takes money out of his coat pocket only to put it into his waistcoat pocket he can always pick it out again, or its equivalent."

Suggestion for the appointment of a River Commission.

3. "The appointment for say 10 years of a River Commission not merely for the Indus, but for the organised study of the physics of great alluvial rivers generally, would be a service to civilisation and an act worthy of a great State. The Mississippi Commission have done a great deal, but their experience is not to any great extent applicable to Indian conditions. The experience of the engineers of the Rhone and the Danube and other European rivers, though valuable in its way, is even less applicable to India than that gained on the Mississippi. Mr. R. A. Molloy's attempt at a theory, as summarised very inadequately in Chapter III, is the first that can be characterised as a scientific generalisation of the river problem that the author has heard of in India. And even this is based on inadequate data, picked up anyhow amidst the multifarious duties falling to the engineer to a system of inundation canals. There is need for a thoroughly scientific location, and for the automatic reading, of gauges at hundreds of places, for several years, along great lengths, selected with care and knowledge, of several of the great Indian rivers, also of some systematisation of the surveys which usually are undertaken on these rivers, and of the making of fresh surveys specially designed to elucidate facts also of an organised system of soundings and sections. The engineers in charge of the work must steadily keep in view the ultimate object of it, and must not make a survey merely for the sake of a section. The object in view will be: To present to the scientific world, and especially to the engineering world, and more particularly to the engineers of structures in India that are subject to fury at the hands of the great alluvial rivers, under various circumstances, as will allow of such action being anticipated; and especially to enable the engineer to utilise fully his knowledge of the rivers, so that he may make a servant of it, instead of being as it is now very often the case, his master. There can be no doubt at least from the author's point of view that more money has been wasted, for want of just such knowledge as a River Commission might provide, than would have sufficed to pay the entire cost of it many times over. Certainly, so far as training works in connection with bridges are concerned, in rivers of the class with which the author has chiefly concerned himself, most engineers responsible for such works would probably admit that whether they spent money unnecessarily as an insurance against their inevitable lack of scientific data, or that they were unduly economical with either disaster, or heavy annual recurring expenditure in after years, as the result. Thus looked on from the lowest or merely commercial standpoint, the establishment of such a Commission ought to be highly remunerative."

Milk and Bread.

THE Symposium organised by the food group of the Society of Chemical Industry in November last, an account of which has appeared in the *Journal of the Society of Chemical Industry* (Vol. **52,** pp. 363 T–414 T) is of very great public interest, as it takes stock of our knowledge concerning the two root components of the nation's dietary. Fourteen papers were presented at the meetings over which Prof. H. E. Armstrong presided.

NATION'S MILK SUPPLY.

In a communication of a more or less general character, Professor H. D. Kay has dealt with the all-important subject of the improvement of nation's milk supply and has given an informed review of the steps that have been taken and the steps that have to be taken to improve the milk supply. The problem has two aspects, the quality and the quantity; the former mainly concerns the consumer who wants for the money he pays an article of maximum dietetic value. The producer, on the other hand, is mainly interested in the quantitative aspect.

The factors that go to make the milk, the most important factor of our dietary, are the high content of animal protein of very high biological value, the easily digestible fat, the balanced salt content with valuable minerals for bone formation and the vitamins. The fact that, at an important stage of the life history of the animal, milk is the only article of diet makes it imperative for the mother to elaborate a food of such useful qualities.

The daily consumption of milk per person in Great Britain is only a third of what is desirable or necessary, and this grave situation calls for attention. The problem of increasing the production is not without difficulties but it has to be remembered that more liquid milk is produced in the country than is actually consumed as liquid milk. It would appear that consumers are not fully alive to the specific nutritional importance of milk, particularly for the growing child; the purchasing power of the poorer classes is low, although from a consideration of the nutritional value, milk is perhaps the best that can be purchased for the money. Added to these, not an inconsiderable part of the population fear that the supply from the bulked milk in large towns is not safe. The problem of increasing milk consumption is not one for the dairy farmer; the remedy lies in propaganda and education.

The quality aspect of the problem is not so simple. The ideal quality can be ensured if milk is produced under strictly hygienic conditions from normal healthy cows, and suffers no deterioration during distribution. This aspect involves agricultural, physiological, bacteriological, chemical and economic problems, and it is most important that the producer and the distributor apply the results obtained from scientific enquiries to actual practice.

CLEAN AND SAFE MILK.

The technique of clean milk production involves the application of hygienic principles to the cowshed and the dairy. In order that the milk may

also be safe for consumption, the cows should be, ideally speaking, entirely free from diseases communicable to man. This is, however, far from being true. Many milks, unfortunately, are infected with bovine tubercle bacilli, and it is a well-established fact that young children can become tubercular by consuming infected milk. The susceptibility to infection diminishes rapidly with advancing age. The bacteriological control of the milk supply is thus a matter of supreme importance.

The other two disease-producing bacteria occurring in different classes of raw milk are *Br. abortus* and the streptococci of mastitis in cows. Owing to the lack of reliable methods of examining *Br. abortus*, the extent of infection of milk from this organism was not so far realised. Minett and Pullinger have worked out methods for the examination of this organism and out of 65 samples examined by them, 48 or 73.8 per cent. gave positive results. Mastitis caused by streptococci is a common affection of the milking cow and the organisms commonly present do not endanger human health. The infection, however, reduces the quality of milk, as such a milk is deficient in fat and lactose and contains excess of chlorides and sometimes even blood proteins and lucocytes. The milk has an unpleasant salty taste and imparts a disagreeable flavour to the butter. Pasteurisation destroys all the organisms in the raw milk and safeguards the health of the consumer. To ensure complete freedom from all organisms, boiling at home is the safest method for the consumer. But apart from rendering the milk safe by heat treatment, it is imperative that a policy should be developed to eradicate the animal diseases communicable to man.

PASTEURISATION AND NUTRITIONAL VALUE.

This leads on to the question of the effect of heat treatment on the nutrition qualities of milk. It has been recently demonstrated that the ingestion of raw cows' milk—not pasteurised milk—by growing children prevents, to a large extent, the incidence of caries. The results of a series of very carefully planned experiments carried out by Dr. Elfrida Mattick and Captain John Golding at the National Institute for Research in Dairying, Reading, have definitely shown that sterilisation of cows' milk definitely lowers its value for the nutrition of young growing rats. Their development is impaired and there is a complete suppression of reproduction. The experiments conducted by Professor Drummond and co-workers, on the contrary, failed to demonstrate any such adverse effects of pasteurised milk. The work of Wilson and Cowell, on mice, which were also planned, in conjunction with Professor Drummond may be regarded as complementary to the work of Drummond on rats. These authors showed that the results obtained from raw and pasteurised milk regarding the numbers surviving, the average survival time, and the breeding records, are remarkably close. The differences, when they exist, are within the limits of experimental error. The experimenters, however, observed that while raw and pasteurised milks appear to be of approximately equal value for the growth and reproduction of mice subsequent to weaning, the raw milk is more advantageous than sterilised milk for the development of mice during the first four weeks of life. These considerations are all of the utmost importance, and although there is much to be said in favour of pasteurisation it may prove useful to supplement pasteurised milk diet with cod liver oil and orange juice for growing children.

CHEMICAL QUALITIES OF MILK.

For many generations past, the dairy cattle are being bred for volume and little attention is paid to the butter fat. The content of solids other than fat is rarely considered at all. There appears to be a negative correlation between volume and fat content and probably also between volume and solids—not fat. There is thus a growing need to turn our attention to the chemical constituents, and eliminate milk with poor nutritional and analytical quality. Remarkable results have been obtained in Denmark, where systematic breeding from animals of known quality has led to an increase both in the average yield of butter fat per lactation by 27 per cent. and the butter fat in the milk by 0·28 per cent. during 16 years. These results should encourage all producers in other countries, to follow similar methods, and the results will prove of lasting benefit both to the dairy industry and to the consumer.

BREAD.

"The manufacture of bread is as old as the hills, and was begun long before the word 'Science' had any meaning in commerce." While dealing with this established article of diet, one is faced, to-day, with the question of quality. Bread-making is now a factory operation, and as Vargus Eyre has put it—calling for mass production and the consequent moulding of processes to suit time-tables of production and this has brought in all kinds of small adjustments in order to secure the maximum output, the biggest loaves, and the lowest cost of production. If bread is to retain the qualities necessary for a staple food, it is necessary to examine the whole question anew, and find out in what processes of manufacture, bread loses its quality, and by what treatment the dietetic value of bread can be improved.

BLEACHING AGENTS AND IMPROVERS.

The endosperm of wheat contains a small amount of carotene which imparts a creamy colour to the flour. The miller, partly with the idea of effectively using those wheats, the endosperm of which is more yellow than others, and partly to make the flour more attractive, bleaches the flour. In this process the carotene is oxidised and bleached flour contains presumably, less vitamin A than the unbleached. Some bleaching agents like chlorine and nitrogen trichloride, not only bleach the flour, but also enhance its baking qualities. In modern baking practice certain improvers are added in minute quantities such as Ammonium persulphate and Potassium bromate, and the baker is thus enabled to use medium or even weak flours which possess only a low water absorption capacity, give a dough lacking in the desired characteristics of stability, elasticity and produce a small loaf. The questions connected with bleaching and improvers have been discussed by Kent-Jones who holds that the addition of these chemicals in the quantities used has no injurious effect on the consumer. The majority of those substances do not appear to affect even the flavour.

QUALITY OF WHEAT.

The results of general interest obtained by the Danish Home-grown Wheat Committee, 1929-33,

have been dealt with in an interesting paper by Holgen Jorgensen, who conducted the chemical and technical work of the Committee. The investigation on the agricultural aspects of the question reveals that the preceding crop (leguminous or non-leguminous) and the time of applying the nitrogenous fertilisers influences the nitrogen content of the wheat and by an appropriate adjustment of the cultural practices, the farmer can obtain a wheat of the desired nitrogen content. The changes in the total nitrogen content can be traced to the change in non-salt soluble protein or gluten. The addition of bromate increases the baking strength of flours, and generally speaking, a positive correlation exists between the nitrogen content of wheat and the ability of the flour to acquire an increased baking strength through the addition of bromate. From a baker's point of view, the most important protein is the gluten, which itself consists of two parts, the gliadin and the glutenin. These two proteins together give the gluten its characteristic properties of plasticity and elasticity and when it is mentioned that in water gliadin forms a sticky mass which can be stretched into threads, while glutenin forms a flaky mass without much coherence, it is at once realised that the baking property of flours is profoundly influenced by the proportions in which these two components of gluten occur.

The development of elastic properties and of distensibility in dough during fermentation under the continued pressure of carbon dioxide produced, are the two quality factors of flours. When the dough is prepared, certain chemical changes are brought about due to the enzymes present in the flour and the yeast. The effect of these changes on the consistency varies with flours of varying baking strengths. The dough may become soft, or with flours of good baking strengths, the consistency may even be increased.

THE DIETETIC VALUE OF BREAD.

From what has been said above, the baker is mainly concerned with the strength of the flour, and is not concerned with its dietetic value. The modern milling and bleaching processes give a flour devoid of the germ of the wheat constituting about 2 per cent. of the grain, and lacking in a large proportion of the mineral salts and vitamins originally present in the grain. The baking flour consists almost entirely of starch and gluten and is thus of only inferior nutritive value to the whole-meal. But it would appear extremely unlikely that there will ever be a wide-spread return to the whole-meal bread. For one thing, the whole-meal flour does not keep well and consequently there will be a difficulty in maintaining a continuous supply of sweet and sound flour. Further, the whole-meal bread is more difficultly digested than white bread and is not altogether well-suited to young people and to those that lead sedentary lives. The only alternative is to improve the quality of white bread.

The two sources of vitamins in bread are the germ of the wheat and the yeast used for the bread making. The former is got rid off in the preparation of the white flour, and the yeast added during the process of bread manufacture is inadequate to supply the vitamins in the necessary quantity. It has been shown by Drummond that the vitamin deficiency of the white bread is not made up by the other foods taken and this raises a very serious dietetic issue. How is it possible to raise the vitamin B content of bread? Yeast is perhaps the best source of vitamin B available and obviously by increasing the yeast content of the bread, the vitamin B content too is increased. Although in smaller bakeries, it would be easy to employ low temperatures, slower yeasts, more salt and vary other conditions so that it would be possible to incorporate more yeast in the bread, such alterations would not be practicable in urban areas where mass production necessitates short doughing processes, high temperatures and faster yeasts. It has been estimated that to make bread a sufficiently useful source of vitamin B in the diet, it would be necessary to raise the yeast content 5 or 6 times. The employment of such large quantities of fresh active yeast introduces several difficulties, but fortunately powdered baker's yeast which has little or no fermentative capacity on the dough, but possesses the full vitamin potency of the yeast, can be incorporated so as to give a bread satisfying normal conditions of growth and health maintenance. Dr. Varges Eyre, in his paper dealing with the value of yeast in bread, maintains that a "health bread" made from a "mixture of flour, dried yeast and fresh yeast would prove a popular and extremely beneficial food: it has the additional advantage of possessing flavour and does not become stale and dry so quickly."

MILK WITH BREAD.

With the main object of supplementing and balancing the nutritional value of bread, it is possible to incorporate dried milk, dried whey, and dried skim milk during its manufacture. If the addition is properly made to bring up the level to 4–6 per cent. of the original weight of flour, the resulting loaf improves both in flavour and keeping quality. This does not entail any additional cost but definitely improves the nutritional value of the finished article. The experimental work has already yielded satisfactory results, and as there is a growing appreciation and demand for bread of proved dietetic value, the time is ripe for the commercial exploitation by enterprising firms.

B. N. SASTRI.