottled. Improvements were gradually made until in 1937 a new unit, the Trumbull Electro-Pure, appeared. This unit incorporated a constant rate of flow, an automatic electrical temperature control, and a contact thermometer to stop the milk pump as a means to prevent underheated milk from being bottled. In 1939 the contact thermometer was discarded and the flow diversion valve method adopted.

Since that time the equipment has remained basicly the same, but there have been some refinements made that not only are improvements from a public health standpoint, but the unit has been streamlined which has made for greater ease and economy of operation, such as developing the automatic-key all-electric flow diversion mechanism, increasing the possible hourly capacities of the units, and grouping the parts closer together to form a more compact unit, with all controls and all parts housed from one cabinet on one base. It is this "unit type" Electro-Pure that I would like to describe to you today.

Tracing the flow of milk through the unit, it starts at the ballast tank which contains a ball float valve controllng the flow of milk from the storage tank and maintaining a constant head. From the ballast tank it is sucked through the raw regenerator plates by the positive type motor-driven milk pump. From the pump it is forced through the rest of the system, passing through the electrode chamber, where the heating takes place, and then through the holding section to the flow diversion valve. Just upstream from the flow diversion valve and at the end of the holding section, the milk passes an indicating thermometer and a recording thermometer. The recorder makes an inked record of the temperature at the end of holding time and also activates the flow diversion mechanism to either forward or diverted flow, depending upon whether the temperature at this point is above or below 160.5° F. If below 160.5° F., the valve automatically acts to divert the milk to the raw supply. If above, the valve acts to send the milk forward through the pasteurized regenerator plates and the final cooling plates, and to the bottle-filler or other equipment as desired.

Now to go back to the electrode chamber. This is where the milk is heated as it passes through the chamber, and is one of the major differences between Electro-Pure and all other types of high-temperature short-time equipment. An alternating electric current is passed through the milk as it

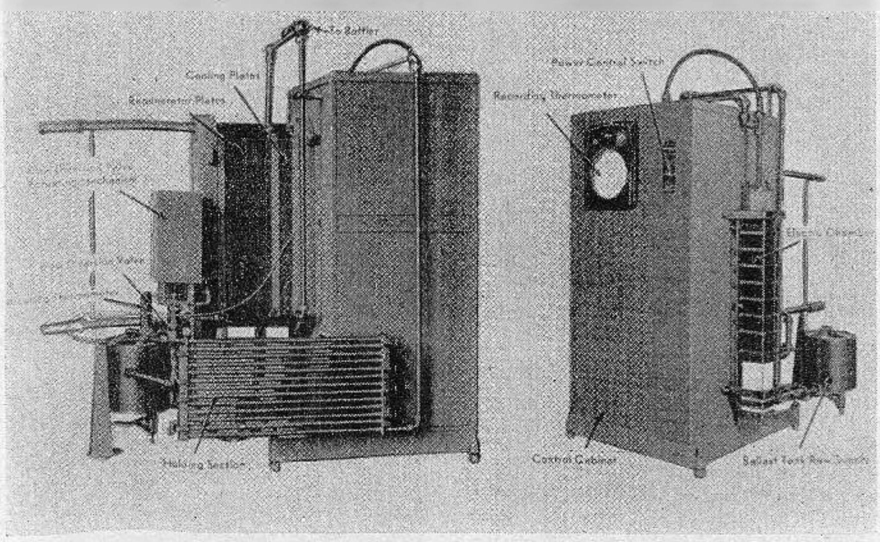


FIGURE 1
Electropure Pasteurizer

travels upward between the carbon electrodes, and due to the resistance of the milk to this passage of current, the milk is heated within itself, instantly and uniformly through all portions, and to the correct amount. Due to this method of heating there are no heating surfaces or so-called hot surfaces; the hottest point in the entire system is the milk itself while it is passing through the electrode chamber. Consequently there is no danger of cooked flavor in products using this method.

Water is kept running over the outer surface of the carbon electrodes. This is not a cooling water, but rather a wetting water to insure even distribution of electrical energy over the entire carbon electrode. Only enough water is needed to wet entirely the outer surface of the electrode, and this water may be any temperature up to 100° F.

If we were to look at a section of the electrode chamber taken at the top of the core, we would see the rectangular opening in the center through which the milk passes. Two sides of this opening are formed by the carbon electrodes, and the other two sides by the glass pieces which insulate the carbons from each other. Then there is the water inlet from which water is sprayed on the backs of the electrodes and the carbon supports in the water passage, which add strength to the electrodes.

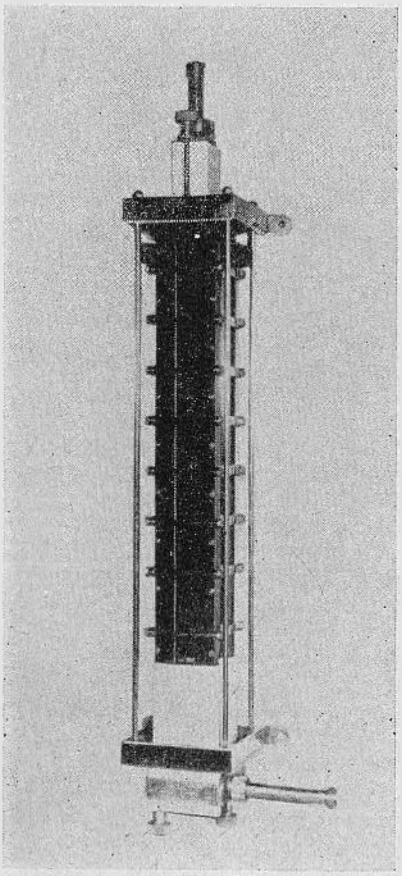


Figure 2
Electrode Chamber—Side View

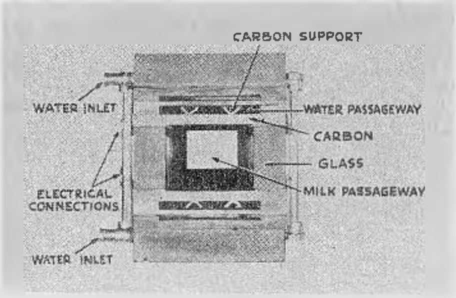


Figure 3
Electrode Chamber—Section View

In Electro-Pure the temperature control is achieved by measuring the actual temperature of the milk itself immediately as it leaves the electrode chamber. This is done by what is called a bulb and bellows—actually another form of a thermometer, except that instead of indicating temperature on a dial or recording it on a chart, it acts to expand a bellows and by so doing instigates a change in the electrical control which is immediately effective in changing the power passing through the milk in the electrode chamber. It is through this method of sensitive and extremely rapid electrical response to any change in temperature that the highest precision of control is achieved in maintaining the temperature at the correct point. This control is entirely automatic and requires no auxiliary equipment.

The holding section is composed of a number of sanitary pipes welded into headers and equipped with manifolds, so that the milk travels through it to the flow diversion valve. This holding section is designed so that it will take the milk at least fifteen seconds to travel through it from the point of final heating to the flow diversion valve.

The flow diversion valve is operated by an electric solenoid. Of course, in normal operation this mechanism is controlled by the activating mechanism in the recorder which sends power to the solenoid at 160.5° F. ascending temperature, and cuts power off at the same point on descending temperature. The entire mechanism is normally protected with a cover which is sealed.

In order to wash the valve after the day's run when the rest of the unit is dis-assembled, the key is pulled, disconnecting the mechanism shaft from the valve shaft. When the valve is reassembled and placed in position, these shafts remain disconnected until the power is turned on to start operation. Then the auto-key mechanism goes into action. When the key is out and power is turned on the unit, the micro switch acts to send power to the solenoid, but cuts off power from the electrode chamber and the pump motor. This brings the mechanism shaft down to the correct key engaging point, the key slides into place of its own accord. This key movement changes the micro switch so that power is now cut off the solenoid and sent to the electrode chamber and pump motor. This is assuming that any fluid in the unit is under 160.5° F. Pulling the key while fluid is above 160.5° F. will result in the same action, except that power is always on the solenoid before and after the key is pulled, due to the action of recorder control above 160.5° F.

Briefly, the power will be turned off the electrode chamber and pump motor, stopping flow whenever the key is pulled, and the mechanism will be in position for self-engagement of the key when it is released. Electric solenoid actuated flow diversion valves are entirely automatic and require no auxiliary equipment.

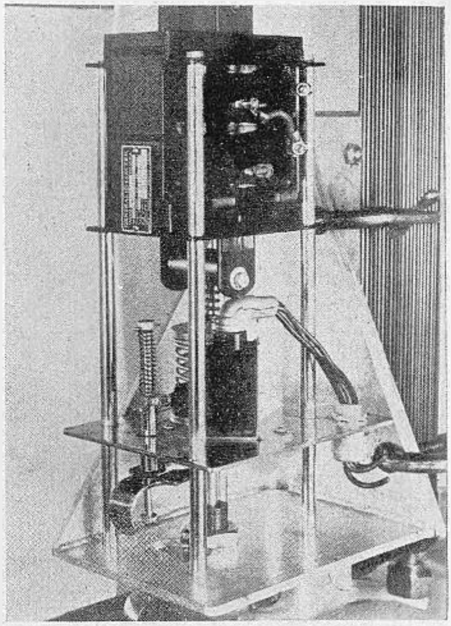


FIGURE 4

New Type of Electro-Pure Diversion Valve Mechanism

Electro-Pure equipment will pasteurize milk, chocolate milk, ice cream mix and heavy cream.

We have an actual installation of two Electro-Pure Cream Pasteurizers synchronized with the output of two De Laval Separators at P. W. & C. V. Dake Company, Saratoga Springs, N. Y. These pasteurizers have been known to operate twenty-two hours a day continually for weeks, stopping only long enough each day to wash up and start over again.

Single Electro-Pure units are manufactured in capacities from 150 gallons per hour up to 900 gallons per hour, and may, of course, be installed in any multiple combinations of capacities.

Steam High-Temperature Short-Time Pasteurizers

DALE GILLESPIE
The Creamery Package Mfg. Company
Chicago, Illinois

THE operation of a steam high-temperature short-time pasteurizer is more easily explained by the use of a schematic flow diagram. (See attached flow diagram.) While this flow diagram was made up to cover a Creamery Package full-flow short-time pasteurizer, the flow of the milk is similar in all other types of steam-plate pasteurizers. The raw milk is sucked from a small supply tank located below the level of the machine, through the regenerator, to the positive raw milk pump. The milk is pushed from this raw-milk pump through the heater section into the holder tube. The milk passes through the holder tube to the flow diversion valve, which is nothing more than an air-operated three-way valve.

If the milk is under 161° F. when it reaches the end of the holder tube, it is automatically diverted back to the raw-milk tank and put through the unit again. If the milk is over 161° when it reaches the end of the holder tube, it is forced through the pasteurized milk side of the regenerator and on through the cooler section, from which it is discharged to the line feeding the bottler or storage tank.

Water which is preheated by steam is circulated on the sides of the plates opposite the milk in the heater section. This hot water is usually 2° above the final temperature of the milk, and since it is at a pre-controlled temperature, the final milk temperature will be indirectly controlled. Cooling is accomplished by circulating a cooling medium such as brine or refrigerated water on the opposite side of the cooler-plate. This cooling medium is automatically controlled in the case of brine. Since the differential between the brine and the milk is very small, this results in a controlled milk temperature.

The only difference between steam pasteurization and Electropure pasteurization is in the method of heating. With modern control instruments, accurate control can be expected from either unit. Ordinarily, control within 0.2° above or below the set point can be expected.

Steam offers many advantages as a heating medium in the processing of milk through a high-temperature short-time pasteurizer. The biggest single advantage is the lower operating cost for heating. The familiarity of the plant personnel with steam, which is normally used as a heating medium also makes it desirable.

Steam is normally required in a plant for the operation of the bottle washer, can washer, and for heating other products which cannot be satisfactorily processed in a short-time high-temperature pasteurizer. The high-temperature short-time pasteurizer usualy represents one of the smaller loads in the plant, and use of steam for this pasteurizer works out advantageously without greatly increasing the boiler capacity.

The enthusiasm for something new and the sales promotional work which normally accompanies any new piece of equipment has resulted in many plant operators believing that the high-temperature short-time pasteurizer is the answer to all their processing problems. Unfortunately there is no single answer to plant processing problems.

ADVANTAGES AND DISADVANTAGES

Along with its many good features, high-temperature short-time pasteurization has definite limitations. Many plant operators have installed a high-temperature short-time pasteurizer only to find that they have acquired another piece of equipment to maintain and clean without eliminating a single piece of the equipment which they formerly used for processing milk. While it is not possible to draw up an exact formula to determine when a short-time pasteurizer should be used and when it should not be used, we shall attempt to give some of the limiting factors which should assist the plant operator in determining whether a high-temperature short-time pasteurizer is desirable.

A high-temperature short-time pasteurizer is most satisfactory when operated at a steady flow rate. Frequent shut-downs or operation at reduced capacity result in a lower cream volume and in over-heating of the milk. In plants which lend themselves to high-temperature short-time pasteurization operations, almost all of the shut-downs or periods of operation at reduced capacities can be eliminated by intelligent planning of the processing.

Steady capacities are not always easy to maintain where a single filler is used to fill a large number of one-half pint and third-quart bottles as well as full-quart bottles. A machine that is engineered to operate satisfactorily when the bottler is handling quarts results in an over-capacity of milk when the plant is filling one-half pint, or one-third quart bottles. In some cases this difficulty can be overcome by arranging to fill cans of milk during the time when the one-half pint and one-third quart bottles are being handled by the fillers.

High-temperature short-time pasteurizers are ordinarily not as desirable where the milk run is very short. The longer the milk run on a short-time pasteurizer, the greater the saving that can be effected. While this is a generalization that can be applied to any piece of equipment, it is more apparent in the case of a short-time pasteurizer, where the clean-up time is the same whether the unit is used one hour or sixteen hours.

Ordinarily high-temperature short-time pasteurizers are not as adaptabe for very small capacities, since the clean-up time is almost the same for a 4,000-pound unit as the 16,000-pound unit. The plates in a short-time pasteurizer are cleaned by the circulation of a cleaning solution, so that the actual scrubbing time spent in brushing plates is very low. Most of the time required for cleaning a short-time pasteurizer is spent in assembling and disassembling the unit. Aside from the number of plates, the number of parts in a 4,000-pound unit equals those in a 16,000-pound, or larger, unit. In case of very short runs or in the case of very small units, the clean-up time on a high-temperature short-time pasteurizer will exceed that on a vat system of pasteurization.

A high-temperature short-time pasteurizer does not ordinarily lend itself to the processing of by-products. Buttermilk or other cultured products must always be handled in vats. While some plants are processing chocolate milk through a short-time pasteurizer, most plants are not satisfied with the product processed in this manner. The long hold at high temperature seems to improve the flavor of the product. The product loss in processing very small volumes of cream makes this operation undesirable with the plate-type unit.

In small plants, tanks are frequently used for many purposes. They may be used for holding the raw milk when it is received, and then for pasteurizing it. Following this, they may be used to set-up the buttermilk, which is bottled prior to the receipt of the milk on the following morning. After the regular run of milk, the tanks may be used for handling chocolate milk and cream. Since the milk, or other products, are pumped directly from the tank and through the cooler, they may be handled without the need of a pasteurized product surge tank.

When a short-time pasteurizer is used, it is necessary to have some form of a holding tank for the milk before it enters the pasteurizer. It is also necessary to have a pasteurized milk balance tank to hold the milk after it has been pasteurized. The type and location of tanks used for storage purposes ordinarily make their use impractical for other purposes.

Only after a very thorough study of each individual plant operation is it possible to determine whether a high-temperature short-time pasteurizer is adaptable. No set formula can be set up which will determine whether or not a short-time pasteurizer should be purchased. While a high-temperature short-time pasteurizer has certain limitations, they also have inherent advantages which have made them the popular piece of equipment that they are. The biggest single advantage is the completely automatic operation provided by controls which have proven thoroughly reliable.

Human errors and short-comings in controlling the processing are eliminated. The process is uniform from day to day and from hour to hour, when the unit is operated at the capacity for which it was engineered. When the pasteurizer is properly engineered and operated at its rated capacity, the cream volume will be uniformly large and the flavor of the raw milk will be unimpaired.

In plants which lend themselves to efficient short-time pasteurizer operations, substantial savings in refrigeration, fuel, and labor can be shown. Frequently the installation of a high-temperature short-time pasteurizer will eliminate the necessity for purchasing a larger boiler or additional refrigeration. The use of regeneration for heating and cooling results in the elimination of the water necessary for cooling. In areas where water is a problem, this saving will frequently outweigh all others.

The continuous operation of a short-time pasteurizer will speed up the bottling operation by eliminating interruptions between batches of milk. Where a batch system of pasteurization is used, the bottling operation is frequently shut down for a few minutes rest period. In a continuous pasteurizer such a shut-down does not occur because the pasteurizer would get ahead of the bottler. Actual field experience has shown that a reduction in the bottling time of milk usually follows the installation of a high-temperature short-time pasteurizer.

The labor savings resulting from the use of the short-time pasteurizer over the batch system is quite sizable when the run is long and the rate of flow is sufficiently high. Since the clean-up time is practically the same for small units, or for short runs, as it is for large units or long runs, this works to the advantage of plants where the more economical runs are possible.

MAINTENANCE

Since maintenance today is one of the most difficult and important problems, plants which own short-time pasteurizers should follow a definite service plan in order that they may realize the best possible service from their unit. While the instruction manual accompanying your machine is the best source of information on the proper care for it, special emphasis should be given to the following points.

When installing a new piece of equipment such as a short-time pasteurizer, have your plant engineer or plant maintenance man who is to be responsible for this piece of equipment present at the time the installation is made. Encourage him to ask questions so that he thoroughly understands the operation of each component part of the equipment.

Make certain that the instruction manuals are in the hands of the parties who will operate and service the machinery. You will find that the equipment manufacturers will be more than willing to give you extra copies of the instruction manuals should you need them.

Set up a regular maintenance schedule. Check the gaskets weekly. Recement any loose portion of the gaskets promptly. Use only the cement and the procedure recommended by the manufacturer of your equipment.

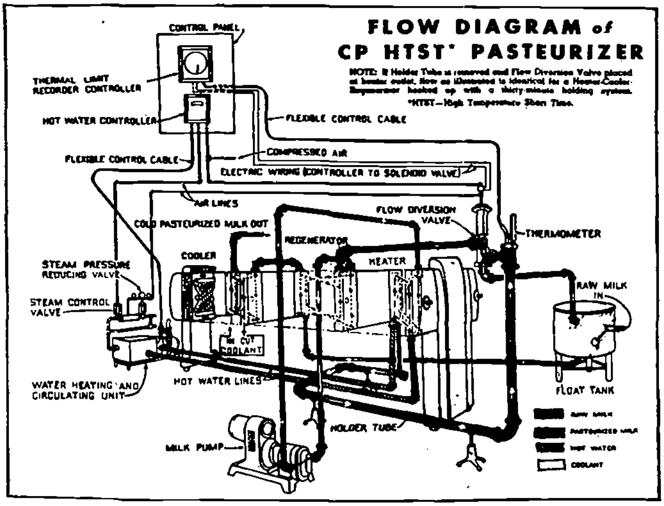
Many of the gaskets supplied today are made of synthetic rubber which requires special adhesives to cement them properly to the plate. The cement supplied for one manufacturer's gaskets may not be suitable for use with another manufacturer's gaskets.

Take out a service policy on your instruments. If this is not possible or if this service is not offered by the instrument manufacturer who supplied the instruments on your unit, have your maintenance man study the instruction manual carefully and give the instruments regular service himself. While the instruments supplied with short-time pasteurizers are very reliable, they do require a certain amount of service if they are to be maintained in satisfactory operating condition.

Reguarly wash the water and brine sides of the plate in your milk unit. Stainless steel will corrode if it is not kept clean and polished. Even with the most corrosive water or brine, very little trouble is experienced where the plates are cleaned daily. These plates may be cleaned by circulating the same milkstone remover used on the milk sides of your plate. Ask your manufacturer to give you definite instructions for circulating these plates.

If you have a brine cooler, keep the brine neutral or slightly on the alkaline side. Use a dichromate inhibitor in your brine. Keep all air out of the brine. Frequently the brine is dumped back into the brine tank above the level of the brine and a large amount of air is incorporated in the cold brine. This air makes the brine very corrosive. Excellent books on how properly to maintain brine are available from the Solvay and Dow Chemical Companies. These books are free for the asking and give detailed information on how to maintain properly the strength of the brine as well as how to reduce corrosive action.

Finally, above all else, do not be afraid to write the manufacturer of your equipment regarding any question which you may have on the proper maintainance or operation of the unit. Field men for equipment companies are constantly checking these units in the field and from their observations come new ideas on how to best take care of the units. If you have some particular problem which is causing you difficulty, possibly these field men have found the answer in some other plant, and the information would be available to you for the asking.



Cleaning and Sterilizing Short-Time Pasteurizers

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It is to be expected that the cleaning of a high-temperature short-time pasteurizing unit is a more difficult problem than cleaning a storage tank, a weigh tank, or a similar piece of dairy equipment. There are two obvious reasons for this: we are heating the milk to a higher-than-normal temperature and we are handling tremendous quantities of milk in the heating and cooling stage over a comparatively small area of equipment. The development of such new equipment as short-time pasteurizers invariably creates new problems in cleaning and sterilizing. Fortunately, the manufacturers of sanitation supplies have kept pace with the manufacturers of dairy equipment. A need was created for a foolproof method involving a minimum of labor and material to insure proper cleaning and sterilizing of the plate-type units. Before discussing this method further, however, it would be well to briefly consider the factors which contribute to the formation and structure of the deposit encountered on such pasteurizers. We can conveniently divide these into chemical factors and mechanical or physical factors.

Chemical Factors

Because of the difficulties experienced in investigating the type of deposit actually encountered under plant conditions, our Research Laboratories designed and built equipment to duplicate reasonably well the plate-type short-time pasteurizer. This equipment was so constructed that a deposit would be formed on stainless steel tubes which were then removed from the experimental unit and available for further study. Samples of the deposit were scraped from the tubing and subjected to an accurate chemical analysis. It was possible to make preliminary cleaning tests with such scrapings, or the tube could be replaced in the unit and treated by a cleaning procedure comparable to that actually employed in the plant. Also, the unit could be operated at the start by a process comparable to the holding method of milk so a direct comparison of the deposit could be made. By further modifications, the effect of water hardness, rinsing, composition of the milk, various cleaning and sterilizing compounds, as well as milkstone removers were thus determined with reasonable accuracy under laboratory conditions. This made it possible later to transfer the work to actual operating conditions in the plant to prove or disprove any ideas obtained from the laboratory investigation.

In these preliminary investigations, it was found that the type of deposit present on the short-time pasteurizer was quite different in composition from that encountered when the milk was pasteurized by the holding method. In the batch or holding method, the deposit consisted of organic and inorganic substances held together and to the equipment by the adhesive characteristics of the casein in the milk. Removal of the casein binder would thus bring about a disintegration of the entire deposit so that mild brushing would effectively remove the entire contamination. Where the equipment had been previously handled with ordinary cleaning compounds, particularly in hard water, the deposit would usually contain a higher-than-normal mineral content. A deposit of this sort would respond more readily to treatment with the proper type acid-base milkstone remover.

In the short-time pasteurizer, the normal type of deposit would consist of organic and inorganic substances but comprised mainly of casein salts which were produced undoubtedly by chemical reaction between the casein and minerals in the milk. Calcium caseinate would predominate; in fact, formed a substantial part of the deposit. Calcium caseinate is not readily soluble in most alkaline solutions and particularly so in those which could be economically and efficiently applied to the equipment under practical operating conditions. When treated with ordinary acid products alone, effective removal was not accomplished because, while the acid solutions would break up the casein salts, it would generally form from it a free casein deposit which was not particularly affected by the acid treatment alone.

Further tests and studies, later confirmed by actual plant runs, resulted in the development of a double operation which is now almost universally accepted as the proper treatment to bring about perfect cleaning of plate-type short-time pasteurizing units. The initial treatment consists in the application of the proper temperature, concentration, and time of contact, and a special milkstone remover which, while acidic in nature, contains adequate wetting properties, solvent characteristics, and ingredients to insure ready contact, penetration, and solution of the deposit. This prior treatment decomposes the calcium caseinate and other complex, organic salts, leaving it in such a condition as to permit practically complete removal by the subsequent or second treatment. The second treatment is the application of an alkaline type milkstone remover which not only contains necessary water-softening powers but further possesses unique wetting action, peptizing, emulsifying, and deflocculating characteristics. Properly applied, with the right compounds, this double treatment results in a surface which is so free of any deposit that subsequent brushing is seldom necessary and then serves more as a check during the inspection of the plates.

That the dual application saves both time and labor can be well demonstrated by use of the products in a single treatment and subsequent examination of the surface. Where the acid-type milkstone remover is used by itself, the organic contamination can be removed by brushing. This brushing operation, however, is not only difficult but very time-consuming, and because of the large number of plants involved, quite impractical—today more than ever before. Application of the special alkaline milkstone remover by itself brings about an action on the organic matter but leaves an objectionable film or deposit which defies any normal brushing operation. Harsh abrasives, scrapers, and mechanical treatment of that sort are generally necessary where only an alkaline milkstone remover is used. The same unit treated the following day by the double method gives results which are well nigh perfect.

PHYSICAL FACTORS

The physical factors which play a part in the type of deposit formed can sometimes be controlled and sometimes not. For example, the final temperature to which the milk is heated. It has been mentioned previously that milk heated to 165° F. produces a different type of deposit than when milk is heated in the same plate unit to 144° F. The rate of heating is likewise a factor. Slowly heated to 163° F., a different type of deposit is produced than when the milk is rapidly heated to 163° F. The actual area of surface in contact with the milk during heating and cooling is another factor. In plate-type units the ratio of surface area to gallons of milk differs greatly from the ratio of surface to milk in the holding method. A tremendous volume of milk handled in a limited area of equipment in a plate-type unit not only creates a greater amount of deposit at the end of each day's run but the deposit itself will frequently be stratified —will consist of several layers of varying composition.

The rate of flow of milk through the unit affects the type and amount of contamination produced. A relatively slow rate of flow gives a heavier deposit which is more uniform in composition over the entire surface of the plates. As the rate of flow increases, less total deposits results but a heavier deposit will generally form on the sides and corners of the plate where the resistance to the flow is greater. There is a tendency for the deposit to be mechanically pushed away or eliminated from those places where the flow is fast and later deposited in those places where the friction is greater and the flow of milk has slowed down.

CLEANING PROCEDURE

These and many other factors have been carefully studied, first in the laboratory experimental unit and then when promising results were indicated, actually carried out in the plant where the short-time unit is operated. This two-fold investigation has resulted in the development of a cleaning procedure that has given eminently satisfactory results in hundreds of plate-type pasteurizing units in all types of hard-water conditions. The important steps in this cleaning procedure may be conveniently summarized as follows:

1. Immediately after handling the milk, disconnect the flow diversion valve and shut off the hot water pump.

2. Circulate cold water through the unit by filling the surge tank with water from the hose and keeping the surge tank overflowing with the cold water. Allow the water to run onto the floor as it comes from the unit. Continue this procedure until the rinse water is free of any traces of milk and the entire unit is cooled down to room temperature.

3. Shut off the flow of cold water to the surge tank and heat the water in the tank to 135–150° F. with a steam hose. Arrange the equipment so that the solution from the unit, which formerly drained to the floor, is circulated back to the surge tank.

4. Add the special acid-base milkstone remover at a concentration of from one pint to one quart to each 40 gallons of water used. The strength to use will depend upon the condition of the plates, the amount of milk handled, and other factors. Enough of the special milkstone remover is used to give the proper concentration to the water contained in the surge tank, as well as that contained in the unit between the plates and in the various connected pipes and pumps.

5. Circulate the milkstone removing solution through the equipment for from 30 minutes to 1 hour. The solution should be maintained at the initial temperature by hot water in the plates. However, at the start the steam hose should be used to bring the solution up to the proper temperature rather than heating it through the deposit on the plates. The use of an ordinary centrifugal-type pump is highly recommended for circulating the cleaning solution. The precision-type milk pump usually employed for handling the milk is lubricated by the fatty matter in the milk and might be damaged through lack of lubrication in the milkstone removing solution.

6. After the milkstone removing solution has been circulated for the proper length of time, overflow the water in the surge or balance tank with hot water from a hose. This will remove the scum and accumulated contamination from the surface of the solution. After the surface contamination has floated off the solution, the outlet pipe from the unit should be removed so that the warm rinse water will be pumped from the balance tank through

the plates and onto the floor. This rinsing should continue for 10 to 15 minutes.

7. Turn off the hot water hose and replace the outlet pipe to the balance tank so that the solution can again be circulated. Add the special alkaline-type milkstone remover to the tank, using 2 pounds for each 40 gallons of water. This solution is heated with a steam hose to 135–145° F.

8. The special alkaline-type solution is circulated through the unit for from 30 minutes to 1 hour. The temperature is maintained at 135–145° F.

9. Force the alkaline solution from the unit by placing cold water in the balance tank and removing the outlet pipe from the unit. Continue circulating fresh cold water through the unit until the plates are cooled down to at least room temperature.

10. Dismantle the pipe lines and open the unit for inspection. A mild solution of alkaline cleaner is prepared in a bucket. The plates are brushed with this solution where necessary. Proper operation of the treatment with proper selection of the products used will produce results so that at best only very light brushing is required, and in most cases a rinse with a hose will remove the last traces of the softened contamination.

11. Rinse the plates thoroughly with warm water. The unit is then reassembled, ready for the sterilizing treatment the following morning.

Where conditions permit, it is of definite advantage to circulate the acid-type solution through the water side of the plates in both the heating and final cooling sections. This treatment will prevent the build-up of even a slight amount of rust film or water scale which naturally interferes with the efficient transfer of heat or refrigeration. With some units a by-pass arrangement is available which makes it possible conveniently to circulate the solution in this way. With other units, special hook-ups are necessary.

If the cooling section of the unit is operated with brine instead of cold water, the brine should always be drained before circulating the hot cleaning solutions. Brine is generally quite corrosive to stainless steel even at low temperatures. If left between the plates during the treatment with the hot milkstone removers, the corrosive action is increased many times and severe difficulties are apt to be encountered. Drain the brine from the unit, rinse it with fresh water where possible, and then circulate the special milkstone removing solutions through the brine section.

STERILIZING PLATE-TYPE UNITS

The sterilizing of short-time pasteurizing units does not differ greatly from the sterilization of other types of dairy equipment. It is very important that the equipment be thoroughly cleaned before we can expect effective sterilization. This holds regardless of whether the equipment under consideration is a vat, a cooler, a pipe line, or a plate-type pasteurizer. The use of chlorine is generally recommended for sterilizing this equipment and is readily applicable in plate-type units as well. A solution of 100 ppm. available chlorine, or whatever strength is required by local health department regulations, is readily circulated through the unit. A sufficient quantity of the sterilizing solution is prepared so that five minutes contact time, the normal recommendation of most health departments, will result.

The temperature at which the chlorine sterilizing solution is used brings in one precaution as compared with sterilizing a weigh tank or vat. With chlorine sterilizers of the quick-acting type, the solution is generally used at room temperature as it is practically as effective in a cold solution. With the short-time pasteurizer, however, the temperature of the chlorine solution must be maintained at the same temperature which is used in handling the milk. This permits the flow diversion valve to remain open so that the solution will flow through the unit, as will occur when handling milk. If the chlorine solution is used at a low temperature, the flow diversion plate-type valve would cut in, causing the solution to be by-passed back to the balance tank and thereby keep it from flowing through to the cooling section of the unit.

Because of the high temperature necessary with the chlorine sterilizing solution, it is important that one be selected which is not only stable at the temperature used but which is also completely non-corrosive to stainless steel and other metals involved in the equipment at the temperature and concentration employed.

PIN POINT BACTERIA

The plate-type pasteurizer, like any other piece of dairy equipment, may be a source of contamination unless properly cleaned and sterilized. This is particularly true in the case of thermoduric or heat-resisting organisms. While it is possible to destroy such organisms with steam or hot water methods of sterilization, such treatment frequently involves many practical operating difficulties. Steam and hot water leave much to be desired when used for sterilizing plate-type pasteurizers. One common fault in the use of hot water for sterilizing, for example, is the failure to maintain the water hot enough to destroy bacteria throughout the entire unit. While it is a simple matter to use the heating section of the plate unit to heat the sterilizing water up to 165 or 175° F., many operators fail to take into consideration the fact that this is the temperature of the water only at the heating end of the unit. Temperatures will be considerably lower in the other sections just as the temperature of the milk is lower when it is handled in these sections. It is generally recognized that it is necessary and important to sterilize preheating, regenerative, and cooling sections of the plate-type unit as well as the heating section. When the chlorine method of sterilizing the unit is employed, it is only necessary to have the temperature of the chlorine solution up to 161° to 165° F. at the flow diversion valve.

Another perhaps more important matter to consider is the resistance of thermoduric organisms to destruction by heat alone. Tests now being conducted at various Agricultural Experiment Stations and not yet published have shown that a temperature of 170° F. in contact for one hour will not destroy certain resistant types of thermoduric organisms. Treatment of the same strain, however, with chlorine at the normally recommended concentration and time of contact brought about complete destruction. Further, the organisms used in these studies show a tendency to develop immunity to treatment by heat. Evidence so far available indicates quite conclusively on the other hand that no such immunity is developed towards chlorine.

The cleaning and sterilizing of electric-type units has also been carefully studied. With these special units it has been shown that the type of deposit produced is generally of such a character that circulation of a solution of the special acid-base milkstone remover will properly take care of conditions without the use of the alkaline milkstone remover. With the special acid milkstone remover, which is extensively used in many plants, a concentration of one-half pint to nine gallons of water gives a solution of the proper electrical characteristics. Nine gallons of the solution are sufficient to accomplish circulation through the unit. The sterilizing solution prepared from the special non-corrosive, stable, quick-acting chlorine sterilizer is made up at the rate of 6 ounces to 9 gallons of water. This solution also has the necessary electrical characteristics to bring about effective results in the electric pasteurizer. It also, of course, has proper germicidal strength to destroy bacteria.

New Books and Other Publications

Tests for Formaldehyde in Milk, by D. W. Horn. Wagner Free Institute of Science, Philadelphia 21, Pennsylvania. 12 pages. 1944.

This monograph reports a study of the relative sensitiveness of five different tests for formaldehyde in milk as influenced by dilution. The author calls attention to the fact that methanamine yields formaldehyde in the presence of free acid, and he shows how combinations of these tests can be used to overcome the conflicting effects of nitrate additions.

The Chemistry and Technology of Food and Food Products. Prepared by a group of specialists under the editorship of Morris B. Jacobs, Ph.D., Senior Chemist, Department of Health, City of New York. Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N. Y. Set of 2 volumes. Volume I—xviii, 952 pages, 79 illustrations and 218 tables—Ready. Volume II—about 950 pages, with many illustrations and tables—Ready September. Price for the set of 2 volumes, $19.00; Price for individual volumes, $10.50.

The volume under review constitutes the first part of an exhaustive treatment of the chemistry and technology of food and food products. The whole field is broken down into 48 chapters, of which 23 are published in the first volume. Forty-one collaborators cover the various phases of the subject matter.

The publishers announce that the two volumes are divided into a total of six parts. In volume I, the first part, on fundamentals, deals with the aspects of food chemistry which are common to all foods. The second part concerns the descriptive aspects of particular food groups, and includes some account of the history, statistics, definitions, standards, composition and chemistry of these food groups. In volume II, part three, unit operations and processes applicable to most foods will be described. Part four will deal with the maintenance of sanitary and quality control of foods and food products. In part five, the principal methods of preserving foods will be delineated. Part six will be concerned with production methods for the principal foods. Throughout the entire book, the role played by adequate nutrition in modern life is stressed.

The first volume is available now. The chapter dealing with the fundamentals gives a condensed picture of modern aspects of organic chemistry and biochemistry in relation to the food field. Physical chemistry, Carbohydrates, Lipids, Amino acids, Enzymes, Vitamins, Hormones, Mineral and Coloring Methods, are the main sections. Part II, Foods, gives a well organized treatment of many possible types of foods and food products, and coordinates widely scattered material from official, scientific, and technical literature. Special emphasis has been placed upon a collection of maximum, up-to-date, numerical values, which are collated in 218 tables. An exhaustive subject index of 50 pages facilitates access to this wealth of factual information.

The second volume is promised by the publishers for September of this year.

Lists of foods treated: Milk, Cream and Dairy Products—Meat and Meat Products—Fish, Shellfish and Crustacea—Poultry and Eggs—Edible Oils and Fats—Cereal Grains—Baking and Bakery Products—Vegetables, Mushrooms, Nuts and Fruits—Carbohydrate and Sugar Foods—Confectionery and Cacao Products—Coffee and Tea—Flavors, Spices, and Condiments.

The Microbiology of Foods, by F. W. Tanner. Published by Garrard Press, Champaign, Ill. 1944. 1196 pages. $12.50.

This is a re-written edition of the author's earlier work and much smaller book. Every chapter (except one) carries numerous references to the voluminous literature, and usually a list of reference books. The literature references total over forty-nine hundred and the books, over one hundred forty (although this figure includes some duplications). Out of the total of 26 chapters, 8 deal with milk and its products, constituting 344 pages out of the total.

The chapters discuss the microorganisms that are commonly associated with almost all of the common foods, often the effect of food processing on the flora, and always detailed micro-organic laboratory procedure (both official and otherwise) for determining or measuring the types and/or numbers of organisms present. Sometimes biochemical methods are given, as for example, the reductase and the phosphatase procedures, for determining what might be called the microbiological quality of the food. Determination of mold content might be called physical tests.

A long chapter (80 pages), contributed by Dr. F. W. Tanner, Jr., presents a full discussion and laboratory methods for the microbiological determination of the various water-soluble vitamins.

A final chapter of 66 pages discusses the composition and usefulness of many media used in microbiological studies of foods.

This treatise is a veritable mine of information on the microbiology of foods. The discussion is clearly and interestingly written, yet succinct and definite. Inasmuch as it carries an elementary presentation of food technology, this book is an excellent companion volume to more formal food technology texts.

JOURNAL OF MILK TECHNOLOGY

Official Publication of the

International Association of Milk Sanitarians

(Association Organized 1911)

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Association News

Associated Illinois Milk Sanitarians

The Associated Illinois Milk Sanitarians are planning to hold their Annual Fall meeting in conjunction with the Annual Conference of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS at the Hotel LaSalle, Chicago, on November 2, 3, and 4. No formal program is being arranged but the annual business meeting of the Association will be held at that time.

P. E. RILEY,
Secretary-Treasurer.

California Association of Dairy and Milk Inspectors

The California Association of Dairy and Milk Inspectors met in annual convention at the Pasadena Athletic Club, September 12 and 13. A school of instruction for state and local dairy inspectors, in accordance with the requirements of the state Agricultural Code, was held on the first day, followed by banquet and business session in the evening. The next day papers were read and a panel discussion was conducted on many phases of the activities of milk inspectors. J. H. S.

Connecticut Association of Dairy and Milk Inspectors

EDWIN G. WOODWARD

Edwin G. Woodward, Dean of Agriculture and Director of Agricultural Extension Work at the University of Connecticut, died July 7, at the Municipal Hospital in Hartford, Connecticut. Mr. and Mrs. Woodward and grandson, Peter Hines (together with three other persons in a group from the University), all lost their lives as the result of the Barnum-Ringling circus fire in Hartford on July 6.

Mr. Woodward became head of the Dairy Department at the University of Nebraska, later at the University of Nevada and at Washington State College. He left Washington State to come to Connecticut as operator of Grassland Farms in Salisbury in 1922. His success in agriculture has been evident through the breeding of Grassland Guernseys which have become nationally known.

In 1934 he was appointed Dairy and Food Commissioner in the state and served until 1940 when he became Dean of Agriculture and Director of

Extension Work at the University of Connecticut.

His interest in agricultural activities, community, county, state and nationwide was shown through his many affiliations.

His continued success as Dean of Agriculture has been obvious in his efficient administration and the increase in agricultural interest throughout the state. We remember Dean Woodward as dairy farmer, Guernsey breeder, teacher, scholar, humorist, naturalist, executive, organizer, and a devoted farmer.

We cannot forget that Mrs. Woodward was a capable farmer's wife, loving mother, business partner, executive, scholar, and public servant.

We extol the many virtues of Dean and Mrs. Woodward, and feel their loss keenly.

H. CLIFFORD GOSLEE,
Secretary-Treasurer.

Iowa Association of Milk Sanitarians

Two very good one-day district conferences of our Association were held this month; the central and west district meeting in Ft. Dodge, July 14, and an east district meeting in Clinton, July 21. These mid-year conferences are popular and profitable. Each Sanitarian throws into the conference his progress and "headaches."

A surprising amount of progress in building and equipment was reported. Other subjects such as fall shortages, subsidies, vaccination of mature animals for Bangs, suggested changes in the state law, and other matters were discussed.

It was pointed out that farmers who sell herds at a high price now may find most of it taken by income tax. Before any herd is sold, the dairyman should ascertain from the Department of Internal Revenue the approximate income tax.

Dr. M. P. Baker, from the Department of Dairy Bacteriology, Iowa State College, has been on a year's leave working with the Sealtest System in the east and southeast. Home for a visit he attended the conference at Ft. Dodge and gave us a very interesting report on conditions he has observed.

Among the other items of progress reported at our two meetings were two new pasteurization plants, three plants remodeled, ten new dairy barns, 75 new milk houses, several new farm mechanical coolers, several new closed country trucks, new equipment in six or eight pasteurization plants, and several new installations of short-time equipment on order. It was encouraging to everyone to feel that there are some bright spots in the picture.

Another encouraging aspect is the increasing number of communities reporting 100 percent pasteurization of their milk supplies.

JAMES R. JENNINGS,
Secretary-Treasurer.

Michigan Association of Dairy and Milk Inspectors

During March, 1944, two week-long courses for milk sanitarians were held in Michigan at the University and at the State College. The subject-matter for both courses has since been printed in book form. Copies may be secured from Mr. H. E. Miller, University of Michigan, Ann Arbor, as long as the limited supply lasts.

The energetic and able secretary-treasurer of the Michigan Association of Dairy and Milk Inspectors, Mr. Harold J. Barnum, has resigned from his position with the Ann Arbor Health Department and is now representative for Calgon, Inc., of Pittsburgh, Pennsylvania, in the middle district of Michigan. This change has necessitated his resignation as *Chairman*, Dairy Farm Methods Committee of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS. At the request of the Board of Directors of the Michigan Association of Dairy and Milk Inspectors he is continuing as secretary-treasurer until the annual meeting on November 9 and 10. His address is 718 Soule Boulevard, Ann Arbor, Michigan.

Mr. John Veenstra, formerly in charge of milk and food sanitation with the Battle Creek Health Department, has succeeded Mr. Barnum as Chief Sanitarian for the Ann Arbor Health Department.

J. H. S.

Missouri Association of Milk Sanitarians

The Missouri Association of Milk Sanitarians held its 12th annual meeting on April 19–20, 1944, at the Dairy Department, University of Missouri, Columbia, Missouri. The dairy department of the College of Agriculture, the State Board of Health and the Missouri Association of Milk Sanitarians cooperated in conducting this meeting.

Speakers this year included members of the staff of the dairy department, the State Board of Health, and members of the Missouri Association. Mr. H. S. Adams of the Minnesota State Health Department was the outside speaker. Mr. Adams made an outstanding talk on the subjects of: (1) "Platform versus Farm Inspections in a Milk Control Program," and (2) "Integrating Milk and Food Inspection."

The attendance this year, in spite of travel and other conditions, compared favorably with attendance at the past meetings. A total of 81 were present.

A portion of the program was devoted to a discussion of food control and restaurant sanitation problems. Milk control and food establishment control are under the same administrative unit in a number of the cities in the state and considerable interest in food control work was evidenced by those milk sanitarians who are working with both programs.

During the meeting a suggestion was made from the floor that future meetings should include additional discussions of interest to those in charge of the food and restaurant sanitation programs. The discussion following this suggestion was favorable to including further material on this subject, though no official action was taken.

GLENN M. YOUNG,
Secretary-Treasurer.

Philadelphia Dairy Technology Society

The members of the Philadelphia Dairy Technology Society are looking forward to starting another successful year with the October, 1944, meeting.

In spite of transportation and food rationing difficulties, four well-attended dinner meetings were held during this past year. Under President Sampey's and Dr. Kelley's competent direction, the last two meetings were "Question and Answer" programs. The questions were sent in by the members, and leaders were selected from the membership to lead the discussion of each question. The result was some very lively and interesting debates. This type of program was so well received that it is believed that it will be featured again at the coming October meeting.

Election of officers for the year 1944–45 was held at the May meeting (see p. 300).

The following members were appointed subsequently by President-elect Kelly, to serve as Committee Chairman:

Chairman, Program Committee—Mr. Thomas Waddell, Philadelphia Milk Exchange;

Chairman, Membership Committee—Mr. Wm. P. Fusselbaugh, Harbisons Dairies;

Chairman, Reception Committee—Dr. F. Bruce Baldwin, Baldwin Dairies.

On Juy 10th, a letter was sent to all members from the new Officers, outlining tentative plans for the coming year, asking for program suggestions and preferences, and enlisting each member's active participation in the affairs of the Society.

HELEN A. SUTTON,
Secretary-Treasurer.

Wisconsin Milk Sanitarians Association

The first annual election by mail ballot of the Wisconsin Milk Sanitarians Association was held in May. A Nominations Committee appointed by K. G. Weckel presented a slate of candidates at the first annual meeting of the Association held at the University of Wisconsin March 30. As a result of the election, the officers for 1944–5 assumed office immediately. See list on page 299.

Mr. C. K. Luchterhand has recently transferred his association in state service as dairy inspector for the Department of Agriculture to the State Health Department. Mr. Luchterhand is engaged in educational and promotional work in production of clean safe milk in Wisconsin cities. In cooperation with the Wisconsin State Department of Agriculture and the University of Wisconsin, Mr. Luchterhand is also working with a number of Wisconsin communities at present without milk ordinances and where introduction of milk regulations are being considered.

SUPPLEE RESEARCH CORPORATION

Dr. G. C. Supplee, a former president of the International Association of Milk Sanitarians, has been selected to head an analytical and consulting organization, known as the G. C. Supplee Research Corporation with principal offices and laboratories in Bainbridge, New York.

"The organization provides for consulting and analytical and vitamin technology service to food, pharmaceutical and biochemical industries and institutions," Dr. Supplee, formerly associate director of research for the Borden Company, explained in a recent interview. He stated further that the group will also carry on developmental research independently. Pilot production of new products, adaptation of formulate, and appraisal of processing methods will feature the activities of the organization.

Dr. Supplee is known for his work in vitamin technology, biological research, and milk product technology. He is a pioneer in the study of dehydration and inert gas packing of desiccated foods and the irradiation of foods, particularly milk, with ultra violet light. He was among the first to isolate, and develop commercial methods for the production of natural riboflavin (vitamin B_2). He has also developed methods for the economical production and recovery of various milk by-products.

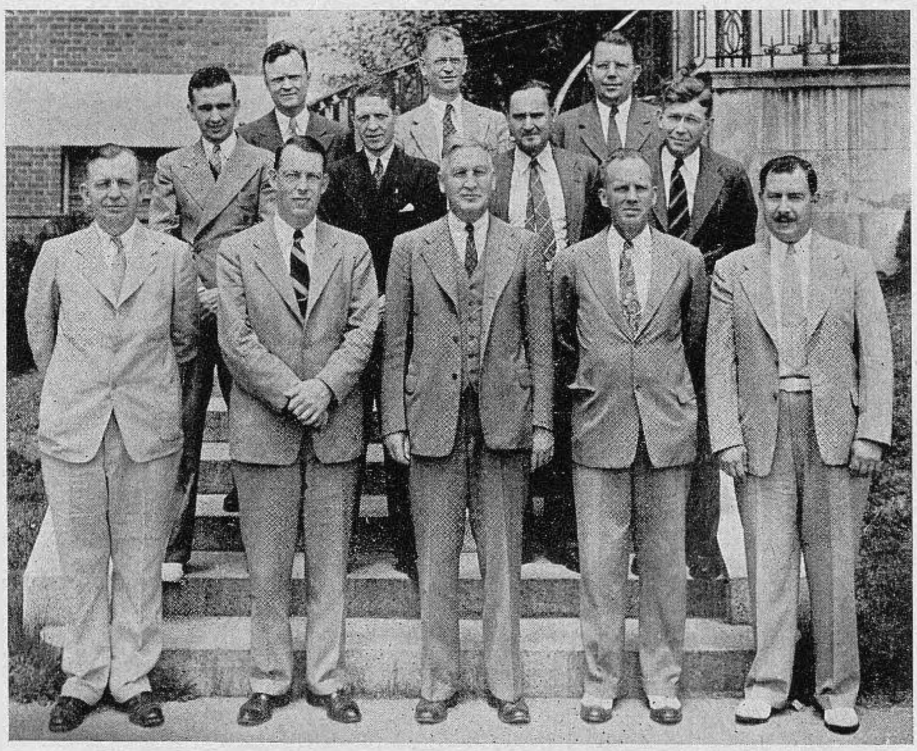
Mr. V. J. Ashbaugh, vice-president and secretary of the Durham Dairy Products, Inc., Durham, N. C., is executive vice-president of the new organization. Mr. C. B. Martin and Mr. Howard Hinton, president and treasurer of the same firm, are secretary and treasurer respectively for the Supplee Corporation. Mr. E. C. Rowe, Norwich, N. Y., formerly head of the legal department of the Borden Company is chief counsel and a member of the Board of Directors.

SHORT-TIME HIGH-TEMPERATURE MILK PASTEURIZATION CONFERENCE AT UNIVERSITY OF CONNECTICUT, STORRS

Milk dealers, inspectors, equipment manufacturers, and quality control officials from Connecticut, New York, and Massachusetts attended a one-day conference on short-time high-temperature pasteurization at the University of Connecticut, Storrs, on June 16. Given under the sponsorship of the Dairy Industry Department of the College of Agriculture, the lively discussion of short-time high-temperature problems by the 160 people in attendance indicated a growing interest in this method of pasteurization. In addition to the talks given by the speakers, such topics as public health requirements, clarification and engineering features were freely discussed.

Prior to the conference a short course of two-weeks duration was given for the milk inspectors of the Connecticut State Dairy and Food Commission, using the Trumbull Electropure short-time high-temperature pasteurizer and

(Continued on page 306)



Speakers at the Short-Time High-Temperature Milk Pasteurization Conference, University of Connecticut, Storrs

Left to right, front row: Dr. A. C. Fay, Mr. R. E. Olson, Dean E. G. Woodward, C. R. Brock, Mr. A. M. Palmer; second row: Dr. D. J. Hankinson, Mr. C. M. Moore, Mr. H. R. Hamilton, Dr. T. W. Workman; back row: Mr. V. C. Patterson, Dr. E. O. Anderson, Mr. H. P. Hinckley (Mr. Dale Gillespie was not present when this picture was taken).

INTERNATIONAL ASSOCIATION OF MILK SANITARIANS

TENTATIVE PROGRAM—ANNUAL MEETING
NOVEMBER 2, 3, AND 4, 1944

Thursday Afternoon—Nov. 2, 1944

* Address of Welcome—**Dr. Herman N. Bundesen,** *President,* Chicago Board of Health.
* Response.
* Address of *President* **C. A. Abele,** International Association of Milk Sanitarians.
* Demonstration of the Rapid Milking Process.
* Report of the Committee on Dairy Farm Methods.
* How to Handle the Mastitis Problem—**Dr. C. S. Bryan,** Michigan State College.

Discussion to be led by **Dr. I. A. Merchant,** Iowa State College.

Thursday Evening—8:00 P.M.

* Presentation of Certificates to Past Presidents.
* Address by **Dr. W. D. Frost,** University of Wisconsin.
* A Typhoid Epidemic from Cheese—**H. L. Thomasson,** Indiana State Health Department.

Friday Morning

Improved Techniques—**Harry Scharer,** New York City Health Department.

Methods of Distinguishing Food Poisoning from Other Intestinal Disturbances—**Dr. G. M. Dack,** Professor of Bacteriology, University of Chicago.

* Report of the Committee on Bovine Diseases Affecting Man.
* A Brief Discussion of Sediment Testing Technique—**Dr. E. H. Parfitt,** Evaporated Milk Association, Chicago.
* A Symposium of the Application of the Methylene-Blue Reduction Test.

Friday Afternoon

Subject to be selected—**Gen. R. A. Kelser,** Office of the Surgeon-General, U. S. Army, Washington.

* Program of the Federal Food and Drug Administration, As It Pertains to Dairy Products—**J. O. Clark,** Food and Drug Administration, Chicago.
* Prospective Developments in Dairy and Milk Plant Equipment—**George W. Putnam,** Creamery Package Corporation, Chicago.

Discussion to be led by **S. V. Layson,** War Food Administration, Washington.

* The Over-All Picture in the Dairy Industry, and Its Potential Effect Upon Milk Sanitation—**E. O. Gaumnitz,** American Cheese Institute, Chicago.

Saturday Morning

* Report of the Committee on Sanitary Procedure.
* Report of the Committee on Milk Ordinances.
* Report of the Committee on Resolutions.
* Business Session.

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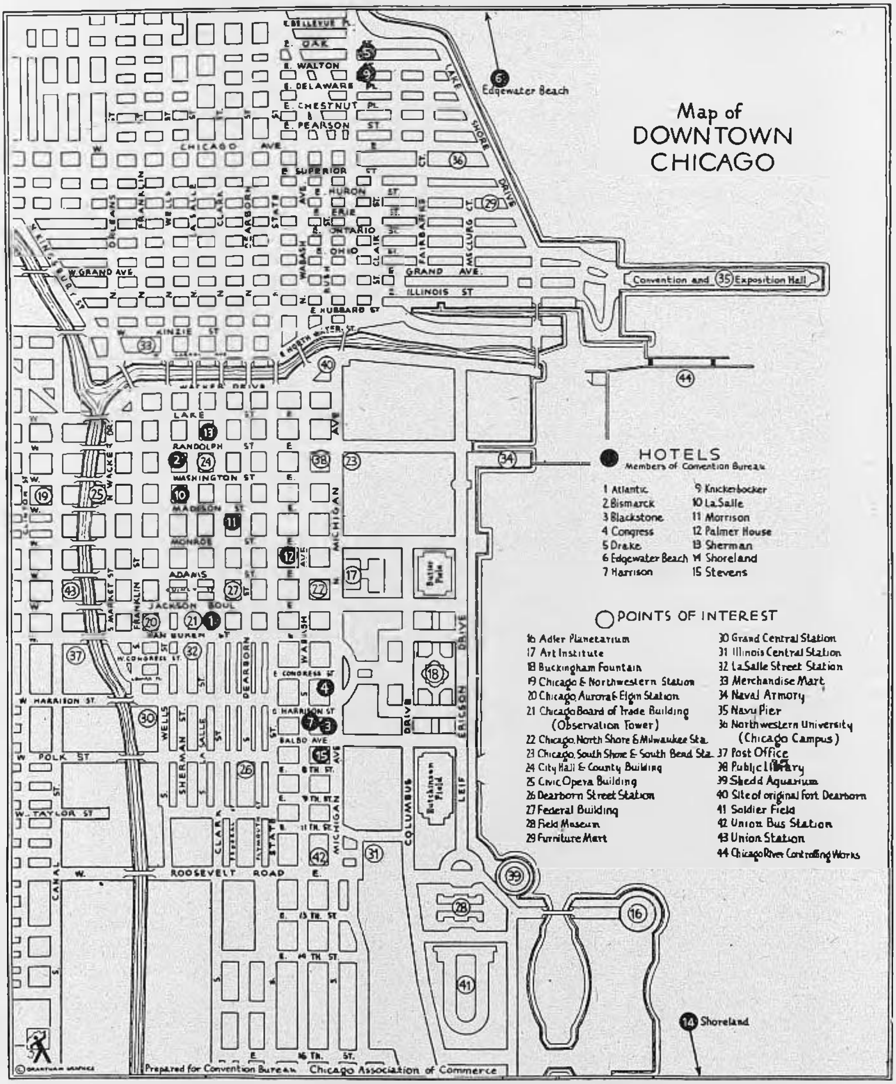
* These asterisked papers are definitely assured. The others have been requested by the Program Committee but have not been promised by the authors.



(Continued from page 304)

other facilities available in the University creamery. Such subjects as checking holding time, adjusting diversion point for the flow diversion valve, wiring arrangements, public health requirements, automatic control, and regeneration were studied under the direction of E. O. Anderson and D. J. Hankinson of the Department of Dairy Industry with the assistance of A. M. Palmer.

Mimeographed copies of abstracts of the talks given at the conference can be obtained by writing to the Department of Dairy Industry, University of Connecticut, Storrs, Connecticut.

New Members

ACTIVE

Evans, Dr. R. C., Chief Inspector, Health Department, Racine, Wis.

Price, Dr. Edmund R., P. A. Sanitarian (R), U. S. P. H. S., 603 B. M. A. Bldg., Kansas City 8, Mo.

ASSOCIATE

*Allen, F. W., Farmer, Ferme Des Ormeaux, Carillon, Quebec.

*Anderson, Eddie, Fieldman, Western Wis. Dairy Imp. Coop., Holmen, Wis.

*Anderson, Jay, Fieldman, Land O'Lakes Creameries, Inc., Mondovi, Wis.

*Barton, K., Plant Superintendent, Union Milk Co., Ltd.

*Carter, Polk A., Chemist, The Milk Shed, 122 1st St., S. E., Moultrie, Ga.

*Cohen, Corporal Harold, 85th AAF Base Unit, Sec. D 101st AACS, Hamilton Field, Cal.

*Conaton, W. R., Field Engineer, The Bristol Co., 221 E. Cullerton Ave., Chicago, Ill.

*Cope, George C., Bacteriologist, Ex-Cell-O Corp., 19915 Imperial Highway, Detroit, Mich.

*Dengler, Peter, Muskegon County Health Dept., Muskegon, Mich.

*Ellickson, Alfred, Fieldman, Tremp. Valley Dairy Imp. Coop., R. 2, Hixton, Wis.

*Engaas, Wm., Cashton Coop. Cry. Assoc., Cashton, Wis.

*Erickson, Julius, Fieldman, Preston Coop. Creamery, Blair, Wis.

*Fowler, Clyde A., Eastern Representative, Schwartz Mfg. Co., 3227 Gaylord Ave., Pittsburgh 16, Pa.

*Frey, Samuel, City Health Department, Battle Creek, Mich.

*Galli, Gott., Cheese Grader, Dept. of Agriculture, Rice Lake, Wis.

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CHANGES IN ADDRESSES

*Barber, Dr. Franklin W., from Madison, Wis., to c/o Golden State Co., Ltd., 425 Battery St., San Francisco, Cal.

Brown, Dr. W. Carson, from Morgantown, W. Va., to Research Dept., Beatrice Creamery Co., 1526 S. State St., Chicago 5, Ill.

Williams, Ralph B., from Cheyenne, Wyo., to Director, Territorial Division of Public Health Laboratories, Juneau, Alaska.

* Associate Member.

Correspondence

STATE OF CALIFORNIA
DEPARTMENT OF AGRICULTURE

Sacramento (14), July 27, 1944.

Dr. J. H. Shrader, Editor,
JOURNAL OF MILK TECHNOLOGY,
23 East Elm Avenue,
Wollaston, Mass.

Dear Dr. Shrader:

In the May–June, 1944 number of the JOURNAL OF MILK TECHNOLOGY, there is an article by Mr. Fred A. Wiggers, on the "Reliability of Formulae in Determining Milk Solids-Not-Fat." Some of the statements made in this article question the generally accepted usefulness of the Babcock formula for the determination of solids-not-fat by use of a lactometer.

The "Hawley-Davis" formula recommended is designed for use in the tropics for milk which is at a temperature of 85° F. when its density is measured. Mr. Wiggers applied this formula to milk at a temperature of 60° F. The nomograph mentioned was published by Davis in "The Chemist-Analyst," November 1941, not in "The Analyst," the British Chemical Journal.

A reading of the description used for the gravimetric determination of milk solids would lead one to believe that the "Standard Methods" procedure was not followed in detail, and as a result the results may be too high, leading to a discrepancy with those obtained by formula. An arithmetical error occurs in Table 1, Sample 4, where the solids-not-fat should be 9.51.

Care must be taken to use the lactometer properly. These conditions have been studied in our laboratory and have been referred to in recent publications, copies of which are attached.

Very truly yours,
L. M. LAMPERT,
Senior Chemist,
Dairy Service Laboratory.

Use of the Lactometer. L. M. Lampert. *Milk Dealer*, 28, No. 3, 25:50 (1938).

Abstract

The Quevenne types lactometer is designed to be read to the top of the meniscus when floating in milk. Reading the instrument at the principal surface of the milk or at some other point will give erroneous results. The most accurate instruments have a large bulb and a narrow stem.

Unless the prior treatment of the milk is known, an element of uncertainty is present in values derived by formula from the specific gravity or lactometer reading. Comparatively fresh milk may give a different reading than when it has stood for some time. Agitation of the milk also affects its specific gravity. With samples having their maximum specific gravity, the average of results obtained by the Babcock formula ($SNF = \frac{1}{4} L + \frac{1}{5} F$) agree fairly well with the average gravimetric results. Values obtained by formula on individual samples may vary considerably from values obtained gravimetrically.

Uniform specific gravity may be obtained by the method of Bakke and Honegger (*Le Lait*, 3, No. 1, 1923). In this method the milk is heated to 40° C., cooled to 15° C. and the lactometer reading made. The results are about 0.2 percent lower than those obtained by the official method of the Association of Agricultural Chemists, and therefore 0.2 percent should be added to the values obtained by the Babcock formula, if this procedure is used.

Nomograph for Correction of Lactometer Readings and Tabulation of Milk Solids. L. M. Lampert. *Ind. Eng. Chemistry*, 12, 527 (1940).

See also—Here is a Chart for Finding Milk Solids from Lactometer Readings. *Milk Plant Monthly*, October (1940).

Abstract

A nomograph for the Babcock formula has been devised which is easier and quicker to read than tables. It eliminates the interpolations needed to obtain corrections if the lactometer is read to parts of a whole degree or if the fat reading is made to less than 0.1 percent, the limit of most tables. Two readings are made, one to correct the lactometer reading to that at 60° F. and then the solids-not-fat are found, corresponding to the fat test previously obtained. With very slight modifications, the nomograph can be used for the New York type lactometer, for Richmond's formula, or with the Bakke and Honegger procedure for obtaining uniform lactometer readings.

SHORT-TIME HIGH-TEMPERATURE PASTEURIZATION

(Continued from page 282)

valve in the pressure controller is usually all that is necessary to correct faulty pressure controller action although if the installation is 5 years or more old, the rubber diaphragm in the pressure controller valve should be examined. Also, the valve itself should be examined, for excessive stuffing box friction. "Hunting" can also be caused by improper temperature controller operation due to a dirty air supply. Its air valve should be cleaned. If this does not produce the desired results, the sensitivity adjustment in the controller should be changed. Regardless of make, an air-operated controller of the type used on H-T-S-T Pasteurizers is usually equipped with a means for changing its sensitivity. Lowering the sensitivity provides a means for reducing the amount of diaphragm valve movement obtained for a given temperature. When this is done usually the hunting action diminishes, providing all the equipment is in good mechanical order and that the steam pressure is not excessive. The criterion of performance is the indication of the air gage showing diaphragm valve pressure. This should be steady between 8 to 10 pounds per square inch. On an installation that has been operating satisfactorily, it is emphasized that such a change in its sensitivity adjustment should be made only as a last resort. See also previously suggested procedure for servicing air-operated pressure controllers and make certain that diaphragm valve stem moves freely. Repack valve if in doubt.

Failure of Flow Diversion Valve to Operate When Milk Is at Correct Temperature

D—If the Flow Diversion Valve is inoperative and remains in its diverted position, the electrical and air supplies should be checked. (The valve will assume a diverted position if either the electrical power or air supply fails). If the movement of the Flow Diversion Valve is too slow, examination should be made of the air inlet valve mechanism within the solenoid valve.

Failure of Flow Diversion Valve to Remain in Forward Flow Position

E—Failure of milk in reaching the temperature necessary to permit forward flow or in not remaining substantially constant, thereby causing repeated diversions, may also be traced to air binding of the water circulating system. This in turn can be attributed to there being not enough water in the surge tank to prevent air from entering the suction port of the circulating pump. The remedy is to see that the surge tank is filled, particularly when starting up. Erratic performance can also be traced to air entering the milk stream through improper gasketing of connection in the milk pump suction. This can also lead to a discrepancy occurring between indications of the mercurial thermometer and the pen of the Safety Thermal Limit Recorder under certain conditions particularly where the end of the holder tube terminates vertically.

Failure of Milk Pump to Start

F—Failure of milk pump motor to start may be attributed to a blown fuse in the Safety Thermal Limit Recorder. Before replacing fuse, the wiring should be checked for defects with assistance of wiring diagram furnished by the manufacturer. (Never attempt making any adjustment other than the one provided for changing the cut-in and cut-out points in this instrument without first making certain the electrical supply is cut off.) Milk pump motor may also be prevented from starting by foreign matter such as a gasket lodging between seat and disc of forward flow port, thereby preventing operation of micro switch 45.

"Dr. Jones" Says—*

Over at church recently the minister preached on the afflictions of Job. And, you know, that's an interesting story: all the troubles the old boy had and the way he reacted to 'em and so on. When a lot of his family and help got killed and he lost his camels and what not he took it in his stride: "the Lord gave and the Lord taketh away." But those boils "from the sole of his foot unto his crown"—the physical troubles, on top of everything else, got him down. But "the patience of Job" held out and eventually everything was fixed up. He lived to be a hundred and forty years old and wound up more prosperous than ever.

Those boils of his—so far as I know that must have been the first case of staphylococcus infection reported in the literature. And Job says: "I am escaped with the skin of my teeth." I never knew, before, where that expression came from.

Another thing I made a note of: Job and some of his friends were talking over all the things that'd happened to him, and Eliphaz, the Temanite, referring to the Lord—"For he maketh sore, and bindeth up," he says, "he woundeth and his hand maketh whole." There's food for thought in that.

But the thing that occurred to me—take Job's boils, for example: in his day they didn't know anything about bacteriology and the causes of such things. About the only thing he could do was grin and bear it. But nowadays we know that boils come from bacterial infection. If they have a lot of 'em they give 'em vaccines or something to step up the body's immunity to the bugs and their effects. And now, of course, we've got effective drugs to treat 'em with. In Job's case patience was a virtue. But anybody today that sat around waiting for the Lord to do something about it—well, "the Lord helps them that help themselves."

Bacteria were discovered and vaccines and sulfa drugs and so on developed, not by waiting but by working. And whether it's boils or tuberculosis or epidemics from contaminated water or food that isn't properly refrigerated: if we've got the means at hand for preventing such things and don't do it the responsibility is on us and nobody else.

And I've got an idea that when the time comes for the final accounting pleading ignorance of the facts may not get us by. "I'm sorry, Brother," the man at the gate's liable to say, "but it was your responsibility and the facts were available to you. No, sir, I don't find your name on the list."

PAUL B. BROOKS, M.D.

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* *Health News*, New York State Department of Health, Albany, June 12, 1944.