

effect of this change on the various reactions taking place.

Some brief references were also made to the importance of finding a really accurate method for measuring the true permeability rates of extremely thin membranes. Theoretical investigations in this

field have already been made by Prof. A. V. Hill, and Dr. F. J. W. Roughton indicated how the streaming method could be made applicable to blood cells, thus permitting an examination of the true rates of ingress and egress both of non-electrolytes and of ions.

ERIC K. RIDEAL.

Water Supply

IT is natural and appropriate that the paramount topic of the drought should find a prominent place in the presidential address of Mr. Councillor Thomas Paris at the annual meeting of the British Waterworks Association (Incorp.) at Edinburgh on June 27. Much of what he had to say respecting the pernicious effects of a shortage of water has been a matter of common experience, but he made the pertinent observation that many of the failures in supply can be traced to procrastination and lack of courage in promoting water schemes. This was more particularly in reference to rural areas where, he emphasised, "the importance of an abundant supply of wholesome water is hardly to be over-estimated" since insufficient or impure water in those areas has wide-reaching effects on public health through milk and foodstuffs produced for general consumption. He alluded to the frequent lack of storage facilities and urged all councils, regional, urban and rural, to take action in the direction of increasing their storage and, where necessary, constructing new waterworks. Another of his points was river pollution, which, he contended, in the national interest must cease. He instanced the case of Edinburgh, where a few years ago there was a turbid stream flowing through the city, "offensive to eye and nostril". The action taken by civic authority has resulted in the transformation of a public nuisance and a menace to health into a "fished water". He is opposed to the formation of a national water grid, alleging that the argument for such a grid, so far as Scotland is concerned, is without foundation. The question in his view is not one of water shortage, but rather of storage and distribution.

Among the papers contributed to the Conference was one of a particularly timely character on the "Consumption, Misuse and Waste of Water". Mr. John Bowman, the author of the paper, directed attention to the striking difference in the quantities of water supplied per head per day by various authorities. He gave a list of 114 authorities in

England, each supplying a population of more than 50,000, in which the consumption ranged from 13.00 to 73.45 gallons per head per day. Another list showed that among 27 water authorities in Scotland, the consumption ranged from 34 to 92 gallons per head per day. Commenting on the subject of undue consumption, which might be defined as the use of more water than is necessary, he said: "a person living in a country where water is scarce may find it possible to perform all his ablutions with one gallon of water per day, and half as much again for culinary and drinking purposes. In civilised countries it would appear that, at least, from 4 to 6 gallons per head must be allowed, where there is no water used for baths or water-closets". Where water is used in addition for the supply of water-closets, it would appear that the lowest figure is about 10 gallons per head. Much depends on the class of property. Houses of the residential class have a higher *per capita* consumption than small tenements.

Mr. Bowman went on to ask the question: What is to be regarded as the future requirements for ordinary domestic consumption? He gave it as his opinion that within the next twenty years at least 20 gallons per head per day would have to be provided for the increased use of baths. The requirements per head per day would then be in the region of 50 gallons. Perhaps forty years from now a consumption of 80 gallons might be considered possible. In American towns 80 gallons per head is looked upon as a normal consumption. Dealing with the question of waste, which he attributed largely to defective fittings, he stated that a good deal of it might be eliminated by the installation of heavy service piping and good fittings. Useful work, he thought, might be done in educating the householder in the avoidance of waste due to faulty fittings and in getting him to see that taps were left properly turned off and to use water without undue consumption.

Fish Preservation in Trawlers

WITH the introduction of steam-driven vessels—somewhere about the year 1870—the great development of the present long-distance, deep-sea trawling industry became possible. But the industry's present greatness is not due to steam alone. Had not the practice of stowing the catch in crushed ice been also introduced about the same time, the bringing back of fish in a saleable condition from far distant grounds would have been impossible even for large and powerful steamers unaffected by the vagaries of wind-propulsion.

In recent years many experiments have been made in an endeavour to evolve and perfect a more satisfactory method of preserving fish at sea. In spite of every effort towards improvement, however, the

stowage of trawled fish in crushed ice is still the general practice, notwithstanding its very serious limitations.

The preservative effect of crushed ice is two-fold. By lowering the temperature of the fish tissues, changes due to autolysis are slowed down. This lowering of temperature also slows down the rates at which the bacteria of decay grow and multiply; but stowage in crushed ice alone cannot inhibit their activities completely.

Bacteria of decay are present on the fish when caught, but only in negligible numbers. As at present handled on board ship after capture, however, the fish become very heavily infected with these organisms. As a result of this severe infection, storage

in crushed ice will in general maintain fish in a really fresh state for not more than 6-7 days. Important researches at the Torry Research Station, Aberdeen¹, have shown that, with care, infection of the fish after capture can be so greatly reduced that they will remain fresh in crushed ice up to a maximum of 10-12 days. By greater attention to cleanliness, therefore, a marked improvement could be brought about in the quality on landing of ice-preserved fish.

Following upon its researches along these lines, the Torry laboratory has now issued a pamphlet² directing the attention of owners, skippers, and mates to certain points of importance which should be observed in the treatment of their catches if they are to obtain maximum returns from them.

Many of the recommendations are of a purely common-sense kind, such as minimum handling of the fish and greater attention to washing with clean water of decks, pounds, baskets and fish-room fittings. Certain additional precautions are also suggested, the most important and most practicable of which are the use of town-supply or other clean water heated to 180° F. (see below) for scrubbing all fittings, boards and baskets after the catch has been landed, and the scrubbing of the fish-room with town-water to which has been added 5 parts per 100 of 40 per cent formaldehyde. The fish-room should finally be sprayed with the same solution. At sea, and before the next catch is stored, the fish-room must be again hosed down with sea-water in order to remove all traces of the disinfectant.

While the better preservation of the catch is to be sought in greater cleanliness, attention to certain details of stowage is also recommended. It is pointed out that stowed fish should be protected so far as possible from all draughts, as these hasten the melting of the ice. The use of vegetable parchment for this purpose, at least for the more valuable species, is advocated as being remarkably effective in preventing wasteful melting caused in this way.

A noteworthy and most commendable feature of the foregoing recommendations is that they require little or no outlay of extra capital or additional running expenses, and can be immediately put into practice, with, it is claimed, marked improvement in the quality of the fish landed.

Certain other recommendations are also put forward which entail the installation of special equipment and involve more radical changes in the present normal routine on board ship. At all points where the fish come into contact with the ship or its fittings, it is suggested that heavily galvanised steel be used to replace or to cover the usual wood; galvanised steel baskets should be substituted for wicker ones; additional pipes and connexions should be installed on deck to facilitate more thorough washing of the fish after gutting; and a heater is advocated for providing water at a temperature of not less than 180° F.

Although there can be little doubt of their theoretical desirability, it is not likely that these special and somewhat costly fittings will be quickly and generally installed throughout fishing fleets. But this in no way detracts from the immediate value of the other and simpler recommendations. It is to be hoped that the general distribution of these leaflets amongst them will induce deep-sea trawlermen to test out the proposals on their own vessels without any further loss of time. This result achieved, sufficiently enhanced returns will be adequate incentive to ensure the permanent and universal adoption of the improved methods. To any less practical arguments trawlermen one and all will pay but little attention.

G. A. S.

¹ Food Investigation Special Report, No. 37. "The Handling and Stowage of White Fish at Sea." (London: H.M. Stationery Office.) 1s. 6d.

² Department of Scientific and Industrial Research: Food Investigation. Leaflet No. 3: The Care of the Trawler's Fish. By A. Lumley. Pp. 4. (London: Department of Scientific and Industrial Research, 1933.) Free.

Annual Gathering at Rothamsted

THE annual gathering of subscribers to the Rothamsted Experimental Station, held on June 20, had, this year, a special significance and there was a record attendance. On this occasion, the title deeds of the Rothamsted Estate, which has now become the property of the Lawes Agricultural Trust, were formally handed over to the Trustees by Mr. Walter Elliot, the Minister of Agriculture. The chairman of the Trust Committee, Lord Clinton, who presided at the meeting, announced that a telegram of congratulation had been received from Lord Bledisloe, Governor-General of New Zealand, a former chairman of the Lawes Trust. Lord Clinton then briefly outlined the reasons that compelled the Committee to issue its recent public appeal for £30,000 to purchase the estate. The land on which the building stood, and the fields containing the unique long-period experiments were threatened by building developments. He paid a warm tribute to Mr. R. McDougall and the Sir Halley Stewart Trustees, who provided £20,000, and to Sir Bernard Greenwell, Bart., whose early offer of £1,000 set a standard for the numerous private subscribers and organisations. As a result, the balance was quickly obtained, and the future of Rothamsted is secure for all time.

The director, Sir John Russell, said that the interest in Rothamsted is well shown by the wide-spread area from which subscriptions came, and by the cosmopolitan nature of the visitors at the annual meeting. He took this as evidence that the policy of Rothamsted is on the right lines: the purpose of the Station is not to teach farmers how to farm, but to give them information that they can use in solving their varied problems on their own farms.

Mr. Elliot congratulated Rothamsted on the successful outcome of the appeal. While it is a pity that an estate, which has been for three hundred years in the possession of one family, has to change hands, it is clear that no more suitable new owners could be found than the organisation Sir John Lawes set up himself. An old tradition has been broken, but a new one has begun which will produce equally great results for agriculture and England. The work of Rothamsted will go on at its present level, for the appeal fund has provided an unmistakable vote of confidence from the agricultural community.

Prof. H. E. Armstrong, vice-chairman of the Trust Committee, thanked Mr. Elliot for his remarks, and joined with Lord Clinton in congratulating the Minister on his efforts in reorganising the agricultural industry. He said that agricultural scientific workers,