The Trumbull Electro-Pure Pasteurizer

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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

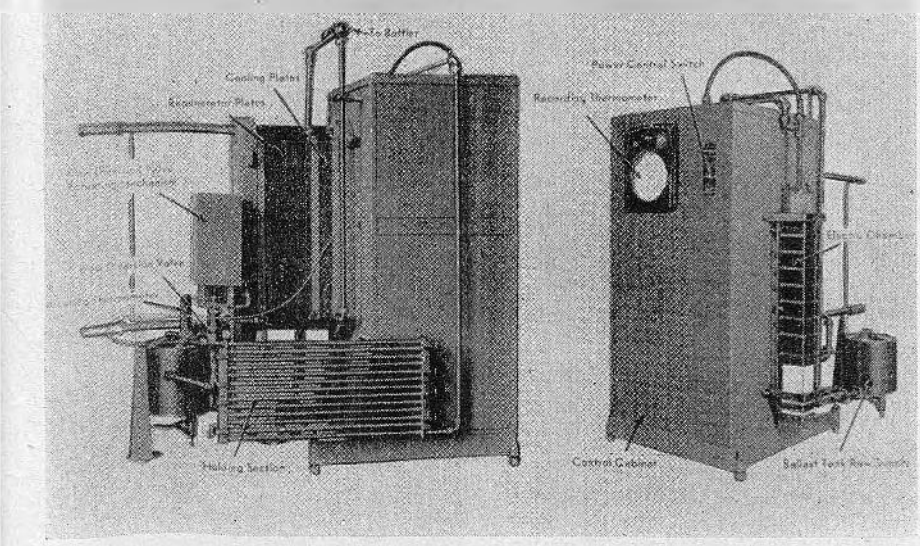

FIGURE 1
Electropure Pasteurizer

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.

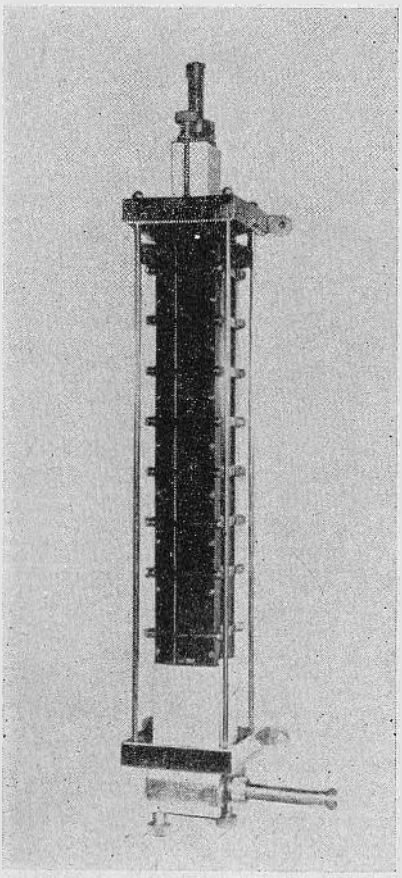

FIGURE 2
Electrode Chamber—Side View

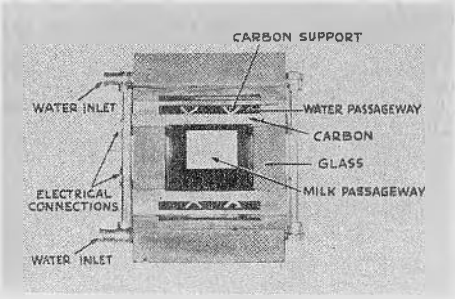

FIGURE 3
Electrode Chamber—Section View

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 main-

taining 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,

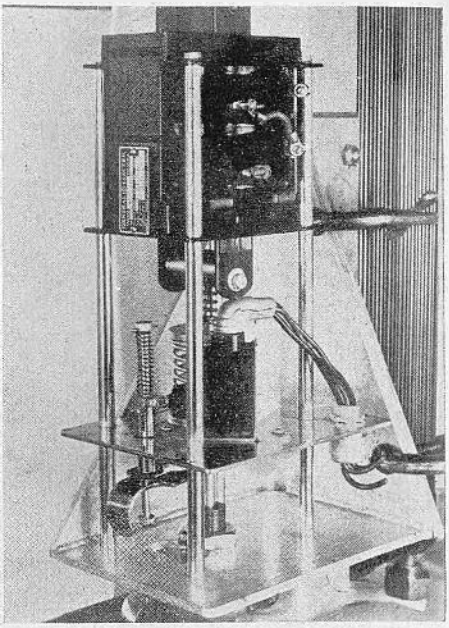

FIGURE 4

New Type of Electro-Pure Diversion Valve Mechanism

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.

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.