Sanitary fittings designed to meet the requirements of a modern milk plant should possess as many of the following features as possible:

- Easy attachment to the tubing.
- Attachment should be positive and strong with no cracks or crevices between fitting and tubing.
- Contact edge between fitting and tubing should be clearly visible.
- Assembled union should be as leakless as possible.
- Unions should be easy to take apart and assemble.
- Unions should lock so that tightening one leaky union will not loosen others.
- Parts should be as few as possible.
- Small parts which might be dropped, lost, or washed into drains should be avoided.
- Work of cleaning should be reduced to a minimum.
- Union seats which always are potential contacts between milk and outside contamination should be as few as possible.
- All parts should be open and straight through for better brushing.
- Edges and depressions should be slightly rounding.
- The fitting should be both strong and light in weight.
- Seat surfaces should be protected and broad enough to prevent serious nicking and abrasion.
- Costs should be kept low.

No fitting at the present time meets all of these requirements. We were unsuccessful in our efforts to find leakless sanitary unions. The best we could do with any of the conventional types was to use gasketed fittings. Two paper gaskets, previously soaked in vaseline or other dope, were applied to each seat. This improves matters but we were never sure that our lines would be leakproof when vacuum was applied; in fact, it was more likely that they would leak. We had gaskets made from rubber of suitable physical properties. This was better still but the seat on the conventional fitting is too small to insure tightness, and the rubber gaskets failed frequently.

The rotation of the pipes on the gaskets during the tightening was one cause of leaks. The surfaces were small and unprotected, and soon became nicked. When these nicked parts were rotated, the gasket was abraded or torn, thus allowing leaks. A union was made with a wider gasket seat and with interlocking parts to prevent rotation. This union did not leak.

**NEW UNION DESIGNED**

After unsuccessful efforts to obtain satisfactory unions from equipment manufacturers, we developed one which we thought would meet our requirements. This union has several features which seem to make it more desirable for general milk plant equipment than the elbows now in use. The uniting of pipes at an angle by means of a coupling has been described (1) but these old forms of the angle union do not meet the requirement of the market milk industry.

The drawing presented gives in detail the construction of an angle fitting of the gasket seat type suitable for 1½ inch tubing. The fitting in one position produces a right angle turn while in the other position it produces a straight line connection. Thus the same fitting is used for turns and straight lines. The attachment between the tubing and the fitting is recessless. The tubing can be attached to the fitting by soldering or by the use of a suitable expander. The pipe is cut
Angle Sanitary Fitting

At right angles for the attachment of the fitting.

Care should be taken to attach the fitting to the pipe with the fitting surface in proper angular position in relation to the other pipes and fittings, because this fitting is of a type which makes it impossible to rotate the pipes on the gasket seat when the pipes are held in alignment. This is an advantage of the fitting from the standpoint of preventing leaks and is a basic feature of the design. On the other hand, before the pipes are placed in position, one pipe can be rotated with respect to the other through the angle of 90° to 180°.

Tees can be constructed by introducing two pipes into the fitting at 90° to each other.

Advantages of New Design

A number of modifications of this type of fitting have been made. The seats may be of the gasket or of the beveled type. The contact seats are broader, thus reducing nicking and permitting the use of larger gaskets. Also, with a slight modification, the tubing can be cut at an angle of 45° and thus the tubing end surfaces can be pressed against each other in the angle fitting.

The angle fitting has numerous advantages such as the elimination of loose elbows and tees, clear view for cleaning, straight open runs for brushing, and decrease in number of contacts between the milk and outside contamination. Time of assembling and taking down of equipment is reduced. There is a great saving in parts to assemble. The union used for a right angle turn involves two ferrules, a nut and a gasket, whereas a conventional elbow type of right angle turn involves two ferrules, two nuts, two gaskets and a loose elbow. The angle tee involves three ferrules, three nuts, three gaskets and a loose tee. The permanent attachment of one end of conventional elbows and tees to tubing is not permitted by many health inspectors.

The weight of the angle fitting used to connect pipes running in a straight line is considerably greater than the weight of the conventional union. However, in a properly-arranged milk plant, there are very few simple unions. The angle union used in place of an elbow is lighter than the conventional elbow assembly, and when used in place of a tee it is very much lighter.

Manufacture of the angle fittings should not be too expensive. Both the thread ferrule and nut ferrule could be machined from the same blank and the parts are small in comparison with an elbow or tee. For a given size pipe, the nut must be larger than the nuts now in use on the same size of pipe. Thus, the nut can be made thinner and still maintain the same strength in the joint. Because the diameter of the nut is considerably greater in relation to the diameter of the tubing, the threads of the nut are visible for inspection and cleaning.

The angle sanitary fitting was developed in connection with the designing of equipment for the deaeration of market milk where some of the unions are subjected to vacuum, and these unions must not leak.

Angle unions possessing the above listed features are not on the market but since they appear to possess certain advantages it would seem that they should be given a trial in a few plants to determine their merits under operating conditions.

Reference