

laboratory, it is found that there is a maximum rate of change or deterioration at about 16° F., this, unfortunately, being the temperature at which we normally store and transport meat. The rate of irreversible change falls off both as the temperature is increased above 16° F., and as the temperature decreases below that figure. It is small at about 30° F.—*i.e.*, the temperature at which Argentine exports her chilled meat. It also progressively decreases towards 0° F., and for many years practice in America with ordinary frozen meat has been to keep the meat at much lower temperatures than are customary in New Zealand because of the preservation of flavour, apart altogether from the question of ice-crystal formation.

It will thus be realized how important it is that, if quick-frozen packaged goods are to be manufactured in New Zealand for transport to the Old Country, the paramount question is *proper storage and transportation*. In fact, this is an all-important but, so far, relatively neglected question, independent altogether of introduction of quick-freezing processes, and has far-reaching consequences in the store in New Zealand, in transport to the wharf, the speed of loading, and proper conditions during both transportation and unloading in England. I regret to state, however, that the case is similar to that of the changes of proteins in cheese, in that the fundamental chemistry is little known, and there are few people who have the necessary training to tackle the problem. As illustrating this point, I found that several chemists attached to the companies preparing quick-frozen packaged meats are still groping on this problem, and the only people from whom I could obtain an at all reliable viewpoint were biochemists—one in the University of Chicago, one in the Leland Stanford University, California, and the other the President of a large packaged-fish factory. In the former case I tracked down the expert working on the question because some other researches had indicated that the holding-power for proteins without change was fundamental to the question of whether certain varieties of wheat could withstand frost, because prolonged exposure to low temperatures caused the water in the wheat-germ to become free instead of bound to the protein; also the question of whether certain pests of wheat could winter over appeared to depend on the holding-power for water at low temperatures of the protoplasm in the insect.

The changes in our frozen products during transportation and storage should have been studied from this point of view for many years; and it cannot be too strongly pointed out that similar work should be carried out in New Zealand, even from the point of view of our present exports. Any development of the quick-frozen packaged meats or fish for transport to England will be fatal unless the right type of men are watching the experiments.

These preliminary semi-scientific considerations are necessary for the proper understanding of the developments of the packaged-meat trade.

That further expansion in the packaging of chilled, as well as quick-frozen meats seems assured, is undoubted, and the recent very expensive case conducted on behalf of the large national meat-packers in America for modification of the so-called "Packers' Consent Decree" is eloquent testimony to the way in which this development is viewed abroad. At present some of the big meat-packers in America cannot enter the retail business. The evidence in this Court case is included in two volumes, which make very interesting reading. The packers, through the Supreme Court, asked for modification of the Packers' Consent Decree in two main directions: Firstly, they desired to enter the retail business as a bargaining force against the chain-store companies who were threatening to enter the packing business so as to supply their own retail stores; secondly, the big meat companies asked the Court's permission to use their branch houses and stores to capacity by handling other food lines. Their anxiety can well be understood when it is remembered that even to August, 1929, 260 of the biggest grocery chains in America had added meat departments to some of their stores. The evidence of Swift's in this case may be briefly synopsisized as follows:—

"Mr. G. F. Swift, Vice-President, Swift and Company, Chicago, testified that his company is experimenting with their own process of quick freezing of foods, which has not been patented. They are selling a small quantity of these products. Although not an expensive process, the lower temperatures require more power in machinery. One of these units costs from 5,000 dollars to 25,000 dollars, depending on the size of the branch or plant, the volume of products handled, &c. About 25 per cent. of his company's branch houses have freezers which carry a temperature of between zero and 16 degrees. (Pp. 2080-95.)"

The evidence of another big packing concern, which is a part of General Foods Corporation, and controlling the "Birdseye" process, is also to the point:—

"Mr. Frederick S. Snyder, president and general manager, Batchelder and Snyder, Dorr and Doe, Boston, Mass., testified that the quick-freezing process cannot be promoted rapidly for the benefit of either the public, the packers, or the stock-raisers unless all packers have the same freedom of action enjoyed by intermediate packers and chain stores. The leading chain stores purchase in car-load lots, ship to their own warehouses, and spread overhead of delivery, avoiding use of packers' branch houses for that purpose. Some chain-store organizations have undertaken the processing of meat products. The Kroger Grocery and Baking Company has put two packing-houses into operation since 1920, while the First National Stores of Boston have a plant for curing and processing meats with the most modern equipment. The quick-freezing process will entirely change packing-house operations from mere slaughtering to the packaging and shipping of identifiable meats, leaving the inedible parts behind. The only salvation for the big packer is to use his branch houses to capacity by handling other lines, and having freedom to do the same as the next hundred packers do. (Pp. 777-860.)"

There are other considerations regarding storage of fats in the meat, and the effects on enzyme action of rapid freezing, and the development of suppressed rancidity. Certain fats must be stored below 5° F.; and this applies also to the unsalted butter.

\* I have stated in the foregoing that the development of quick freezing and packaged meats owes its impetus to newer methods of marketing in America. The two major changes that have occurred