ABSTRACT OF LECTURE

CITY MILK SUPPLY EQUIPMENT: FROM THE FARM TO THE CONSUMER.

By J. Borrie.

The purpose of the author in preparing this lecture was to outline a scheme for the satisfactory supply of milk to residents of the metropolis, and to indicate the great part which the engineer performs in providing the means for its successful accomplishment. Coming of a family of farmers, and having been closely connected for many years with that and collateral industries, the author claims to have special knowledge of the problems peculiar to the subject of this paper, and he considers in much detail the economies of the dairy farm itself; the provision at high cost of cows prolific in butter fat; the area of the holdings; the provision of ample supplies of water, hot and cold; windbreaks and sheltering hedges; farm hygiene and sanitation; cultivation of appropriate grasses and their fertilisation, according to the soil conditions; and the increase in the use of milking machines and other labour-saving dairy farm machinery. He then outlines a scheme for the delivery of milk from the farm to country depots, where it receives preliminary treatment prior to its transport in special vehicles to city and suburban distributing depots at which it receives final examination and treatment. In the course of the lecture many illustrations are borrowed from the author's knowledge of conditions in the dairy industry of New Zealand, and of the procedure in that country in the handling of milk.

It is desirable that the farmer should place his cans in sheltered cases at the roadside, whence they would be collected by motor-waggons of five or six tons capacity which deliver the cans to the country depots. It is essential that roads from the farmer's gate to the depot should be capable of carrying such traffic. Milking sheds and holding yards should be concreted and graded to drains leading to manure pits, and provision should be made for their adequate cleansing. Milking machines are rapidly displacing hand milking; and in New Zealand an average revenue of £24 to £30 per annum per farm was received for electric power consumed in 1920 by these machines alone; and the Electric Supply Board will construct lines in any district provided they can show a revenue of £45 per mile per annum. The author emphasises that dairy farming is becoming so specialised that in order to compete on foreign markets it is necessary to have
more highly-trained farmers than in the past, and he commends the educative work of the Government demonstration farms and Better Farming Trains; he suggests their continuance and extension, together with the delivery in country centres of illustrated lectures on the various phases of the dairy industry, and the appointment of more trained farm instructors, and greater encouragement in the district high schools by formation of boys' and girls' clubs for growing root crops and for rearing calves.

The milk, having been delivered to the country depots, it is tested by smell, and for acidity, for mechanical purity, for bacteria; and finally its butter-fat content is determined, and payment to the farmer is based on this. The cans, after washing and sterilising in special machines, are returned to the shelter at the farmer's gate. The milk is then cooled and delivered in road or rail tank waggons, which are heat insulated and heavily glazed inside, and which may be artificially cooled in the summer. As the demand and supply of milk vary throughout the year, facilities should be provided at country depots to treat the surplus of spring and summer. This entails an elaborate plant, which may produce any or all of the products, namely, table cream and butter (the skim milk being converted to powdered milk, or casein, or be used for feeding pigs as a by-product), sweetened condensed milk, evaporated milk, full cream milk powder, or cheese. Consequently the country depot should be located in the centre of a dairy district, beside a railway if possible, and near the main roads; the site and the works must be well drained and specially sewerred; water supply should be ample and fuel readily obtainable; all approaches, yards, etc., should be concreted and graded to the drains, with all necessary provision for washing down the area; the buildings should be of brick or concrete, with walls impervious to a height of seven feet; well lit by day and night, and well ventilated; an adequate supply of hot water and steam is essential; there should be provision of land for a piggery and for growing root crops. The treatment of milk sewage is a particularly difficult matter, and offers a special field of research for the sanitary engineer. Milk intended for the city supply is first weighed, preferably on a direct reading spring balance, which should comply with the British Board of Trade Regulations, and read in \frac{1}{2} pounds. It is then run through a fine wire gauze strainer into a receiving vat, which should be glass enamelled inside. From this it is passed through a clarifier to remove mechanical impurities, as tests in America have proved that clarified milk carries better, and there is a smaller increase in bacteria. Then the milk is passed over a three section water and brine cooler, or direct expansion cooler. Samples are taken before the milk enters the receiving vats. The milk is now ready.
The plant entailed in the above treatment involves a good steam boiler, refrigerator and brine tanks, and either electric motor or a crude oil engine; also a drip catcher for draining milk cans into. American tests have shown a saving of 300 gallons per day in a 100,000 gallon plant by this means; but the milk so saved is not used for town supply. In addition to this plant, a can-washing machine is provided, and it is expedient to install a plant for making sodium hyperchloride for disinfecting.

The milk, having been transported in glass enamelled tank waggons by rail or road to the city and suburban depots, is again weighed and tested; and from the receiving vat it is pasteurised, cooled and held in cool storage until required. The bottles before being filled are mechanically washed, sterilised and cooled. The arrangement of the plant and the type of machines used depend on the amount of milk to be treated and the method of treatment employed. Whenever possible, glass enamelled vats, etc., are used; and all appliances and all pipe lines must be so arranged that they can be effectively cleaned and sterilised. The author is strongly opposed to any scheme where the milk is pasteurised in the country prior to forwarding to the city. Delivery to the consumers should be on the block system; and the author outlines the constitution of a co-operative association for handling the milk supply, to provide reasonable profit to the producer, and to ensure pure milk to the consumer at a low price, and he emphasises the importance of having an engineer and other technical experts on the board of control.

The lecture was illustrated profusely with about fifty lantern slides.
DISCUSSION.

The PRESIDENT said Mr. Borrie had delivered a most interesting lecture, and, although not an engineering matter in the strict sense of the term, Mr. Borrie had shown that the influence of the engineer was felt in every phase of the city’s milk supply. It was interesting to see the tremendous growth of the dairy industry in New Zealand, and the use to which that Dominion has put her area in the matter of butter manufacture. He thought there were but small areas in New Zealand where irrigation was necessary. As a general rule there was a fairly plentiful rainfall. With reference to the use of electricity on the farms, the thought that while this was quite successful in irrigation districts where the allotments varied from ten to twenty acres, the usual dairy farms were of a much larger area, and the cost of distribution in such cases would be prohibitive. Road access was a matter that was receiving continual attention. It was possible for New Zealand, with its smaller areas, to develop its road policy. But Australia was not neglecting the matter. Main road communication was very desirable, and he hoped the aspirations in that direction, expressed in Mr. Borrie’s paper, would be realised. All the matters elaborated by Mr. Borrie provided work for the engineer. He congratulated the author on the time and trouble expended in the preparation of the lecture, and upon the excellent result attained.

Mr. WM. CHAS. ROWE said he had been greatly interested in the paper. If they could not travel themselves, they could learn from those who travelled. Mr. Borrie had set them a standard which they would do well to imitate. They had been shown a system of intense culture applied to the dairying industry, and the use of means available to all men if they would use them. It would be a fine thing if the paper could ultimately get into the hands of the small dairy farmer, and induce him to improve his methods. The matter of glass-lined tanks should be placed before all the milk suppliers of the country, because first and foremost it was necessary that the commodity should reach the consumer in a pure state.

Mr. A. E. HUGHES said he had been much interested in the lecture. What impressed him particularly was the advantage to be gained by co-operation with the Government authorities in technical matters. The Government had helped the farmer in so far that money had been made available for specific purposes, and the people had had the sense to grasp the opportunity. If one looked at the map one could understand the advantage New Zealand had in the matter of giving practically city conditions to the farmer. New Zealand
was very much smaller than Australia, and the closeness of
the centres to each other was a big factor in enabling New
Zealand to extend electricity and other advantages to the
farms, owing to the relative cheapness of distribution. An-
other important matter was the culling of the herds. The
crux of the matter was to obtain the highest average yield
for the lowest possible cost. This was evidently recognised
by the New Zealand farmer, when he paid such enormous
prices for his cattle. The mechanical engineer had made
enormous progress in providing the dairy farmer with facili-
ties for turning out a high grade product. He had been
amazed, when visiting some factories in the Western Dis-

tricf, to see the delicate and beautifully made machinery that
was in use—some of it almost automatic. The whole matter
was of the utmost importance, and it would be regrettable if
the information Mr. Borrie had at his disposal could not be
made available universally.

Mr. P. J. CARROLL, Commonwealth Dairy Expert, said
Mr. Borrie had held up New Zealand as an example, not from
a desire to reflect on Australian methods and conditions, but
to show that an improvement in our methods could be effected
by observing those of other countries. New Zealand people
were neither more intelligent nor more progressive than the
people of Australia, but progress had been forced upon them
because dairying was practically the life-blood of New Zea-
land. It had assisted in the development of New Zealand
more than any other industry. Hence it was that New Zealand
had made more rapid strides is the direction of herd-testing,
and particularly in the matter of top dressing the land. In
New Zealand production was referred to in terms of so much
fat per acre, and from that basis their methods were de-
veloped. It was a fine thing that an engineer should devote
his time and arouse interest in this matter among the mem-
bers of the Institute, because dairying, like agriculture, was
sometimes looked down upon as something beneath the or-
dinary individual. That impression should be removed. He
had greatly appreciated Mr. Borrie's lecture, and was very
pleased to have the opportunity of attending.

Mr. R. CROWE, Superintendent of Export of Dairy Pro-
doce in Victoria, congratulated Mr. Borrie on his paper. In
support of Mr. Carroll's contention that Victoria was not back-
ward in the dairy industry, he said that the results of inves-
tigations some years ago in New South Wales and in New
Zealand showed that the average cost of production in the
latter was threepence per pound higher than in Victoria or
N.S.W. He was confident that, were the rainfall in Victoria
as reliable as that in New Zealand, the results would be even
further in advance. The Agricultural Department of Vic-
Discussion.

Victoria, like that of New Zealand, was also following a progressive policy, and instructors and dairy supervisors were doing good work in the country, but it was a huge task, and would take long to accomplish.

Dr. D. G. Robertson, Director of the Commonwealth Department of Health, expressed his appreciation of the invitation to attend, and congratulated Mr. Borrie upon his excellent lecture. Most of the matters dealt with were somewhat outside the medical field; the medical man was dependent upon the engineer for the due performance of improvements in the methods of conveying the commodity to the consumer. Milk was a very suitable soil for bacterial growth, and unless adequate measures were adopted from the time of its collection until it was consumed there would be a very marked increase in the number of bacteria in the milk. Mr. Borrie had illustrated hygienic milking sheds to minimise dust; the use of milking machines instead of hand milking; the cooling of the milk, which inhibited the growth of bacteria; sterilisation, and the special smooth surface tanks in which bacteria could not lodge; and also methods of pasteurisation and cooling. But however pure the milk might be on delivery, by the time it was consumed, especially where bottled milk was not supplied, the bacterial count would probably amount to many millions per cubic centimetre.

Mr. D. T. McInnes, Government Dairy Expert, New South Wales, said that New Zealand had progressed a great deal in dairying. Australia had also progressed greatly, and the value of the dairying industry in Australia was now £44,000,000 a year, which was considerably more than that of New Zealand. The problem of milk distribution was receiving attention in Sydney as well as in Melbourne. At a conference recently held in Sydney a resolution was passed that the milk distribution for the city of Sydney should be on the block system. The idea was that the milk should be produced and treated in the country districts, brought to the city at a temperature of 40 deg. F., and then distributed. They had just completed a milk distributing depot in which for the first time the atmosphere inside the building would be filtered and sterilised. Feeding was the basis of milk production. The experience of New South Wales was that the difference in production between a year of drought and a year when good feed was available represented a value of £3,500,000.

Mr. J. Borrie, in reply, said that under his scheme they would get one quality milk at a uniform price throughout the whole of Melbourne. He thanked members for their hearty reception of the lecture.
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