

in the food industry since 1920 are the consolidation of retail outlets in the hands of regular and voluntary chain-store organizations and the concentration of control in the sale of manufactured meat-products. For instance, in 1929 the number of such stores had increased to 60,000, with sales to 3,500,000,000 dollars. These 60,000 chain stores were operated by 900 separate corporations, and the seventy largest of these corporations owned 48,700 stores. The largest chain-store organization is the great Atlantic and Pacific Tea Company, and its sales in 1929 were nearly 1,000,000,000 dollars. I stayed for an hour in one of the stores of this company in Chicago, and watched customers enter the shop and choose quick-frozen packages from a low-temperature case, such purchases varying from roasts to chops, livers, &c. The meat was prepared by Swift's, and wrapped in moisture-proof "cellophane," indicating the brand, weight, and Government stamp, and was sold over the counter by a girl, probably earning £1 10s. a week, instead of by a butcher at £7 a week. The result is that the housewife need visit only one meat and grocery store and purchase the whole of her supplies there in attractive packaged form. Moreover, she need park her car only once.

It is claimed that this method of freezing and packaging of meat avoids some 4 per cent. shrinkage of stored meat, and some $6\frac{1}{2}$ per cent. loss due to butchers' cutting wastes. Moreover, in certain circumstances, economies are possible in distribution costs. As an offset, it must be remembered that freezing costs at such low temperatures are higher, while the retail store must carry a freezing-cabinet. It is estimated that the cost of quick freezing, packaging, and storing, amounts to about $1\frac{1}{2}$ d. per pound of meat. For transport, however, twenty-seven lambs of 40 lb. weight each, when cut up, complete with package, occupy a space of 1 cubic yard; under present conditions, as carcasses, this amount of lamb would occupy about two and a half times the volume.

In America it is claimed that customers' prejudice against frozen meats is being overcome in this way. This prejudice, as stated above, is correctly based on inferior texture and flavour of the *slow-frozen* article; but I could obtain no evidence against the claim that quick-frozen meats, properly wrapped and stored, were in flavour inferior to fresh meats.

The main problem which at present is engaging considerable attention is the production of a properly insulated display cabinet and equipment to maintain the low temperatures desired. If such a method of marketing could be arranged in England, the advantage would be that our product would be placed on the market under its own brand and name. There may be strenuous opposition from Smithfield merchants and from retail butchers. Such opposition already is in evidence in America against package meats, but it will be accentuated manifold in Britain. It is probable that the retail butcher often succeeds in selling New Zealand lamb as English lamb in spite of the national "mark" scheme. It should be noted that in January of this year English second-quality lamb was sold at a premium of $2\frac{1}{2}$ d. per pound over New Zealand first-quality lamb, though this may refer to a demand to a certain extent specialized. Consequently, New Zealand is vitally interested, in that the first of such products sold should be of the very highest quality and in the very best condition. In the "Birdseye" system the smaller meat-cuts are wrapped in cellophane, placed in packages, and frozen by the machine. Roasts of beef are wrapped in cellophane, covered with an open muslin wrap, and quick frozen between the plates of the machine. From a study of the practice in America, and from the reports already furnished by the Health Inspectors in England, I do not foresee any difficulty regarding meat inspection of packaged meats, unless some subtle outlet is found for the propaganda which may temporarily arise from retailers.

Other firms are quick freezing their meats, in many cases doing the cutting after the freezing, in special very low temperature stores. I do not think that any firm has as yet fully developed its process to secure the full advantages of the method. They have been preparing packaged meats and relying on the novelty of the idea to sell the product, and using newer methods of distribution. Some samples of meats quick frozen by this method and examined by me undoubtedly showed signs of surface deterioration. Such frozen cuts of beef probably were inferior to those of "Birdseye," in that the wrapping had been carried out after freezing, and was loose, and considerable moisture had distilled from the meat and crystallized in big ice-crystals on the top of the meat, while, in addition, the surface colour had changed.

There are several methods of quick freezing on the market, apart from the above, and I am convinced that we in New Zealand can develop an effective method.

A more technical discussion of these various methods is hardly suitable for this report.

Regarding Fish.—In my opinion, there are ample possibilities in New Zealand in this connection, and the same quick-freezing machinery would be applicable. The industry would need to be developed on a moderately large scale and by-products worked up. In America there have been greater developments in regard to fish than has been the case with meat. The production of frozen package fish-products increased 71 per cent. from 1928 to 1929. Moreover, one firm—the Atlantic Coast Fisheries—which sold 2,000,000 dollars' worth of quick-frozen fish last year, has developed an additional safeguard to keep the fish in proper condition during storage. They introduced into the fish certain salts, which, although not infringing the Pure Foods Act, have the effect of rendering the fish-cells the better able to hold moisture after thawing, and obviating the drip and flabby appearance characteristic of fish that has been thawed after freezing. This development, unfortunately, is not applicable to meat; but even in samples of filleted fish, after long storage, it was possible to detect the chalky appearance of certain of the surface fish-cells, and this would detract from the value of the product.

Either quick-freezing and package methods, or export of chilled meat, which is now possible owing to the uniformity of temperature now obtainable in the ships of newer design, is not without significance from the point of view of export of beef, a very desirable development, which would assist in the better utilization of much of the land in New Zealand. Should a development of beef export appear likely it would be necessary to consider the question of importation of improved stock. Under the present changing conditions it is worth while to closely watch all the technical developments in regard to freezing and transportation. Fortunately, we now have in the country men competent for this if their services could be utilized in this direction.