

A HISTORY
of the
NEW ZEALAND
DAIRY INDUSTRY
===== 1840 - 1935 =====

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**A HISTORY OF
THE NEW ZEALAND DAIRY INDUSTRY.**



W. M. SINGLETON, DIRECTOR OF DAIRY DIVISION.

FOREWORD.

THE author of this book has recovered from the fast-perishing records of the past—records hitherto largely hidden in men's memories—the story of New Zealand's great dairying industry, an industry which to-day supports over one hundred thousand workers, and, in addition to fulfilling the wants of New Zealand's population by way of milk and milk products, exports these commodities to the annual value of over sixteen million pounds.

The book is an important one, not merely as a record of progress, and of past trials and errors, but as a handbook of facts and figures and of general information for those whose occupation lies in the field of dairying. The author states that the romantic side has been omitted, but the history is in itself a romance to recruits to the industry, while those who have laid down the tools of their trade will find much inspiration for pleasant reminiscence—much justification for pride, too—in the foundations they assisted to construct.

Those who were keen young men in the 1880's, the true starting-point of New Zealand's dairying development, are now nearing their allotted span, and each year evidences a woeful thinning of the ranks of the pioneers. I am pleased that this book has been written before it is too late, and certainly in another year or two the historian's task would have been even more difficult.

I trust that this great industry will continue to progress and to render its service to New Zealand and the people of the Home-land.

I also wish this book the success it deserves.



Minister of Agriculture.

5th May, 1937.

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PREFACE.

The dairy industry has done so much for the welfare of New Zealand that its influence on the well-being of New-Zealanders as a whole cannot be estimated. It has proved to be the corner-stone of the economic edifice this country has created, and this in turn is the principal support of the necessities and luxuries which are enjoyed by those living in this Dominion.

The industry has a history which is very worthy of permanent record. It was recognized that the time for the commencement of collation of data was ripe some years since when Mr. D. Cuddie, then Director of the Dairy Division, did some work in that direction. Other officers interested in the record of early-day experiences collected some data, but the results were more or less fragmentary, and it was recognized that an extended survey should be made. This work carried a responsibility which possibly did not devolve on any individual, but had to be undertaken. The Dairy Division accepted that responsibility, and I asked Mr. H. G. Philpott to undertake this survey on behalf of the Division.

Mr. Philpott was well equipped for the work. He has a facile pen, and his early environment and later official duties have helped to develop factors necessary to the success of the work. This has been evidenced by the very thorough search which has been made for information of value and interest and by the tenacity with which he has adhered to the task allotted to him.

Some matters give more pleasure when viewed in retrospect than when actually experienced. This would doubtless be the verdict of the majority of New Zealand's dairy pioneers, who did so much for the industry and themselves, despite those discouragements which only they can appraise. The pioneers of the industry have probably built better than they realized in their day. Reference is made in this book to their work and worth, and readers will agree that the tribute is richly deserved.

Domestic animals are closely associated with advancing civilization and settlement, and this book gives the reader a good general idea of the development of the dairy herds and the manufacture of dairy products from their milk and cream. The early manufacture of farm-made butter and cheese gave way to the factory system, which, if it did not always produce a better quality

than the farm-made produce, did contribute to uniformity. For an export trade uniformity is an asset. Since the inception of the factory system there has been constant effort towards improvement and uniformity, with the result that the United Kingdom, which is the emporium of dairy products from more countries than any other market, now obtains its most uniform quality of butter and cheese from New Zealand. The application of pasteurization to milk and cream for cheese and butter manufacture extended very rapidly amongst the cheese factories and creameries in New Zealand and proved to be a potent factor in the direction of uniformity of quality. Not only has the quality become uniform, but New Zealand dairy-produce now possesses keeping-qualities equalled by these products of no other country.

All the essentials for rapid development in production of milk products, particularly butter and cheese, were here. Some excellent strains of purebred dairy cattle were amongst the importations. The excellency of many of these strains was early recognized and numerical increase was assured. The soil is responsive to fertilizers, and a comparatively reliable and copious rainfall in the principal dairying districts has enabled dairy-farmers to put New Zealand in the forefront of countries exporting butterfat in the various dairy products.

Naturally such development called for increased administrative attention, and whereas in the early days of the dairy-factory system of manufacture the officer in charge of the instruction and grading service could afford time to do some instruction work in connection with manufacture of butter and cheese, the work of the Head Office of the Dairy Division is now such that full-time attention of a staff is required to cope with the administrative duties which have to be carried out.

The various amendments to the Dairy Industry Act and the dairy-produce general regulations are now important factors governing the production and delivery of milk and cream, the manufacture, grading, and the storage of dairy-produce. These amending Acts and regulations have been brought in largely at the request of producers and are indicative of a spirit of progress.

This historical survey of New Zealand's dairy industry will bring before readers, whether here or overseas, an outline of what has been accomplished with respect to the development of dairying up to the present. The future has its perplexities, but food will be required for human consumption, and it is surely not too optimistic to conclude that New Zealand's overseas trade by way of export of food products will mean as much to her welfare in the future as it has in the period referred to herein.

The issue of this publication preserves by way of permanent record many items of interest which would otherwise doubtless be lost. The student is likely to find much which will be of help either by way of direct information or by giving a clue as to how further information can be obtained. The general matter has, in my judgment, been as well arranged as overlapping circumstances would permit. I trust history will be as appreciative of Mr. Philpott's effort as this book is of New Zealand's dairy industry of to-day.

W. M. SINGLETON,

Director of the Dairy Division.

Wellington, 5th May, 1936.

INTRODUCTORY.

Objects—Plan of work—General survey.

THE principal object of this work is to provide a brief historical account of the progress of the New Zealand dairy industry from the beginnings of the colony to the end of 1935, and to make available in a permanent and reasonably concise form a record of the origin and development of the more important factors relating to its growth.

An economist, in closely analysing relevant statistics and trends, and the effects of those many influences which have had a bearing on the progress of the industry, would discover that the movement falls naturally into several major periods, which, in turn, may be subdivided into a number of lesser periods. The first definite period would be from colonization in 1840 to refrigeration in 1882, and would be regarded as the period of local trade. This period could be divided at about the 1851 mark, and from then on to 1882 be called a period of experimentation, inasmuch as producers were interesting themselves in the possibilities of an external trade, and experimenting with methods of exporting butter and cheese. The next period would run from 1882 to 1895, which was the period of establishment of the dairy-factory system and of the export trade, and, taken as a whole, was a time of instability not only for dairy-producers, but for the entire colony. From 1896 to 1913 there followed a fairly smooth-running period of steady expansion in the industry. Then came the Great War, which created a hiatus for the years 1914 to 1919, during which high prices ruled. From 1920 to 1929 statistics reveal rapid expansion (with a temporary, though somewhat severe, price-depression from 1921 to 1923, during what might be termed a period of readjustment), while 1930 to 1935, the close of this history, and also a period not yet completed, will be looked back upon in days to come as a time of marketing difficulties.

The present history, however, makes no pretence to being an economic treatise. The important factors so far as this work is concerned are technical rather than economic. This being so,

only two main periods have been recognized—namely, (1) the period of local trade, and (2) the period of export trade; in other words the period before refrigeration and the period after refrigeration.

The plan chosen for writing has been to divide the work into three main sections. The first section contains a narrative account and records the major happenings year by year, following, as it were, the main current of events. The second section embraces a series of more specialized studies and detailed information concerning various important branches of the industry, while the third and final section embodies a series of tables and statistical information.

In its broader aspect the subject has been dealt with almost entirely from the angle of the export trade, in milk products, for the reason that the export trade—particularly the export of butter and cheese—is, and, with certain brief and comparatively unimportant exceptions, always has been the determining factor in the industry. Had it not been for the export trade, New Zealand's dairying activities must necessarily have remained comparatively insignificant, irrespective of the extension of certain other branches of agriculture.

Very little will be found relative to the husbandry of dairy stock on the farm, and what has been included refers mostly to the introduction of types of various breeds of dairy cattle and the steps taken to secure the establishment of good milking-strains as indicated by seasonal production of butterfat. Matters concerning financial assistance given by the State are mentioned only where such assistance has been directly applied to the dairy industry. State assistance with respect to land-settlement generally and most of the facilities for advancing finance to settlers for development purposes have been at the disposal of all agriculturalists, and are therefore not dealt with. In short, this volume is very largely a record of the march of progress from the private or individualist making of butter and cheese on the farm to the successful institution of the community or co-operative dairy-factory system of manufacture of high-quality milk products for supply principally to markets overseas.

A difficulty has been to know how to choose out of the great mass of detail collected not what seemed to be of interest, but what it seemed necessary to record, and, above all, to arrange it satisfactorily from the reader's point of view.

Inventions, innovations, and developments of distinctly foreign origin or of a world-wide influence rather than particularly applicable to New Zealand have been but lightly touched upon except in so far as they directly affected this Dominion. Such things as the application of mechanical refrigeration, the centrifugal cream separator, and the various tests for butterfat would come under this heading. There are already authoritative works of reference on the origin and operation of these appliances and inventions readily available to the specialized student. Nevertheless, reasonably detailed particulars of these and allied subjects have been included.

A somewhat disappointing feature is that fuller mention of a personal nature could not be made of the founders of the industry. To live awhile among the old historical records and accounts is to recognize that New Zealand owes a heavy debt of gratitude and respect, as well as admiration, to many unknown pioneers for their splendid teaching and example. It should always be remembered that progress does not drop like manna from Heaven, but has to be earned and entails sacrifice, sustained effort, and devotion to high ideals. Nor should the women be omitted from this tribute, for in all pioneering enterprises success lies even more with the women than the men, for women courageously endure hardship and loneliness and fear that men may take heart and achieve their ambitions.

Despite the undeniably great work of our nation-builders, however, the part played by matters beyond man's control, or of foreign origin, must not be overlooked. Fate has been singularly generous to New Zealand. These things will be dealt with in their correct sequence as this work progresses, but in the meantime may be briefly summarized. There was, for instance, the discovery of gold. This occurred at a time when nothing but a sudden and large increase in population could save the farmers from disaster. The gold rush was instrumental in almost quadrupling our white population in ten years. When the gold-rush boom passed it was

but a few years before another period of depression presented itself, only to be relieved by the discovery and application of mechanical refrigeration. Later, but at remarkably opportune stages in our history, came the separator, the Babcock test, and the milking-machine. More recently there loomed out of the mists the Great War of 1914 to 1918, and except for the Great War, with its myriad and far-reaching influences, it is decidedly problematic whether our dairying industry would have gained its present magnitude. And after the War came Nauru Island phosphate, providing cheap and suitable fertilizer at a time when our farms were becoming less fertile. One does not deny our workers in the industry the credit for having utilized these inventions and circumstances with marked efficiency and undeniable success, but it is good that the effect of the influences mentioned should be remembered. Climate, soil, and such natural advantages must also be kept in mind. The principal—one might say the only important disadvantage—was the obstacle of distance, which time and invention have very largely overcome, enabling us, so far as the Northern Hemisphere is concerned, to enjoy the benefits arising from our opposite seasonal periods of production.

The land of the Dominion is, in general, eminently suitable for dairy-farming. The climate is temperate, and in most districts cattle do not require to be stall-fed, even in the winter season. There are, nevertheless, many instances where stall-feeding is practised, and the tendency appears to be growing, especially with a view to ensuring continuous supplies of milk for cities; but for the production of milk for butter and cheese factories, grass, supplemented by hay and roots, are on most dairy-farms the only foods which the cows receive. As is to be expected in a narrow strip of country stretched across a thousand miles of ocean, our climate varies. In the southern portions of the South Island a fairly cold winter is experienced, but even there good pastures are easily maintained, and stall-feeding is the exception. Fodder crops flourish throughout the Dominion, and of recent years increasing attention has been given to their cultivation.

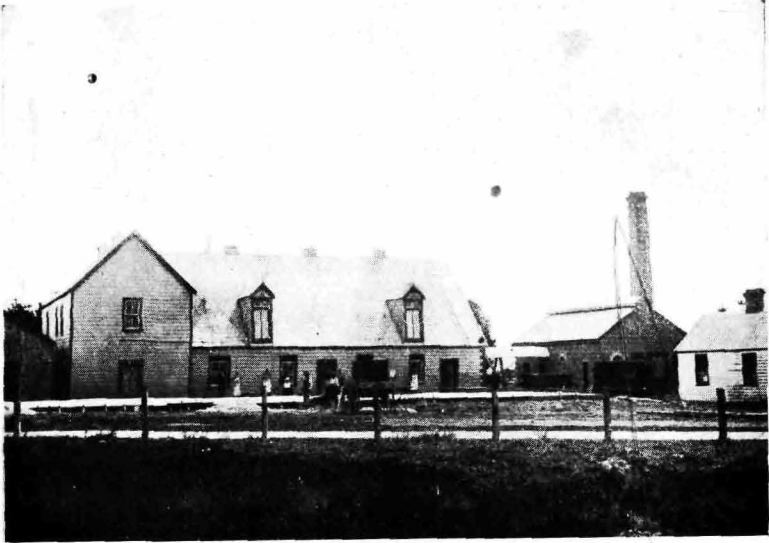
Dairying was at one time handicapped by the fact that it required far more labour than sheep-farming, but cows are now milked by machinery, and it is possible to run a dairy-farm with very few workers. Rural reticulation of electric power has further improved the position.

Good pastures are comparatively easy to establish in this country, for English grasses thrive wherever the natural bush and fern are cleared. Even in the coldest months of the year there is some growth in the pastures, and in practically all occupied parts of the country stock can live the year round without any food other than local vegetation. Obviously, therefore, Nature has been very generous to us, and from the dairy-farmer's point of view New Zealand is a producer's paradise.

New Zealand's present position on the butter and cheese markets of the world has been built on an extremely short and rapid dairying history, moving hand in hand with a general agricultural development. The dairy industry has shown wonderful progress and, taken as a whole, has enjoyed remarkable prosperity. As will be shown later, the causes of progress have been many, although co-operation and Government encouragement seem to have been the principal factors. And when thinking of progress it must not be overlooked that progress in quantity could not have been achieved without due regard having been paid to quality. The comparatively high quality of our butter and cheese is strong evidence of considerable efficiency in the methods followed in the production and handling of the raw and manufactured products. The development on the farm and in the manufacturing dairy has been consistently progressive and a high standard of efficiency attained. Viewed in the light of age one is forced to marvel that so much has been done in so short a time, the whole thing carved out from the rough in considerably less than a century. As will be seen from the pages which follow, there was not a decade which was not crowded with event; one development following close on the heels of another; one invention filling the minds of the pioneers with wonder, while something still more ingenious was waiting to make them marvel anew. For the past fifty years every year has been a page of history crammed with interest, and it is just that multiplicity of happenings which makes the history of New Zealand's dairy industry so absorbing, and so formidable from the historian's point of view.

H. G. P.

TWO OF THE FIRST DAIRY FACTORIES IN NEW ZEALAND.



EDENDALE.



FLEMINGTON.

[To face page 12.]

SECTION I.

A Brief Record of Major Events in the New Zealand Dairy Industry from 1840 to 1935.

CHAPTER I (1642—1850).

THE FIRST DOMESTIC CATTLE.

Bay of Islands—Mana—Kapiti—Akaroa—Waikouaiti—Port
Nicholson—Nelson—New Plymouth—The first Ayrshires—
First records of trade in dairy-produce—Howick Cow Co.

WHILE dairying cannot be claimed to have reached the dimensions of an industry of any importance until the advent of refrigeration in 1882 paved the way for an export trade, one can scarcely begin a history of this kind without reference to those pioneers and adventurers who so efficiently blazed the trail for later generations of agriculturalists.

The first European discoverer of New Zealand was Abel Tasman, the famous Dutch navigator, who first sighted these shores in 1642. No further known voyage of Europeans to these Islands occurred until 1769, when Captain Cook made the first of his visits, his last being in 1777. Close on the heels of Captain Cook came the whalers, and from 1792 the whaling-ships of different nations began to touch on the coast.

Captain Cook, on his last voyage, brought cattle to New Zealand, but did not leave them. He states that he fully intended to leave not only goats and hogs, but sheep and a young bull with two heifers if he could have found either a Maori chief powerful enough to protect and keep them, or a place where there might be a probability of their being concealed from those who would ignorantly attempt to destroy them. Captain Cook's later diaries, however, make it quite clear that he decided to take the cattle away with him, and that he left some of them, if not all, in the Friendly Islands.

One would have expected to find references to the cow in connection with some of the many whaling-stations which dotted our southern shores, but there is no record of any domestic cattle having been introduced into New Zealand before 1814. In December

of that year the Rev. Samuel Marsden, our first missionary, whose headquarters in Australia were at Parramatta, near Sydney, arrived at Kororareka, in the Bay of Islands, in North Auckland, by the brig "Active," and brought with him, among other domestic animals, a bull and two cows. They were a present from Governor Macquarie, and were selected from the Crown Herd of New South Wales. Kororareka was the old name for Russell.

The Rev. Marsden continued to send small consignments of dairy cattle until 1822 or 1823, but says that he had never been able from the first to convince the missionary settlers of the value of cattle. "My wish," he states, "was that the missionaries in time should be supplied with milk, butter, cheese, and animal food, which would in a great measure render them independent of the Natives for support." On one occasion he found that a missionary had shot three of his heifers and two bulls, and also one calf. Moreover, in some instances the heifers and bulls were never mated, thus checking any increase. Despite these facts, it is recorded that in 1821 Mr. Marsden had about twenty-three head of cattle grazing upon the missionary grounds, besides three or four cows that had escaped and were running wild in the woods. They appeared to be in very good condition, and were chiefly heifers and cows. In a letter written in January, 1823, Marsden puts the number down at fifty or upwards, and presents them to the Missionary Society "for the comfort and support of their missionaries."

The Rev. Samuel Marsden must therefore go down in history as having forged the first link in the chain, for it was he who realized and stressed the importance of the dairy cow to a new country, and who was responsible for her introduction to New Zealand.

In all probability the second important link was that forged by Mr. John Bell, our first settler, who on the 30th March, 1833, set out from Sydney to establish himself at Mana Island, a small strip of land a mile and a quarter long, which lies off the West Coast of the Wellington Province near the entrance to Cook Strait. Bell brought with him 10 head of cattle, 102 sheep, and $2\frac{1}{2}$ tons of hay. The cattle were used to supply milk and beef to the whaling trade, which was, by that time, a considerable industry in these latitudes.

In May, 1839, Messrs. Cooper and Holt, of Sydney, sent some young bulls and heifers to Kapiti Island, then known as Entry Island, but what became of these cattle it has not been possible to ascertain.

The scene then shifts to the South Island. History tells us that in September of the same year, 1839, William Barnard Rhodes purchased the barque "Eleanor" and loaded her in part with 50 head of cattle, nearly pure Durham, purchased at £16 a head at the Hunter River, New South Wales, from a Mr. Rust. These cattle were landed at Akaroa, Banks Peninsula, early in November, 1839.

Another prominent figure in the very early days of the South Island was Mr. John Jones, who in 1838 purchased from Messrs. Wright and Long, of Sydney, the Waikouaiti whaling-station. "Johnny Jones" is described as "a man of great shrewdness, determination, and otherwise strongly marked character." He became a large landowner, and in 1840 settled a number of families on his holdings. It is known that Jones sent over cattle to Waikouaiti from Sydney, and though the exact date does not appear to have been recorded, the first lot would probably have arrived between 1838 and 1840. It is recorded, however, that at a later date Dunedin derived "a great food-supply" from Jones's cattle and sheep.

Thereafter, for a space, records are even more blurred, so that it cannot be told, except by inference, when or how the cattle came. It is evident, though, that Australia was the principal source of supply, and that importations grew rapidly.

Many useful and interesting facts are to be gleaned from the letters of the early immigrants, the first of whom arrived in 1840, when organized colonization had its successful beginning. A letter written from Port Nicholson (Wellington) in 1842 tells us that "there is a great deal of cattle here now, and more expected." Another of the same year and place states that "a cow with a calf by her side we get for £10." Still another that "we have three cows that we milk at present, one more that will calve in about ten days, and a very handsome bull, and four large calves; two are heifers, and two bulls." A sentence which makes us pause is in another letter from Port Nicholson, and also written in 1842:

“ My wife is nursing at present at Evan’s Bay, about three miles from Port Nicholson, *at a large dairy.*” The owner of this dairy was probably Mr. W. K. Hulke, afterwards a prominent North Taranaki pioneer.

Letters written from Nelson in the same year contain particulars equally well worth quoting :—

“ Two cargoes of horses, cattle, and sheep, have been recently landed here ; the first brought by Dr. Imlay, a celebrated Australian breeder, in beautiful condition, and very excellent stock.”

“ Revans has been here, and I expect he will give a good account of the place. He sold a part of a cargo from Sydney pretty well, and bought a herd of cattle *and established a station or dairy.*”

Letters from the New Plymouth settlement, also written in 1842, afford further interesting glimpses. Following are two brief selections culled from many of similar strain :—

“ I send this by Captain King to Sydney ; he is gone there to buy cattle and bring here.”

“ Cattle do remarkably well in the bush, growing quite fat. We sold a heifer the other day to the butcher for £30, the beef was excellent, and two milch cows realized £65. We expect Messrs. Molesworth and Wall from Port Nicholson overland, with about 20 or 30 head of cattle and some horses ; this will bring down the price of stock.”

The Hon. Henry William Petre, in his book “ The Settlements of the New Zealand Company,” refers to the importation of cattle from New South Wales and Van Diemen’s Land (Tasmania), and says that in 1841 milch cows were sufficiently numerous in Port Nicholson to afford milk and butter for constant sale.

In a letter from Wellington dated 26th February, 1841, and addressed to the Secretary of the New Zealand Company, William Wakefield states : “ My confidence in the success of this settlement (Port Nicholson) rests in no slight degree on the vigour with which many gentlemen are now employed in raising stock, and in farming operations. *The importation of cattle from New South Wales supplies us with the means of increasing the best breeds.*”

For want of some more direct historical reference, the foregoing particulars have been presented. The dates, 1841 and 1842, should be kept securely in mind. Two important facts are at once apparent, though perhaps not new to colonization; first the immediate realization by the colonists that their present livelihood and future welfare in these islands was bound up in no mean way with the dairy cow, and, second, the rapidity, considering the lack of transport facilities, with which the dairy-cow population grew.

AYRSHIRES IMPORTED.

Settlers of Otago and Southland knew the Ayrshire cow in her native land, and it is only natural that those early Scottish colonists should import their favourite breed as soon as the necessary arrangements could be made. The "Philip Laing" is said to have brought out the first Ayrshire bull, which was consigned to the Rev. Dr. Burns, first Presbyterian Minister in Otago. This was in the year 1848. After this importations were more frequent, and representatives of the breed came with such vessels as the "Cheviot," the "Bruce," and the "Cashmere" prior to the year 1875. The principal importers were the New Zealand and Australian Land Co., Messrs. Thos. and Robt. Hamilton, Messrs. Cargill and Anderson. The names of Messrs. David Warnock, A. and T. McFarlane, and Cook may also be mentioned amongst the earliest breeders and importers. As the Ayrshire came so early on the scene, and possesses such widely recognized merit as a dairy cow, it is somewhat surprising to find that this breed has not increased more rapidly. At the present time (1935) only 7 per cent. of our recognized purebred dairy cows are Ayrshires.

EARLY TRADE IN DAIRY-PRODUCE.

James Hay, in his book "Earliest Canterbury," refers to what surely must have been the first semblance of a trade in dairy-produce. He tells us that the McIntosh family, who arrived in Pigeon Bay, Banks Peninsula, in 1846 and commenced dairy-farming in 1847, made cheese which was famed on the Melbourne market. It has not been possible to trace any trial shipments to Australia in the early "fifties." There is, however, in the *New Zealand Country Journal*, 1882, the following reference, which

is contained in an article on "Canterbury Past and Present," by Mrs. Deans: "In 1847 Mr. John Gebbie had made 2,400 lb. of cheese and 700 lb. of butter. Samuel Manson had made 600 lb. of cheese and 1,600 lb. of butter. John Deans took butter and cheese to Sydney, where he sold butter for 1s. 3d. per pound and cheese for 1s. per pound." It will be noted that the statement is not clear on the point as to what year Mr. Deans took his butter and cheese to Sydney.

Hay also tells us that what cheese and butter could not be disposed of by barter to the whalers on Banks Peninsula had to be sent to Wellington, which was the only other market for dairy-produce at this time—towards the middle of the "forties." There are several records extant which prove the accuracy of this statement.

Another reference is to a man named Ryan, who was a cooper on a whaler which arrived in New Zealand in 1848, and who "accumulated quite a ransom making dairy appliances (tubs, churns, chessets, &c.) for the early settlers, to whom he was indispensable."

An interesting glimpse, which also affords a hint of pioneering difficulties, is contained in an account from the same book of the sale of the schooner "Richmond" in 1843 to Mr. W. B. Rhodes, of Wellington, for ten cows, valued at £20 per head. Those cows were at Akaroa, and it took eight men three weeks to cut a track to get them to Pigeon Bay, a distance of approximately fifteen miles.

HOWICK PENSIONERS' CO-OPERATIVE COW CO.

In these days of a huge and highly organized dairying industry it is of interest to look back to the very humble starting-points from which the industry has developed. One discovers with no little astonishment that as far back as 29th May, 1848, there was established at Howick, near Auckland, an organization known as the Howick Pensioners' Co-operative Cow Co. The carefully drawn rules for the conduct of the company are still preserved, and they are eloquent of the limitations and privations of life in those pioneering days.

The Howick Co., formed by soldier settlers sent out from England, consisted of forty members, each holding one £10 share, and its modest object was to purchase a cow for each of its members. Any one could become a member by taking out a copy of the rules, for which cost price had to be paid, paying £1, and undertaking further weekly instalments.

The government of the company was vested in a committee of thirteen, inclusive of executive officers. It was the duty of the committee, when sufficient funds had been subscribed, to purchase cows for the company. "They shall fix the price which the produce of the cows shall be sold at to members," continues the old document, "and, should a surplus remain, the price at which it may be sold to the public." It was also the duty of the committee to brand the cattle purchased, numbering them from one upward, and to keep a book recording the particulars of each. The records do not state from whom they bought their cows, and it can only be assumed that they would have to rely almost entirely on importations from Australia.

It is somewhat disappointing to find that such a gallant effort at co-operative organization in those early days came to an end on account of the inability of members to keep up their payments.

THE CLOSE OF THE "FORTIES."

One leaves the "forties" with the impression that they were active, crowded years for those who were laying the foundations of New Zealand's history. Colonists were arriving in increasing numbers, and settlements were being established in various parts of both Islands, the South Island apparently enjoying the preponderance of favour. So far as dairying is concerned, however, the cow received little attention beyond the supplying of the immediate needs of the scant population by way of milk, butter, and cheese. The first cows, mainly Shorthorns and Durhams, with a decided leaning to beef rather than butterfat, were scarcely the ideal foundation for the development of a dairying industry, and in those modest beginnings the nucleus of the great industry which was subsequently to come to pass was by no means clearly discernible.

CHAPTER II (1851-1881).

EARLY EXPANSION OF THE INDUSTRY.

Survey of period—Influence of gold rushes—The first Jerseys—
The first herd-books—The first dairy factory—Private
cheesemakers — Government bonus — Akaroa cheese
exported.

THE year 1851 marked the commencement of a period which extended for thirty years, and was only terminated by the advent of refrigeration in 1882. In its broader aspect it was a period of experimentation. It was a time when colonists were paying greater heed to the produce of the cow, and endeavouring to turn that produce into wealth. More attention was being devoted to manufacture, and early newspapers indicate that much enthusiasm was evidenced in the matter of butter and cheese exhibits at the various agricultural shows, which by the close of the "fifties" were common to most rural districts throughout the colony. This was, of course, farm-made butter and cheese. The colonists were, too, struggling hard to find a satisfactory method of conveying butter and cheese to outside markets, and many and varied were the experiments made. These experiments were not confined to shipping, but included the manufacture and packing of the produce.

In another sense the period 1851-1881 could correctly be called *the period of expansion for local requirements*, and in turn appears to fall into two main subdivisions—namely, 1850-1860, the period of early expansion tending to export, and 1861-1881, a period of rapid expansion—following the gold rush and rapid colonization. Population was, of course, an important factor in the local trade of those first few years—one might almost say the most important factor. An addition of only a few hundred inhabitants to the population of a settlement could mean a great deal to the producers supplying that particular settlement.

New Zealand's white population in 1851 was only 26,700, straggling over both Islands, so that local requirements did not encourage an extensive dairying industry. Nevertheless, it must not be overlooked that ten years earlier—that is to say, 1840—the European population numbered only about two thousand. But even if productive enterprise was restricted by the local market, export facilities were little more encouraging. The absence of refrigeration precluded lengthy transport, so that the only outlet for the surplus over local demands was Australia, and export was largely dependent upon the seasons in Australia as well as here. And even with the comparatively short sea journey much difficulty is said to have been experienced with bad flavours developing in butter during transit, so that on arrival the product was not always saleable. With cheese there was less difficulty, and New Zealand cheese, particularly that from Banks Peninsula, was quick to establish a favourable reputation on the Australian market and, when market conditions were right, realized satisfactory prices. Prices, however, varied quickly and considerably with supply and demand, and it was difficult to judge the market, so that consignments were frequently unprofitable to exporters.

It was during the "fifties," it will be remembered, that the gold rushes of Australia were at their height, and the influx of population to that country was largely responsible for expediting our first experiments in the exportation of dairy-produce. The trade activity, however, was of short duration.

The "fifties," then, witnessed a continuation of agricultural development, attention being devoted principally to cereals, meat, and wool, although dairying was by no means neglected, and it was during this decade that the first systematic attempts to establish an export trade in butter and cheese were undertaken.

Although both butter and cheese appear in the first statistics relating to our external dairy-produce trade, it is apparent that in the beginning there was considered to be a readier market for butter than for cheese.

A certain amount of both butter and cheese was disposed of locally to the various overseas trading-vessels to replenish ships' stores, but although shipping was increasing rapidly, this custom was, to say the least, an unreliable and indefinite quantity, and not likely to be sufficient to materially affect the general position

At this period processes of manufacture were still very crude. There were no proper methods of caring for milk, no scientific cooling, and altogether the resultant product depended mainly on the skill and cleanliness of the maker, the god of luck playing no unimportant part. Barter was still the principal business medium, butter and cheese being exchanged with the storekeepers for flour, tea, sugar, and other household necessities.

The technical records of those days were interspersed with now unfamiliar terms, such as crocks, kegs, chesets, tubs, plungers, &c., and these, viewed in the light of modern nomenclature, are in themselves sufficient to stamp the period as being before the dawn of dairy science such as we of to-day are accustomed to. Butter was preserved in brine, or sometimes in salt alone with sawdust as an insulator, but the product in many cases must have been such that it is doubtful if even the refrigerator would have enabled it to reach the consumers' table in edible condition.

The South Island was being developed more rapidly than the North and supported the larger population. This was only to be expected, seeing that the South Island was, as a whole, more suitable for immediate occupation, and its inhabitants safer from molestation from the Maoris, who, in the North Island, were still hostile and a menace to isolated settlers.

By 1859 New Zealand's population had reached the 59,000 mark, and for that year there was exported 859 cwt. of butter, valued at £5,588, and 1,067 cwt. of cheese, valued at £4,926, the total being worth £1,725 less than for 1853, and the highest since that year, so that there was little reason for optimism on the part of the dairy-farmer.

The "sixties" represented a turbulent period in New Zealand's history, for during that decade the gold fever prevailed. A great and sudden influx of population, mainly from Australia, took place, and a shortage of commodities, accompanied by an immediate rise in prices, was the natural outcome. Although the rural population was not immediately affected, this invasion of fortune-hunters had a stimulating effect on the agricultural and pastoral industries. All branches of production prospered, and just as suddenly as the population increased so the exports ceased, or at least dwindled to insignificance. There was a payable market

within the country for everything that could be raised, and the total value of dairy exports for the years 1862 to 1865 inclusive was under £3,000. Moreover, New Zealand could not cope with the local demand for butter and cheese and had to import a quantity of these commodities from England and Ireland.

The position which arose gave New Zealand dairy-farmers fresh heart at a moment when they were sorely in need of it. They were already growing discouraged because of the lack of outlet for their produce and the limited possibilities of development. The local market was glutted, attempts at export were only partly successful, and altogether the position appeared almost hopeless. Some idea of the improved local market resulting from the gold rush may be gained from the fact that in 1858 our population was estimated at 59,413 whites, while ten years later, in 1868, it had jumped to no less than 226,618.

One is inclined to ask how importation could be successful when exportation had proved little better than failure, for there is evidence to show that Irish butter and English cheese opened up here in very passable condition. The explanation probably lies in the fact that the Irish were then, as now, expert butter-makers; that, with a view to fostering an export trade, only produce of the highest quality would be selected, and this packed and conveyed under the best available conditions. The bulk of the trade, too, would be in Irish summer-made butter—that is to say, butter made at the best time of the year and under the most favourable conditions for quality and keeping. The butter was packed in oak firkins, and was what we to-day would consider heavily salted, as well as packed in salt for preservative reasons. The brand known as Double Rose Cork was, we are told, the most favoured by the colonists. Although it has not been possible to trace details regarding cheese, doubtless a similar position with respect to selection, packing, and transport would apply. It is said that some of the early cheese came out in tins.

The Hon. (afterwards Sir) Robert Stout, in his study "Notes on the progress of New Zealand," gives useful figures relating to the average prices of provisions in New Zealand in 1864. Fresh butter is quoted at 1s. 11d. per pound, salt butter at 1s. 3½d., cheese at 1s. 4½d., and milk at 6½d. per quart. It will be recognized that these were good prices for the dairy-farmer.

The importations referred to were made before the advent of refrigeration and the establishment of an export trade in dairy-produce, and for this reason the Jersey breed did not make the same progress as the more dual-purpose types of cattle, but with the development of the dairy industry the progress of the Jersey breed was phenomenal, and to-day something like 75 per cent. of our purebred dairy cattle belong to this breed. It may be mentioned in passing that in several instances the original Jersey females came to New Zealand as ship's cows to furnish fresh milk on the voyage. Although not brought out in this capacity, one of the earliest Jersey cows, "Orange Rose," whose name is to be found away back in the pedigree of many of our present-day Jerseys, was called upon to fulfil a like duty under rather unusual circumstances. Upon the arrival of the ship on which "Orange Rose" travelled it was decided to send the Governor's son to England for medical treatment. Owing to the child's delicate health fresh milk for the voyage became necessary, and the services of "Orange Rose" were enlisted. Thus she was transported back to England, coming out to New Zealand for the second time on the ship's return journey. In view of the comparatively primitive shipping conditions of those days, "Orange Rose" surely has an enviable travel record. The foregoing particulars have been extracted from the booklet, "The Jersey in New Zealand," issued by the New Zealand Jersey Cattle Breeders' Association in 1932. Particulars of the origin and objects of this society will be given in due course.

THE SHORTHORN BREED OF DAIRY CATTLE.—THE FIRST NEW ZEALAND HERD-BOOKS.

Although Ayrshires and Jerseys came to New Zealand at a very early stage in our history the first cattle to be imported were mainly Shorthorns, and this breed was numerically dominant until well after the close of last century. In 1884 the Canterbury Agricultural and Pastoral Association issued the *New Zealand Herd Book of Short-horned Cattle* (New Series), Vol. I. Following is an extract from the introduction to this volume :—

" Breeders of cattle in the Colony of New Zealand at an early date recognized the importance of possessing reliable records of the pedigrees of their stock, and accordingly some years ago a

Herd Book was established by Sir George Whitmore, who, after the publication of the third volume in 1870, passed his interest in the book over to Mr. W. J. G. Bluett, under whose editorship it reached its fifth volume. Subsequent to the commencement of the *New Zealand Herd Book* the Agricultural and Pastoral Association of Canterbury in 1870 established a Herd Book with the title of the *Canterbury Herd Book* for the purpose of collecting and recording the pedigrees of the numerous Cows and Bulls which had been introduced into the Province from the earliest days of the settlement. Many of those were highly-bred cattle but owing to the exigencies which attend the settlement of a new country their pedigrees have been lost, even although their influence was plainly noticeable amongst the cattle to be seen on the farms of the district. This book reached its fifth volume in 1880, and there can be no question about the advantage conferred upon the breeders who availed themselves of its publication.

“ In the course of time many breeders of Short-horn cattle expressed a wish that the continuation of the *New Zealand Herd Book* should be undertaken by the Agricultural and Pastoral Association of Canterbury, as being a work congenial to the position which was accorded to that Society as one of the leading bodies engaged in the advancement of agricultural pursuits in New Zealand. The Committee of the Association accordingly conferred with Mr. Bluett, who met them in a liberal spirit and transferred the copyright of his book to them.

“ It thus became essential that the *New Zealand Herd Book* and the *Canterbury Herd Book* should merge into one, and this has accordingly been done under the name of *The New Zealand Short-horn Herd Book* (New Series).”

We have there a brief history of the foundation of the Shorthorn herd-books of New Zealand, which were also our first registers of dairy cattle. Sir George Whitmore was prominent in our early military history, as well as in parliamentary circles, being for several years a member of the Legislative Council. He settled in Hawke's Bay in 1862. Although the date of publication of his first herd-book cannot be traced it is obvious that he published two herd-books in the “sixties” and somewhere between 1862 and 1869, his third and last volume being issued in 1870, the

volume being known as the *New Zealand Herd Book*. By 1880 five volumes of the Canterbury herd-book had been issued, while in 1884 the matter was put on a more comprehensive basis by the issue of the first volume of the *New Zealand Shorthorn Herd Book*. No further development of historic importance relating to this breed took place until the founding of the New Zealand Milking Shorthorn Association at Palmerston North in 1913, their first herd-book being issued in 1915. The Canterbury Agricultural and Pastoral Association were truly pioneers with regard to the recording of pedigrees of purebred dairy cattle, as in 1886 they issued Vol. 1 of "The New Zealand Herd Book of Breeds of Cattle other than Short-Horns, embracing Herefords, Ayrshires, Polled Angus, Channel Islands, Devons, and Dutch Friesian." Some of these, needless to say, are no longer regarded as dairy cattle. In the preface to the volume the hope is expressed that "the time is not far distant when the requirements of stock-owners will render it necessary to publish separate herd-books for each breed of cattle." In reality it was not until seventeen years later (1903) that the New Zealand Jersey Association entered the field with its first herd-book.

THE CLOSE OF THE "SIXTIES."

Toward the close of the decade 1860-69 the gold fever cooled off, many of the gold-seekers left our shores, and a lean period for the dairy-farmer again ensued. From 1866 to 1868 there was apparently an effort to re-establish an export trade in butter and cheese, but the quantities were negligible. In 1869, however, the quantity suddenly rose to 2,705 cwt. of butter and 2,331 cwt. of cheese, valued at a total of £22,719. The quantity was by far the highest recorded up to this date, although the price received was low in comparison with previous years. It may be mentioned that quantities are a more reliable index than price of the trade in dairy-produce. The quantities can be accepted as accurate, but, apart from considerations of market and monetary value fluctuations, the methods of assessing values are not so dependable.

Altogether, then, dairying, despite its momentary periods of activity, was still experiencing a period of depression, and from an export point of view was still very much in a state of groping and experiment.

NEW ZEALAND'S FIRST DAIRY FACTORY.

The "seventies" were destined to be auspicious years in the making of New Zealand's dairying history, and witnessed the beginnings of the factory system of manufacture.

On the 22nd August, 1871, a little group of eight men met together in the home of Mr. John Mathieson, at Springfield, on the Otago Peninsula, to discuss the formation of a company "for the purpose of cheesemaking on the co-operative principle, with limited liability, shares to be £1. Each share to represent ten quarts of milk."

The shares were taken up as follows :—

Mr. John Mathieson	..	..	..	20 shares.
Mr. James Beattie	..	..	..	15 "
Mr. Alex. Stuart	..	..	..	12 "
Mr. Thomas Inglis	..	..	..	12 "
Mr. Richard Irving	..	..	..	10 "
Mr. William Michie	..	..	..	5 "
Mr. John L. McGregor	..	..	..	3 "
Mr. Walter Riddell	..	..	..	5 "

The enterprise was called the Otago Peninsula Co-operative Cheese Factory Co., Ltd. One reads the records of this little company's operations with admiration, so businesslike were the methods adopted, and so generously fair-minded the outlook of the promoters, as indicated by their handling of the emergencies which arose. As a model for the co-operative dairy company, it is astonishing how little the present-day system has deviated from that which this company formulated.

The factory, a wooden building, commenced operations in September, 1871, and, on present evidence, was New Zealand's first co-operative dairy factory. The first manager was Mr. John Laidlaw McGregor, and during its first year's operations the company made 9,919 lb. of cheese, which realized the sum of £246 6s. 1½d. Three new members were admitted during the second season; the milk taken in was 13,007½ gallons, from which 12,307½ lb. cheese were made, for which the company received £353 3s. 7d.

For no reason which the minutes disclose, on 16th June, 1875, "a meeting of the projectors of the New Peninsula Cheesemaking Company was held in the house of Mr. John McGregor for the purpose of selling shares and making arrangements for a site for a building to carry on their business of making cheese." The factory for the new company was duly erected at Pukekihi (Highcliff) on a site on the Portobello Road adjoining the Central Church property. What happened to the original factory is now unknown. Possibly it was burned down, as early records mention the destruction of a dairy factory in a bush fire which swept the Peninsula. It is also significant that the new building was erected in brick and concrete, whereas the original structure was of wood.

In 1875 the management of the factory was taken over by Mr. George Farquhar. In 1879 the name was changed to the "Peninsula Pioneer Cheese Co.," with Mr. Walter Riddell as "Clerk to the Company." In 1882 the company made some changes in its constitution, and a meeting was called "to arrange with parties who were willing to send milk into the factory to get it made into cheese, without having shares, by paying their share of all expenses incurred in manufacture."

To sum up, then, this company, variously referred to in its minutes as the Otago Peninsula Co-operative Cheese Factory Co., Ltd. (the name written on the inside cover of the minute-book), the Peninsula Cheese Making Co., the Pioneer Cheese Co., and the Peninsula Pioneer Cheese Co., made cheese for about fourteen years, and apparently with a certain measure of success. Prices received averaged about 6d. per pound cheese, ranging from 9½d. to 4½d. During seasons when prices offered in Dunedin were unduly low, the company shipped cheese to various parts of Australia, principally Adelaide, and appeared to find the venture satisfactory. One shipment, however, was lost in the wreck of the "Tararua," which took place on the 29th April, 1881. After about fourteen years of operation as a cheese factory a change to buttermaking was made, the butter being collected from the suppliers in granular form and milled. The old Highcliff factory was equipped with revolving shelves, to facilitate the end for end turning of the cheese during curing. Morning's milk only was used, night's milk being considered unsuitable for cheesemaking in those days. The

factory made its own rennet, from calf-vells. The curd was cut large, the whey dipped out and heated in a copper, and returned to the vat at a temperature high enough to cook the curd.

The interest and historic importance attaching to this first dairy factory, strictly co-operative in mode of operation, has been considered sufficient to justify the rather full particulars given.

THE FIRST CO-OPERATIVE DAIRY FACTORIES IN THE WORLD.

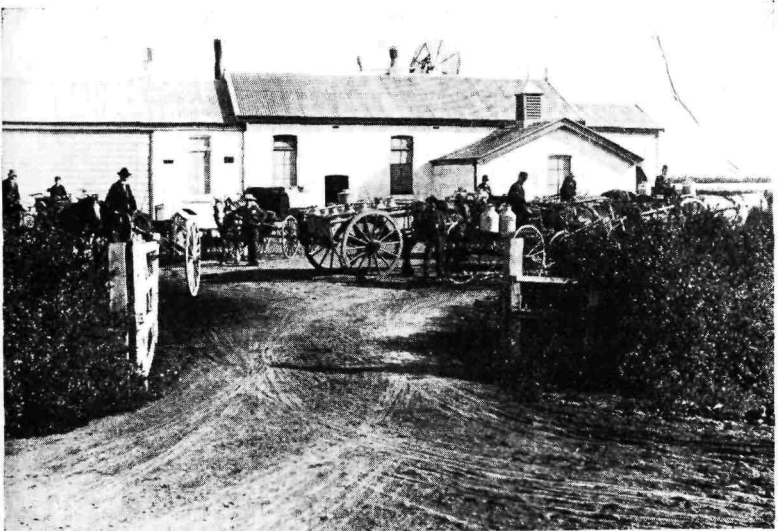
Readers will be interested to know where New Zealand stands in comparison with other countries in the matter of date of commencement of co-operative factory dairying. This is a difficult point to determine precisely for the reason that the description "co-operative" is used somewhat elastically by many writers, and, further, even official reports are noticeably inconsistent regarding dates of foundation enterprises.

The following particulars have been gleaned from the publications of the International Institute of Agriculture at Rome, which are comprised mainly of official articles compiled at the request of the Institute, and consequently may be accepted as probably the most reliable source of information available. *Norway*.—"The first Norwegian Co-operative Society, the Rausjødal dairy, was founded in 1855 by thirty small farmers in an out-of-the-way district in the North. Their initiative was consequently not the product of external influence, but of a local need which made itself felt. In the following year three more co-operative dairies were opened." *Switzerland*.—Under the heading of "Social Dairies and Cheese Factories" it is stated that "the first modern co-operative societies were not established until after the year 1855, in the Cantons of Lucerne, Aargau, Zurich, St. Gall, and Thurgau." *Sweden*.—One report refers to co-operative dairy factories in the 1860's while another, more definite, states: "The first Swedish co-operative dairy was established at Vilan, in Skane, in 1880, but it was not before the beginning of the 'nineties' that the class of dairies in question gained a firm footing in the country." *Denmark*.—The first was established at Hjedding, Jutland, in 1882. *France*.—"The first co-operative dairy was founded at Chaillé in 1888. Its methods were of the most rudimentary character, and not always in accordance with the latest scientific discoveries."

EARLY OTAGO FACTORIES.



OMIMI.



TAIERI.

[To face page 30.]

Germany.—Particulars regarding Germany are a little vague, it being stated that the first German co-operative dairies were organized in the ten years from 1870 to 1879. The dates for *Russia* and *Siberia* appear to be 1897 and 1901 respectively, and for *Belgium* 1894. The position regarding *Holland* is also indefinite, though what appears the most reliable report credits a factory at Warga in Friesland, 1886, as the first co-operative. *England* was early in the field with a strictly co-operative factory at Longford, Derbyshire, which commenced operations early in 1870. *Ireland* started in the 1890's, though *Scotland* and *Wales* apparently did not form their first co-operative dairy companies until the first decade of the present century. The *United States of America* and *Canada* adopted the principle in the late "seventies." The United States had dairy factories at a very early date which are frequently referred to as "co-operatives," but these appear to have been joint-stock companies rather than co-operatives as we define the term. *Australia* did not come in until the mid "eighties."

While, therefore, Highcliff cannot be claimed a pioneer institution of its kind outside the Southern Hemisphere, it was, nevertheless, very early in the field of co-operative world dairying, and certainly marks the starting-point of a system which has reached a very high stage of efficiency in New Zealand.

PRIVATE CHEESEMAKERS IN NEW ZEALAND.

Among many private cheesemakers of this period worthy of special mention are Messrs. C. B. Candy, John Gebbie, and Captain Runciman. Messrs. Gilpin and Pardon should also be included.

Mr. C. B. Candy, of Halswell, was well known in connection with the industry of cheesemaking. For many years in succession he was the chief prize-winner for cheese at the Canterbury Metropolitan Show, and in 1886 he won first prize for cheese at the Colonial and Indian Exhibition held in London. He was among the early experimenters and shipped cheese in air-cooled chambers as well as chambers cooled through the medium of freezing mixtures. Professor A. W. Bickerton guided several of these attempts to overcome the temperature problem. Mr. Candy originally came out from England to take charge of the dairy at Lincoln College.

At the end of August, 1881, Mr. J. R. Hill, President of the Canterbury Agricultural and Pastoral Association, sent, as an experiment, one of Mr. C. B. Candy's cheeses to England, to test the possibility of sending the product to the British market. The cheese was packed in a piece of common calico, placed in an ordinary white-pine box, with about 2 in. of sawdust for insulation. It is reported that it arrived in excellent condition, and was declared to be equal to the best English Cheddar.

Mr. John Gebbie, of Gebbie's Valley, Banks Peninsula, was also a well-known cheesemaker, and commenced his export trade by sending cheese to Wellington as early as the mid "forties." He bore a good name on the Australian market for sound-quality cheese.

Captain Runciman, of Hautapu, near Cambridge, was an outstanding influence in the Waikato. He was among the first to import American dairy-factory machinery and later to stress the importance of suitable containers for butter and cheese. In 1878 he was making cheese at a small factory on his farm, and in addition to the milk of his own herd was taking in milk from his neighbours.

Messrs. Gilpin and Pardon were the pioneers of the factory business in the Wairarapa. In 1880 they established a factory at Featherston, which ran for about two years. They manufactured cheese from milk supplied by dairy-farmers in the vicinity.

IMPORTANT DAIRY INVENTIONS.

Much interesting material is available from the point of view of pioneering difficulties and happenings, but mostly from a purely local or personal aspect. Such matters are outside the scope of this history, neither is it intended to trace the movement beyond the confines of New Zealand. There were, however, one or two discoveries and inventions which fell within the period under review and were destined to be of such importance as to warrant a brief reference here. In 1853 W. E. Gaine, England, discovered the process of making vegetable parchment. This substance was for many years known as Gaine's paper. In 1859 the testing of milk by centrifugal force was being investigated by Professor Fuchs, of Karlsruhe, Germany. In 1860 centrifugal force was

being investigated by Albert Fesca, Berlin. In 1877 a centrifugal cream-extractor was invented in Germany. The first creamery to use centrifugal separators is said to have been established in Kiel, Germany, in the same year. In 1878 L. C. Neilsen, Denmark, invented the continuous-flow separator, the patent being bought by Burmeister and Wain, Ltd., who were ship-builders. In the same year Dr. De Laval, Sweden, invented his cream-separator, and the appliance was first demonstrated in England in 1879.

FIRST FACTORIES IN THE UNITED STATES OF AMERICA AND CANADA.

In 1851 Jesse Williams, known as the founder of cheese factories, built his first factory at Rome, Oneida County, New York. Previous to that time cheese in America had been produced only as a home-farm operation. Jesse Williams, for the first time in the history of American dairying, converted sweet milk from surrounding dairies into cheese at a central point.

In 1864 Harvey Farrington built Canada's first cheese factory—at Hamilton in Western Ontario.

JOSEPH HARDING.

Another matter worthy of mention is that during this period there lived a man, Joseph Harding, of Marksbury Farm, Somerset. Joseph Harding is perhaps little known to the present generation of cheesemakers, but is known to older members of the dairy business as the father of the Cheddar system, not that he made the first Cheddar cheese (that was made hundreds of years ago), but because he was the first man to systematize its manufacture, and, as one report says, to teach rational cheesemaking. He not only left his mark as a cheesemaker, teacher, and writer on the subject, but also left a large family of excellent cheesemakers. It might almost be said that his influence was world wide. It is certainly true that New Zealand owes much to Joseph Harding, for the method followed here is much the same as that which he elaborated nearly a hundred years ago. His son, William, came to New Zealand in the early "eighties" as first manager of Flemington, and later (1885) a nephew—Earnest G. Harding—who accompanied him from England became manager at Okoia.

1881.

GOVERNMENT BONUS.

The first definite evidence of the Government's practical interest in the dairy industry is to be found in the offer of a bonus. The notice, which appeared in the *New Zealand Gazette* for the 18th May, 1881, under the general heading of "Bonuses on Colonial Industries" reads as follows:—

Butter or Cheese.

"A bonus of five hundred pounds (£500) will be given for the first 25 tons of butter or the first 50 tons of cheese (produced in a factory worked on the American principle, and to which factory any farmer, subject to certain conditions, may send his milk) which shall be exported from New Zealand and sold at such prices in a foreign market as shall show that the articles are of fair quality."

There are three interesting points concerning this matter. The most conspicuous is the stipulation that the factory must be worked on the "American principle." In explanation it may be remarked that this implied the conducting of the business of the factory on such lines as had led to the success of factory butter and cheese manufacture—cheese in particular—in the United States of America, and which a few years later became increasingly extensive in Canada. In practice the farmers who supplied the milk received as payment the whole of the return from the sale of the produce less the cost of manufacture and selling. The buildings and plant had evolved as a result of experience, and in many features varied considerably from that of butter and cheese dairies in Britain.

The bonus was awarded to Edendale on its second season's output, 1882-83, Edendale being the only factory to export the stipulated amount of 50 tons of cheese.

The second interesting point is that in May, 1881, there was only one dairy factory in New Zealand, that one being at Highcliff. There were, of course, quite a number of private dairies, but, in view of the trend in other countries, the Government of the day was evidently favourably disposed towards the factory system of manufacture, and decided to encourage it.

The third point is that refrigeration had not yet been introduced. No doubt, however, the efforts in this direction in America, Australia, and England were being closely watched, and it was felt that the offer of a substantial bonus, thereby encouraging the development of dairy-produce exports, would give an impetus to shipping experiments as connected with New Zealand.

AKAROA CHEESE.

Several shipments to England in 1881 by Hudson and Ridley, of Christchurch, and sent as ordinary cargo, realized 62s. to 65s. per hundredweight, less 1½d. per pound freight. The cheese was packed in drapery cases in oat husks, and some in white-pine sawdust, and shipped among wool and other cargo.

LINCOLN COLLEGE.

This year saw the founding of the Canterbury Agricultural College at Lincoln, which was opened on the 19th July, 1881.

CLOSE OF PERIOD.

This brings us to the end of 1881. In summing up the period 1851-1881 it is apparent that, while New Zealand dairy-farmers enjoyed a certain transient prosperity during the gold rushes here and to a lesser extent in Australia, 1881 found them very little further forward than 1851 so far as the export trade and a true foundation for the industry was concerned. There were few indications that we were on the eve of a period which was to mark a turning-point in the progress of the industry. The offer of the bonus, however, was to some extent evidence that confidence in brighter prospects for dairying was not altogether dormant, and that the spirit of enterprise could not be suppressed.

CHAPTER III (1882—1895).

ESTABLISHMENT OF DAIRY-FACTORY SYSTEM AND COMMENCEMENT OF EXPORT TRADE.

Refrigeration—Early dairy factories—Government dairy instruction—Friesian cattle imported—Condensed milk—Butter-packing companies—Middle Island Dairy Association—Department of Agriculture established—First and second Dairy Industry Acts passed—First milking-machines—Grading system introduced—Margarine Act passed—North Island Dairy Association—Dairy schools—Summary of period.

1882.

WE come now to the most important period in the history of our dairying development—the period which witnessed the birth or, in any case, the utilization of those inventions and discoveries which made advancement possible. The early difficulties were, as already stated, mainly connected with the problem of transport—how to deliver the local surplus upon an external market in sufficiently good condition to command payable prices. Until that problem could be solved the New Zealand dairy-farmers were, so to speak, in a locked room, with the wide world and its vast possibilities of wealth visible from the window, but quite out of reach. The key to the door was Refrigeration, which was presented to us in 1882. The effect of refrigeration on dairying was not apparent immediately; in fact, it was not until 1890 that rapid increase set in, but refrigeration made possible the establishment of an export trade and justified the erection of dairy factories and the planning of a dairying future with resolution and confidence. To discover the reason for delayed activity it is only necessary to take a fleeting glimpse at the

general state of affairs throughout the colony about that time. The year 1870 was marked by the initiation of Sir Julius Vogel's public-works scheme, which resulted in the land boom of 1874-76, which was in turn followed by the collapse of the land boom in 1878-80. Then came a period of stagnation throughout the world, which was the forerunner of a period of great depression between 1885 and 1889. This depression was world-wide, and for New Zealand, where it was particularly severe, the clouds had not quite dispersed until 1890. Another point is that while it was not long before the output of the factories was more than sufficient to glut the local market, the quantity was not large enough to make it worth while for any one to devote himself specially to establishing a market for it in the Old Country. The organization required was both costly and elaborate, and it must be remembered that in those days the frozen-meat trade completely overshadowed the infant dairy business. There followed, however, an almost golden age for our dairy industry, with improved prices and comparative freedom from serious marketing problems, while production increased with a steady and practically uninterrupted flow.

REFRIGERATION.

From New Zealand's point of view the historic date regarding refrigeration is the 15th February, 1882, when the sailing-ship "Dunedin," of 1,200 tons, left Port Chalmers for England with the first shipment of frozen meat. While the experiment was primarily concerned with meat—and was entirely successful—the "Dunedin" also took a small quantity of butter. This probably was made at the Edendale Dairy Factory. The test was a severe one, as not only were there sundry mishaps and much delay during the process of loading, but the boat did not arrive in London Docks until the 24th May after the long passage of ninety-eight days. In referring to the outcome of the project the Year-Book of New Zealand, 1886-87, says, in quoting a report by Bowron dated 1883, "The quality was inferior, yet in June, the cheapest month in all the year, it sold for 11½d. per pound."

These are all the particulars with regard to butter which it has been possible to discover concerning that historic enterprise, but they probably tell all it is necessary to know—namely, the

date of the shipment and the fact that the experiment was successful, not only from the point of view of proving that our greatest difficulty—the obstacle of distance—was in a fair way towards being surmounted, but also that there was every prospect of a payable market for the produce.

The persons most prominent in this great achievement were Mr. William Soltau Davidson, of Edinburgh, general manager of the New Zealand and Australian Land Co.—a large Scottish concern—and Mr. Thomas Brydone, superintendent of the company. It was Mr. Davidson who considered the time was ripe for New Zealand to make the attempt to export frozen meat and who was chiefly instrumental in bringing the shipping arrangements to fruition, whereas the organization at this end was in the hands of Mr. Brydone, and it was due to his influence that a small quantity of butter was included in the cargo.

The second lot of butter to be shipped under mechanical refrigeration would appear to be that which went by the “Lady Jocelyn” in 1883. This vessel took the first cargo of frozen meat from Wellington, seven kegs of butter being included in the shipment. Unfortunately, it has not been possible to trace this butter to its destination.

It was a comparatively short space of time before many of the more modern vessels were fitted up with refrigerating machinery, and a number of new steamers specially designed and equipped for the purpose of transporting frozen cargoes across the globe. The New Zealand Shipping Co. had five steamers built in the mid “eighties” to do the Home trip in forty-five days out and forty-two days Home. These steamers were fitted with refrigerating machinery and cool chambers, and were capable of carrying 12,000 to 15,000 carcasses of mutton, or a corresponding quantity of dairy-produce. The enterprise of the shipping companies is deserving of commendation. They had to build in anticipation of cargoes which might never eventuate and risk their capital in a long-range investment.

The advent of refrigeration, then, was the most important event relating to the year 1882. This year was also of particular historic interest as marking the date of establishment of three further dairy factories.

TWO SOUTH ISLAND PIONEERS.



THOMAS BRYDONE.



WALTER RIDDELL.

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EDENDALE.

While the Highcliff factory had been started some eleven years earlier, 1882 is usually regarded as the date from which the erection of dairy factories really commenced. It is rather remarkable that although the *Highcliff factory*, fully described in a previous chapter, seems to have operated quite successfully, our second factory was not erected until eleven years later. The most careful and comprehensive searching, however, affords no grounds for supposing that any factories were started in the interval.

The first of the three factories to commence operations in 1882 was Edendale, a dual plant factory, which opened on the 18th January of that year. The Edendale Dairy Factory is regarded by many as the *pioneer of New Zealand's dairy factories*, inasmuch as it was more than a mere establishment for the manufacture of cheese, being a sort of combined dairy factory, experiment station, and dairy school. The company's first registered brand, and still its brand, was "Pioneer," and although Edendale was not our first factory there are few who will dispute its right to so historically descriptive a trademark. Many experiments in manufacture were carried out at Edendale in those days when our cheesemakers, through their isolation and lack of opportunities for training, were in need of enlightenment on a variety of points connected with the work. Many new inventions and methods were tried there for the first time in New Zealand—the first modern curd agitators, the first pasteurizers, the first manufacture of whey butter. Some of the first milking-machines used in the colony were tried out on Edendale farms. The company engaged factory assistants on the understanding that not only were they to work in the factory, but were to be taught the work of the factory, and not a few of our later successful factory-managers owed their success to the fact that they were trained at Edendale. Later, when the Government acceded to requests for short-course dairy schools in the winter-time, the directors of the Edendale company were the first to offer their factory and their services. The duration of the schools was usually about a month.

The Edendale Dairy Factory was built by the New Zealand and Australian Land Co., on the company's Edendale estate and to plans obtained from Ingersoll, in Canada. Mr. Thomas Brydone

supervised the building. The factory was under the active supervision of Mr. R. M. McCallum, manager of the estate, the work of the factory being carried on by Mr. George Inglis, his wife, daughter, and an assistant, who looked after the pigs, &c. The second manager of the factory was Mr. Joseph Wood, who was later succeeded by Mr. Thomas Scoullar. Many interesting particulars are to be found in the autobiography of Mr. William Soltau Davidson, from which the following paragraph has been extracted :

“ In order to give the factory a fair start, the company themselves purchased 300 cows ; but it was always a difficult and expensive matter to secure milkers, and later on we were glad when the land purchasers and tenants on Edendale became the chief suppliers of milk. Indeed, it was mainly to attract farmers to that estate that dairying was started, and the existence of the factory and the purchasing of milk by the company helped the sale of thousands of acres. . . . The factory cost about £1,200 ; but against this the company gained the bonus of £500 offered by the Government to the dairy factory, on the American principle, which first exported to a foreign market fifty tons of cheese or twenty-five tons of butter.”

An early report states : “ The cows are milked by women and boys at one penny per cow, in sheds constructed in convenient parts of the paddocks, floored with concrete, and well supplied with water—a great consideration with dairy stock. One hundred and fifty Berkshire pigs are kept not far from the factory, to consume the whey.” This refers, of course, to stock owned by the Edendale Estate. In addition, the factory received supply from a number of farmers who owned their farms or leased them from the estate.

Edendale was equipped for both butter and cheesemaking, though buttermaking was not attempted to any extent during the first year or two, the price procurable for cheese being found more profitable. It is interesting to recall that the Edendale factory was making butter before the separator came into use in New Zealand, the procedure followed being the old-fashioned pan-skimming gravity system. In 1890 Mr. Newman Anderson, a man selected in Denmark by Mr. W. S. Davidson, was sent out to Edendale as an expert in buttermaking. For his use the company

imported from Denmark, among other plant, two power-driven Holstein churns of about 150 lb. butter capacity, and a power-driven rotary butter-worker. Mr. Newman Anderson later joined the Government instructional staff, and after a brief period resigned to become the first manager of the Canterbury Central Co-operative Dairy Co. at Addington.

The Edendale factory ran successfully under the New Zealand and Australian Land Co. until 1903, when, as the result of the estate being acquired by the Government for close settlement, a co-operative dairy company was formed. This company subsequently built branch factories at Brydone and Menzies Ferry.

In 1912 the company erected a separate building and equipped it with plant for the manufacture of whey butter from cream separated from the cheese whey. Although whey-butter experiments were conducted at Kaponga in 1910, and from that date a certain amount of whey butter was being manufactured at some of the cheese-factories, the one at Edendale was the first factory of its kind in New Zealand.

In concluding these notes special mention should be made of the work of Mr. Thos. Brydone. The establishment and success of the Edendale factory was due in a very large measure to the active and intelligent interest of this man, whose memory is held in esteem not only for his work as a founder of the dairy industry, but also for his outstanding service in connection with the founding of the frozen-meat trade.

FLEMINGTON.

The second factory was that built at Flemington, near Ashburton. It has been difficult to discover the genesis of this establishment, but the promoter appears to have been Mr. John Bowron. Under the caption of "Cheese and Butter Factory" (the "and butter" is interesting) the *Ashburton Guardian* of the 4th January 1882, reminds "directors" of the importance of the meeting called for that night. The report of next day refers to the meeting of "provisional directors" and states that "two-thirds of the shares are now taken up." This all points to the fact that the scheme had been mooted some time previously. On the 11th January, 1882, directors and a secretary were appointed, and

and on the 19th January tenders were invited for 10 acres of land—a rather large area for the purpose. The *Ashburton Guardian* of the 9th February, 1882, reports that the Ashburton Cheese and Butter Factory purchased from Mr. John Grigg 10 acres of land opposite the Flemington schoolhouse. Nothing further appears to have occurred until the 7th September, when a special meeting was held to meet Mr. Bowron, who, a report states, had been travelling over England and America in the interests of the company, purchasing equipment, &c. It was later reported that Mr. Bowron had engaged a Mr. Harding as manager. The *Guardian* of the 13th October reports a dispute among suppliers as to the basis of charges for cartage of milk. The original idea was that the dairy company should keep a number of horses and carts and collect the milk, this no doubt accounting for the 10 acres of land. The dispute arose over the difficulty of determining cost of cartage according to distance from the factory. The directors finally met the position by making each supplier responsible for delivering his own milk to the factory. The factory, which cost approximately £1,000, finally opened on the 30th October, the leading names in the report of the opening ceremony being Mr. Harding, manager; Mr. Thorn, assistant; Mr. Bowron, promoter; and Mr. S. S. Poyntz, secretary. The Flemington factory competed for the Government bonus, but only had 30 tons of cheese ready for export. A few years later the factory failed and was taken over by Mr. Grigg, which probably accounts for the fact that it is often referred to as Grigg's factory. At one stage the factory was leased and run by Messrs. John and James Sawers.

Several of the names mentioned in connection with the foundation of the Flemington factory are historically important and warrant brief comment. Mr. John Bowron, who purchased the plant on behalf of the company and also selected the manager and his assistants, was a wise counsellor in the establishment of several of our early dairying enterprises in Canterbury. He was afterwards one of the founders of the firm of Bowron Bros., produce-merchants, &c., of Christchurch. Mr. Bowron brought four men out from England with him—namely, William Harding, Ernest G. Harding, E. Thorn, and Charles Candy.

William Harding, manager of Flemington, was a son of the famous Joseph Harding, of Somerset. Mr. E. G. Harding was a grandson of Joseph Harding and a nephew of William Harding, and worked as William Harding's assistant at Flemington. Mr. E. Thorn also worked as an assistant at Flemington for a while and was then engaged to go to Okoia in January, 1884, as first manager. Mr. E. G. Harding succeeded him in this capacity in 1885. Mr Charles Candy went to Lincoln College to take charge of the dairy. Later he severed his connection with that institution and became a successful private cheesemaker.

TE AWAMUTU.

The third factory of that historic year was at Te Awamutu, in the Waikato. Te Awamutu, like Flemington, was a co-operative company, and also bears the historic distinction of being the North Island's first dairy factory.

This concern was called the Te Awamutu Cheese and Bacon Co., and commenced operations on the 15th November, 1882. The factory-manager was Mr. Horace Walpole, and the secretary, Mr. R. W. Roche. Captain Runciman played an important part in this as in so many other early enterprises in the Waikato. When in America he had ordered the machinery, but owing to a misunderstanding its arrival was delayed, and so far as can be ascertained it did not finally reach New Zealand until January of the following year. Reports indicate that the plant installed at Te Awamutu was "prepared in Auckland by Mr. Waite," a tinsmith. Just what "prepared" means is difficult to say, but in any case the factory opened with plant supplied by Mr. Waite, and presumably much of it would be made by him, so that Te Awamutu was essentially a pioneer and a New Zealand concern. The American plant was afterwards installed in another factory. What factory has not been discovered, but probably Taupiri or Tauwhare.

The Te Awamutu factory buildings cost £805. The capacity of the factory was 800 gallons, and the bacon side of the business started with 37 pigs.

1883.

Nine new factories commenced operations in 1883, seven of which were in the North Island.

GREYTOWN.

The first of these was Greytown, a co-operative concern which took in its first milk for cheesemaking on the 2nd January, 1883. Mr. Thomas Shaw, a local farmer and cheesemaker, was the first manager. Although the Greytown factory did not commence operations until January, 1883, early newspaper records indicate that its establishment was planned at least a year earlier. The man who figured most prominently in the enterprise was Mr. Coleman Phillips, although Mr. (afterwards Sir) Walter Buchanan also played an important part and was the first chairman of directors of the Greytown Co-operative Dairy Co. Mr. Coleman Phillips was an ardent supporter of the co-operative principle of dairying and of small holdings owned and worked by the occupants. A generous-minded and public-spirited man, his good works in the Wairarapa district justify the permanent memory of his character. He was, among other things, a barrister, and drew up the first memorandum and articles of association for the Greytown company. These subsequently proved both practical and complete, and for many years afterwards were usually adopted on the formation of co-operative dairy companies.

With the exception of Taratahi, it has not been possible to establish the order of opening of the remaining eight factories, but their names were: The Pukekohe Cheese and Bacon Co.; the Waikato Dairy Co., Hamilton; Katikati; Wairoa South, Clevedon; Mr. Alfred Brake's private factory at Lepperton; Taratahi; Temuka; and the Waiareka Dairy Factory, Weston, Oamaru, Mr. Joseph Wood being the first manager.

TARATAHI.

The Taratahi Butter and Cheese Factory, a co-operative concern in the Wairarapa district, was opened on the 8th October, 1883. Mr. Thomas Cole was the first secretary to the company, and a Mr. Foss, specially imported from England, was the first manager of the factory.

WAIAREKA AND FLEMINGTON.

Waiareka and Flemington were later leased by Messrs. John and James Sawers for a period. The enterprise was not a financial success. The lessees had a good deal of trouble with gas in the cheese, which they considered to be due to the cows grazing on red clover. A large portion of the countryside round Flemington and Waiareka was originally swamp, and when drained and brought under cultivation red clover was very generously used in the grass-seed mixture.

With regard to the payment for milk according to quality, in 1886 the Waiareka dairy factory adopted the following scale: Milk containing under 8 per cent. of cream to be rejected; from 8 per cent. to 12 per cent. to be paid at the rate of 4d. per 11 lb.; over 12 per cent. at 4d. per 10 lb. Mr. James Sawers, the manager, stated that milk as low as 7 per cent. had been sent to the factory, while occasionally some had reached 15. The average was reckoned to be about 10. The foregoing figures relate to the amount of cream shown after standing for a number of hours in a graduated glass cylinder known as the Creamometer.

PUKEKOHE.

This concern, which commenced operations in either October or November, 1883, was originally called the Pukekohe and Mauku Cheese and Bacon Co., Ltd. It had a very unsuccessful career and was only operating for a season before it went into liquidation, and was later started as a proprietary concern by a Mr. Langford, but was never a success until taken over by the New Zealand Dairy Association under the general management of Mr. Wesley Spragg. The first manager of the Pukekohe factory was Mr. Horace Walpole, who had managed at Te Awamutu during the previous season.

LEPPERTON.

Mr. Alfred Brake's private cheese-factory at Lepperton, about ten miles north-east of New Plymouth, warrants mention for the reason that it marks Taranaki's entry into the field of factory dairying. Records are a little indefinite as to the exact date of establishment of the factory, but it appears to have been erected

in 1883, though it may possibly have been 1882. Mr. Brake used to gather the milk himself from nearby farmers, and for the purpose drove an old-fashioned two-horse express from farm to farm on set days each week.

TARANAKI.

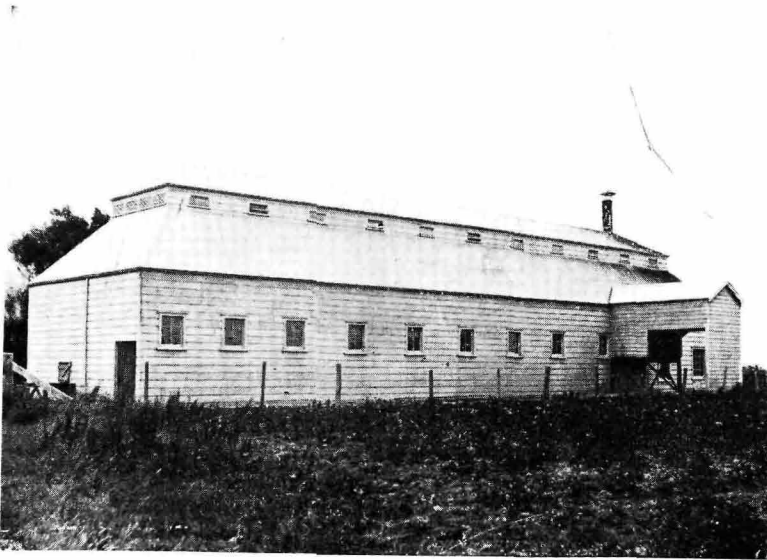
It will be noticed that the drift to the North Island was now setting in, and although from 1883 onward many new factories were erected in the South, the really rapid development was taking place in the North Island. While the foundations of the industry were laid in the South, Otago, but more particularly Southland, are the only South Island provinces which have played a *significant part in the dairy industry of New Zealand*. In making this statement the position of Banks Peninsula has not been overlooked. This locality, however, is entitled to honourable mention for quality rather than for the quantity of dairy-produce manufactured, and to its reputation for farm-made cheese. Banks Peninsula has always enjoyed a high reputation for cheese-manufacture, and for many years was regarded as the standard of quality, at any rate for the South Island.

Although Taranaki was somewhat late in the field, there having been many dairy factories in operation in other parts of the colony before Taranaki's first factory was built, this province developed its dairying activities more rapidly than any other province of New Zealand, and subsequently became for many years the leading dairying district. The reasons for the delay are not far to seek. In the first place the Maoris were a menace in Taranaki for some years after they had ceased to be troublesome in most other quarters; it was well on toward 1880 before isolated settlers felt really secure, particularly in the northern end of the province; consequently settlement was late in commencing. Then again, there was no suitable seaport throughout the whole coast-line of the province, neither was there, until 1885, railway communication with other parts of the Island. Waitara and Patea had rivers which at high tide would accommodate steamers of moderate size, but the river-bars peculiar to all west-coast streams were always uncertain and often treacherous. New Plymouth and Opunake had open roadsteads and later breakwaters, but in the beginning anchorage at these ports was almost

PIONEER FACTORIES.



INGLEWOOD, TARANAKI.



NGARUAWAHIA, WAIKATO.

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as unreliable as the rivers. As a result produce had to be transported overland to Wanganui or Wellington, a costly business, and quite unsatisfactory before the days of insulated rail transport. Roading and bridging was costly on account of the heavily forested country, the innumerable streams, and the heavy rainfall. Lastly, Taranaki dairy-farmers probably had less Government financial assistance in the early years than settlers in almost any other part of the colony. Also stock and station agency firms generally did not appear to find such attractive opportunity for their capital and enterprise in Taranaki as obtained in most parts of the colony then in a state of active development. The fact is apparent from a survey of the beginnings of this province. In view of the hardships faced and the lack of outside help and communication, the first Taranaki settlers were truly pioneers.

It is interesting to recall that it was not so much dairy-produce as fungus which provided the means of keeping many Taranaki dairy-farmers on their holdings between the years 1875 and 1885. The trade in Taranaki fungus was established by a Chinese named Chew Chong, mentioned elsewhere in these pages in connection with his part in the development of the butter industry. Chew Chong, during his wanderings as a pedlar of toys in Taranaki, recognized the fungus growing on the tawa, pukatea, and especially the mahoe trees, as similar to an edible fungus greatly prized in China as a vegetable. It proved to be yet another instance of a chance and apparently insignificant discovery which developed into a commerce of major importance. Chew Chong set about establishing a trade in fungus with his native land, and the venture was an immediate success. In 1885 the value of fungus exported is stated to have amounted to £72,000—more than the total value of butter shipped from the province—and when Chew Chong was in China some years later he was informed by Chinese Customs authorities that from 1872 to 1904 the imports were valued at £375,000. It is difficult in these days to realize what fungus—commonly known as “Taranaki wool”—meant to the pioneer dairyman in that province. When Chew Chong commenced to purchase this commodity the settlers lived by a system of barter. Fourpence a pound was probably the average price for the butter they produced, while fungus brought about 3d. per pound. The storekeepers did not pay cash for the butter, however,

but accepted it in exchange for stores, milled it, and shipped it Home in a salted condition in kegs as ordinary cargo. It was a matter of great difficulty to obtain sufficient cash to meet the annual rates levied by local bodies. From these facts the joy with which they received spot cash for their fungus is not difficult to imagine. Moreover, the fungus trade was all profit to the settler, costing nothing to produce. Thus while at first sight there would appear to be no kinship between fungus and dairy-produce it will be seen that there was a time when, in Taranaki at least, they were very near relations.

In the same way as the sale of fungus saved many Taranaki dairy-farmers in the early days of the settlement of that province, kauri timber and kauri-gum provided the principal income for many farmers in the northern peninsula. Later, when the bush was being felled and the formation of roads and bridges and railways was in progress, there was for some years a good business to be done in the provision of milk, butter, and cheese to the many workmen in the various camps, much as the whaling trade had provided a market in earlier times. An outstanding example of a fortuitous side-line which temporarily assumed major dimensions and nourished the weakling dairy industry was "Akaroa" cocksfoot. For many years, with this product, New Zealand played a prominent part in the cocksfoot-seed market of the world, and without this financial assistance the dairy-farmers of Akaroa, an important dairying centre, must have abandoned the prospects of a dairying future and turned to other lines of endeavour.

THE FIRST GOVERNMENT LECTURER.

Following on the opening of three factories in 1882 with a prospect of the erection of several more in 1883, there arose a need for assistance by way of an officer who could advise concerning dairy-factory design and equipment, and the Government was approached accordingly. The first step was the engagement

Mr. William Bowron to make a tour of the colony and prepare a report on the general dairying situation. The outcome was a pamphlet issued in 1883 under the title of "Observations on the Manufacture of Cheese, Butter, and Bacon in New Zealand."

In those days pig-raising and bacon-curing were regarded as part and parcel of the dairy business. The main features of this pamphlet are to be found in the enthusiasm displayed over the suitability of New Zealand land and climate to a dairying industry, and the extremely favourable prospects of an unlimited market in England. Emphasis is given to the advantages of the factory system of manufacture as compared with butter and cheese making on the farm as then in vogue. The appointment of Mr. Bowron would appear to mark the beginnings of a Government supervision and advisory service. An instructional service was to follow some six years later.

MR. WESLEY SPRAGG.

The year 1883 was also auspicious, though no one suspected it at the time, for having witnessed the birth of an enterprise which later became the New Zealand Dairy Association, and, by devious ways, was subsequently to play an important part in the development of one of the world's greatest organizations of its kind—namely, the New Zealand Co-operative Dairy Co. The man who made the first move was Mr. Wesley Spragg, whose name stands out prominently in the history of the industry in the Auckland Province. He rendered notable service from 1886 to 1912; he built soundly and well, and left a reputation for honour and integrity. The institution which was the real beginning of the business which later became the New Zealand Dairy Association and the largest of the three companies which still later amalgamated to form the New Zealand Co-operative Dairy Co., was a "Butter Department" of the New Zealand Frozen Meat and Storage Co., Ltd., now the Farmers' Freezing Co., Ltd., Auckland. Mr. Wesley Spragg was in charge of that department and had an interest in it. It was purely a trading concern dealing with the buying and selling of butter. The early history of the company is admirably told in an article by Mr. Spragg under the title of "Establishment and Growth of the Dairy Association," which appears in the booklet "The Empire's Dairy Farm," issued in November, 1923, by the New Zealand Co-operative Dairy Co. The article contains such useful general information concerning

the industry in those early days, quite apart from its particular reference to the pioneer work of Mr. Spragg, as to appear to justify the following summary:—

“Butter manufactured by settlers was purchased, sorted, classified, blended, and packed according to market. We early began to cater for the city trade. This, of course, was in pound and half-pound pats. The balance was packed in suitable 112 lb. totara kegs, and found its market when it could in sawmillers’ demand and in New South Wales. We quickly extended our buying operations to include Taranaki, and established a buyer at Waitara. Naturally, we dealt chiefly with the surplus manufactured by the individual dairymen. They sold to the provision-dealer and grocer, and we took the balance or the unsaleable lots. We paid various prices for the product, from sevenpence and sixpence down to as low as twopence for it, delivered at the depot. Under this system we bought and sold about 300 tons of butter per year, which was quite an important quantity in those days of very small things.

“Within a few years prior to this period several co-operative cheesemaking concerns had been started in the districts which we operated in. There had been one at Pukekohe and others at Hamilton, Paterangi, and Te Awamutu, and all had failed, and, naturally, nobody wanted to touch co-operative dairying again just then; and yet clearly the only way to improve matters was to take the milk from the dairying settlers and to handle it on factory lines with a competent buttermaker in charge. I suggested that as a beginning I would meet the settlers at Pukekohe and discuss the matter with them. Subsequently arrangements were made to purchase milk and manufacture butter in that district. The real business—that which was worth while—began then. The old cheese-factory was taken over and fitted up with vats and separators. A Danish buttermaker (Bruhn), who had strayed to New Zealand, was engaged to take charge of a factory which was fitted up in the premises of the Auckland Frozen Meat and Storage Co., on the new reclamation near the railway-station, the cream being brought to Auckland. We bought by weight, ten pounds to the gallon, for which we paid round about 2½d.

“The factory was shortly afterwards removed to Pukekohe where, with innumerable enlargements of the premises, it was constantly employed until destroyed by fire in 1922

“ Later I was fortunate enough to secure the association with me in the proprietorship of the New Zealand Dairy Association, of Lovell and Christmas, of London, who gave the business most generous financial backing in addition to their valuable services as London representatives. In this manner we were tided over the dangerous period, so that later on when the Upper Waikato business, which had for some time been carried on by Henry Reynolds and Co., was on the market, the New Zealand Dairy Association was able to absorb it by purchase.”

The story of the New Zealand Co-operative Dairy Co. is told in the section relating to 1919, the year in which the “big company” was formed.

1884.

The principal interest attaching to 1884, apart from the further extension of the factory system, lies in the fact that in April, 1884, Mr. A. B. Fitchett, of Wellington, installed a Tuxon and Hammerich separator, which he had imported from Denmark. This was called a “Nakskov,” and appears to have been New Zealand’s first farm separator.

Another important item is that in August, 1884, a consignment of Ayrshire cattle was sent to Australia for sale. This seems to be the first semblance of an export trade in purebred dairy cattle. The important members of the shiplot were the bull “Duke,” bred by Messrs. Cargill and Anderson, and a cow called “May Queen.” This cow fetched 260 guineas, but the selling-price of the bull was not stated in the report. There were twenty-seven animals in the consignment, which, apart from the bull and cow mentioned, included twenty-three cows and heifers and two young bulls. Omitting “Duke,” the cattle sold in Sydney for £910, an encouraging figure.

FRIESIANS IMPORTED.

According to the first volume of the New Zealand Holstein-Friesian Herd Book the first importation of Dutch-Friesian cattle into New Zealand was made by Mr. John Grigg, of Longbeach, Canterbury, in the year 1884. The shipment consisted of one bull, “Taureau,” and seven cows. Four years later Mr. Coleman

Phillips, of Carterton, afterwards first president of the New Zealand Holstein-Friesian Association, introduced the breed into the North Island by purchasing two bulls from Mr. Grigg, and establishing a herd in the Wairarapa. Mr. Grigg was therefore the pioneer, so far as New Zealand is concerned, of what we now know as the Friesian breed of dairy cattle.

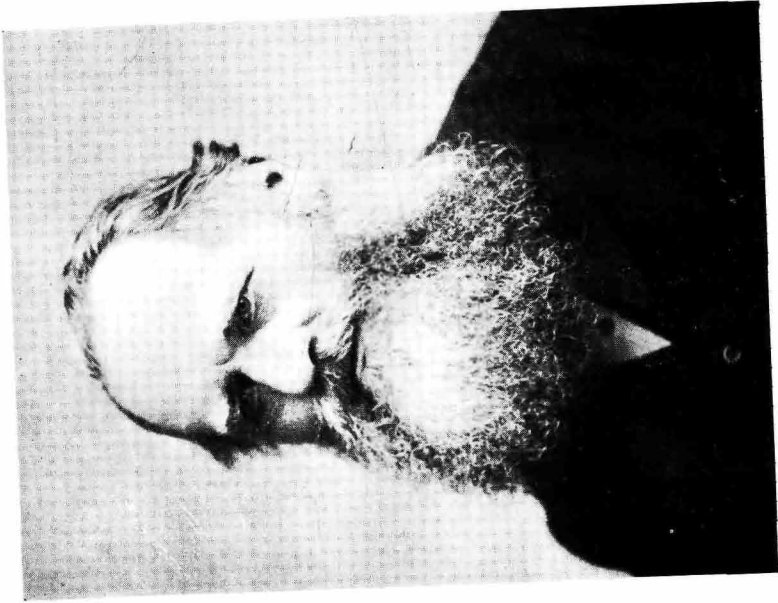
REPORT ON INDUSTRY.

In August, 1884, a report signed by Geo. Bowron, Inspector of Dairy Factories, was presented to the House of Parliament under the title of "Dairy Factories in New Zealand." This seems to be the only occasion on which the name of Geo. Bowron appears in the historical records pertaining to the dairy industry, and whether or not the name is a misprint for William Bowron it is now impossible to say. The report is mainly a description of the factories then working, but points to a more thorough investigation than that reported in the pamphlet issued under the name of William Bowron in the preceding year. The report states, among other things, that "there are fourteen factories which have been managed by directors during the past season (1883-84), and five conducted by private gentlemen. 414 tons of cheese have been made in the factories during the late season. The average price received was £65 per ton. £22,900 has been expended in buildings and plant, and over £4,000 on the purchase of land where the factories are located. There will be 23 factories at work in the coming season (1884-85), exclusive of six or seven private ones." The report also contains the following optimistic comment: "We have only to make the prime article in butter and cheese, then no power on earth can stay the flow of gold in this direction. The untold enduring wealth of New Zealand lies upon the surface, and the cow is the first factor in the way of securing it." An indication of the religious rigour of the times is to be found in the fact that the factories did not work on Sundays, Sundays' milk being kept at home for buttermaking.

FURTHER FACTORIES ESTABLISHED.

Eight new dairy factories have been traced as having commenced operations during this year. These were Maungakamea, Morrinsville, Okoia, Karere, Paterangi, Rukuhia, Geraldine, and

PIONEER FRIESIAN BREEDERS.



JOHN GRIGG.



COLEMAN PHILLIPS.

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the Taieri and Peninsula Milk Supply Co., Dunedin. All of these factories, with the exception of Karere, and the Taieri and Peninsula Milk Supply Co. were cheese. Karere appears to be entitled to the historic honour of being New Zealand's first butter factory, though the evidence in support of this distinction is somewhat inadequate. A report appearing in the *Taranaki Herald* in January, 1885, states that Mr. Elwin, one of the founders of the Opunake Dairy Co., paid a visit, for the purposes of obtaining information, to a cheese factory near Wanganui (this would be Okoia) and to the butter factory at Karere, this latter factory having had a season's experience. This seems sufficiently definite to justify setting down the date of establishment of Karere as 1884 and of classing it as a butter factory, though it has been impossible to confirm the position, either from printed records or from old identities of the district. Mr. Joseph Liggins was the first manager of Karere. Okoia opened in January, 1884, and later failed and was compelled to close down in 1890. Its first manager, as previously stated, was Mr. E. Thorn, Mr. E. G. Harding succeeding him in 1885. Maungakamea was the first North Auckland dairy factory. The Geraldine factory was a stone building and claimed to be very modern in design and equipment. It was suggested that this factory would make an excellent training-school for young people to learn the art of making cheese and butter, and the use of the cream separator.

TAIERI AND PENINSULA MILK SUPPLY CO.

The Taieri and Peninsula Milk Supply Co., Dunedin, was founded by Messrs. W. J. Birch, T. O. Stokes, and J. Johnston, Mr. Birch being general manager and Mr. Johnston acting as secretary. The business was established to supply milk and cream to the people of Dunedin and its suburbs, but later undertook the manufacture of butter, and subsequently developed into a very large concern. Commencing in 1884 by the issue of 3,000 shares of £1 each, its first establishment consisted of a small factory and a dwellinghouse, the whole costing about £660. At first the company was able to take only a proportionate quantity of milk from each of its suppliers, who had to dispose of the balance of their milk and butter at very unsatisfactory prices. In 1889 a butter-plant

was added, the concern turned into a butter factory, and in 1893 arrangements were made for the first skimming-stations at Sandy-mount and at Mihiwaka. Early in the "nineties" two of the then directors, who were interested in the business, took charge of the concern, and there followed a rapid development. These gentlemen were Mr. William James Bolt, the general manager, and Mr. Walter Riddell, the factory-manager. By 1900 the business embraced thirty skimming-stations ranging from Tokarahi, eighty miles north of Dunedin, to Edendale, ninety miles south. In 1884 the turnover was £5,000, while in 1900 it had grown to over £110,000. In later years the company made a good deal of cheese. Subsequently, however, a number of the skimming-stations were taken over by the suppliers and formed into co-operative companies. Some made cheese, though following on the establishment and rapid development of home separation many were converted to butter factories. Several of these later companies were unsuccessful. The Taieri and Peninsula Co. is now confined to two main factories. At present, 1935, the company has 1,600 suppliers, and, in addition to a large local business in butter, milk, and cream, exports about 300 tons of butter annually from its two factories at Dunedin and Oamaru.

1885.

The next year, 1885, was an interesting one and saw the introduction of several new enterprises, among them being the Taranaki Butter Co., New Plymouth, which commenced operations during the year in the business of tinning butter and exporting the product. The company made strong endeavours to develop a foreign trade, and sent sample shipments to Fiji, Honolulu, South America, India, and the Far East. The trade, however, never assumed important dimensions. Quite apart from lack of trade opportunities, reports indicate that the tinning system was not without defect and that the butter did not always open up in a satisfactory condition.

In the same year a group of factories in the Waikato formed themselves into an organization called the Waikato Dairy Factories' Association. The general idea was co-operative and along lines something similar to the North and South Island dairy associations formed some years later and fully described elsewhere in these pages. At a meeting held at Hamilton on the 9th January, 1885,

of delegates of the various cheese-factory companies in the Waikato the following resolution was carried: "That an association be formed, to be called 'The Waikato Dairy Factories' Association' to consist of delegates nominated by the boards of the various factories, for the purpose of watching and promoting the common interests of the dairy industry." The association was formed for the purpose of obtaining united action with regard to the following matters: (1) The reduction of freight both by land and sea and of general charges; (2) the best external market; (3) the reduction of duty in Australian and other ports; (4) the best means of packing both butter and cheese; (5) the establishing of a butter and cheese-box manufactory; (6) also with a view of collecting and recording the information gained each year, and, if possible, of publishing a pamphlet to show what the industry has already accomplished and is capable of accomplishing.

It seems that the association did not accomplish a great deal. In any case, its operations were very sparsely published, and it has not been possible to trace its growth and ultimate decay. The Waikato association was, however, but one of a number of similar organizations formed throughout the colony within the next few years.

Another interesting historical note relates to the adaptation by Messrs. Fischer Bros. of a building on Mr. Gane's farm, Pukerimu, near Cambridge, to the purposes of a Swiss cheese and dairy factory. This was opened in January, 1885. Newspapers at that time were devoting considerable space to the subject of Swiss cheese, and a reader would be justified in forming the impression that the dairy industry was on the eve of an important development. The enthusiasm, however, quickly died out. Messrs. Fischer Bros. arranged, so a report says, to erect a similar factory at Normanby in Taranaki, but it appears that the project did not eventuate. The factory at Pukerimu ceased operations after only one season.

The following extract from the *N.Z. Farmer* of December, 1885, provides useful historical data: "The Stratford and Ngairu correspondent of the *Hawera Star* says that what is putting good heart into the bush dairymen is a recent new departure in the butter trade. One of the great grievances hitherto has been that storekeepers would not give cash for fresh butter, the value had

always to be 'taken out,' which was an unsatisfactory practice and very hurtful to the district. Now, however, the Waitama company have entered the lists, and their buyer has his regular days in each week at the various settlements, when he is ready to take all the fresh butter that comes along, at a fair price for cash on the spot." It must be remembered that these were still the days before butter factories when practically all the butter was made on the farm.

In November, 1885, in connection with the agricultural and pastoral show, milking-tests were held at Ellerslie. Both milk and fat were taken into consideration, the fat determinations being made by Mr. J. A. Pond, Colonial Analyst.

The following dairy factories commenced operations during the year : The Gisborne Cheese Factory, the first on that coast, opened on the 20th January. The Moa Dairy Factory, Inglewood, opened in September, although this factory was built in 1884, but lay idle for a season owing to trouble over obtaining sufficient milk supply to commence operations. The Opunake Dairy Factory took in its first milk on the 12th October, 1885. Wyndham opened on 4th November, 1885, Mr. S. M. Robbins being the first manager. Bruce opened on the 29th September, 1885. Other factories which started in 1885 were Tauwhare, owned by the Waikato Land Association ; the Waihou Cheese and Bacon Co.'s factory ; and Woodlands, though the exact date of commencement for these particular factories is not known.

THE MOA DAIRY FACTORY CO., LTD.

This factory, built at Inglewood, was the first co-operative concern of its kind in Taranaki. It had a stormy career for the first twelve months of its existence, and indications point to the fact that it was somewhat ahead of its time on account of inadequate milk-supply. The erection of the factory was commenced early in 1884, but, owing to differences of opinion as to the planning and construction of the building and to delay in obtaining some of the plant, the factory was not finally ready for the reception of milk until May, 1885. A special feature of the opening ceremony was to be a demonstration of the working of the separator, the first to go into that particular district, but as milk was not

EARLY TARANAKI FACTORIES.



CHEW CHONG'S "JUBILEE" BUTTER FACTORY.



MOA FARMERS', INGLEWOOD.

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forthcoming to demonstrate the machine, the factory-manager demonstrated the principle of the separator by running through some muddy water gathered from a nearby creek. It is recorded that the demonstration was successful. In view of the fact that the separator is worked on the basis of centrifugal force there is no reason why it should not have been. Obviously, the factory was opened at the wrong time of the year, it being the season when dairy-farmers would have less milk than at any other season. During that particular year the price given for fresh farm butter was fairly remunerative, so that, all things considered, it was only natural the factory would experience difficulty in obtaining an adequate milk-supply. In those days a good deal of trouble was experienced in inducing farmers to give up farm buttermaking for the reason that export raised the price locally.

The original intention of the shareholders was to confine the factory's operations to the manufacture of butter. At a meeting held on the 21st July, 1885, an additional £200 was subscribed to provide for the making of cheese. Mr. A. Brake, of Lepperton, previously mentioned, was engaged as manager for twelve months, at a salary equalling £2 6s. 6d. per week when butter only was made, and £3 6s. 6d. during the part of the year when cheese was made. The factory was therefore a dual plant making both butter and cheese. The Moa factory finally commenced operations in September, 1885, but its troubles were by no means over. The quantity of milk received was inadequate, and apparently the farmers did not keep to their agreements regarding supply. The state of mind of the shareholders is reflected in the fact that at a meeting held on the 21st October, 1885, it was decided to sell up if 100 cows were not guaranteed by the following Saturday. Evidently this ultimatum had its effect, for the factory seems to have run smoothly for the remainder of the season. The company, however, lost £127 14s. 1d. on the first year's operations. Mr. Sydney Morris was appointed manager for the second season, which opened on the 14th September, 1886.

THE OPUNAKE DAIRY FACTORY CO., LTD.

Taranaki's third factory was the cheese factory built at Opunake in 1885, and which commenced operations on the 12th October of that year. The principal founders of the company were Mr. Samuel Augustus Breach, of Opunake, chairman of directors,

and afterwards largest supplier, and Mr. J. J. Elwin, of New Plymouth. Mr. Elwin was a schoolmaster as well as a dairy-farmer, and was called in on account of his organizing ability and his knowledge of the dairying business. The Opunake company had reason to be proud of the work of its founders, and was one of the most successful of Taranaki's early dairy factories. The manager for the first season was Mr. Thos. Cranswick, who had been first assistant in Captain Runciman's factory in the Waikato. Mr. A. Brake, previously manager of Moa, took over the management of Opunake for its second season. The first secretary to the company was Mr. A. H. Moore. Any reader who is interested in fuller details concerning the foundation of the Opunake company will find a code of rules and some general details in the *Taranaki Herald*, for the 25th September, 1885. In the flush of the 1886 spring the supply of milk to the factory was so great that it became necessary to run a night shift in order to allow all the shareholders' milk to be utilized.

BRUCE DAIRY AND BACON-CURING CO.

This concern, which we know to-day as the Milton Dairy Co., commenced operations on the 29th September, 1885, Mr. Samuel Bowman, previously manager of Temuka, being the first to fill the position at Bruce. The original company was co-operative, Mr. James Gray being an important figure in its establishment. The factory, however, did not have a very successful career in its early stages; in fact, there was little enthusiasm connected with its founding, and on the 22nd September, 1890, was taken over by James Gray and Son and operated as a proprietary concern until 1900, when it entered the ownership of the big Taieri and Peninsula Milk Supply Co., but was closed down after a year or two. In 1912 a new company, known as the Milton Co-operative Dairy Co., was formed, and a new and up-to-date factory built about half a mile away from the original Bruce factory. The present company has run successfully since its inception.

DUAL-PLANT FACTORIES.

It will be noted that up to the present there were only two butter factories in the colony—namely, Karere, erected in 1884, and Moa, opened in 1885. All other factories were classed under

EARLY SOUTH ISLAND CHEESE FACTORIES.



BRUCE.



WYNDHAM.

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the general heading of cheese factories. The position, however, is somewhat misleading, inasmuch as, owing to the sudden shortage of butter on external markets and the consequent appreciation in price, several cheese factories in 1885 installed buttermaking plant and therefore became dual-plant factories. Edendale, which was already fitted up for buttermaking, commenced the manufacture of this product, while among the factories which specially installed buttermaking machinery were Tauwhare, Hamilton, and Mangere. The erection of plant in these three factories was done by Mr. W. W. Crawford, who later became a Government Dairy Instructor. In each case American machinery was chosen and seems to have been the most popular in the Waikato for several years. Captain Runciman was probably a strong influence in this direction. He had visited the United States in connection with dairy matters and returned with a leaning towards American appliances and methods.

One early report refers to a butter factory in operation at Whatawhata in the Waikato in 1885 but it has not been possible to confirm the statement or to discover details.

The position regarding the overseas butter trade about this time is indicated by the figures relating to the export of this product. In 1883 the quantity of butter exported was 8,869 cwt., in 1884 it was 15,766 cwt., while in 1885 it rose to 24,923 cwt. The enlivened demand, however, was of short duration, as in 1886 export declined to 23,175 cwt., and a year later fell back to 17,018 cwt.

1886.

In this year cheese factories were erected at Stirling (opened 7th November, 1886) in the South, at Otakeho and Manaia in Taranaki, at Belvedere in the Wairarapa, while the Ormond Cheese Factory, Poverty Bay, was also established. In addition, the Ihaia Road Creamery, Taranaki, originally known as the Opunake Creamery, was built.

THE OPUNAKE CREAMERY.

In 1886 Mr. S. A. Breach, the largest supplier, severed his connection with the Opunake Dairy Factory, and in June of that year built a butter factory on his own property on the Ihaia Road.

This was known in the district as the Opunake Creamery. A De Laval separator was obtained from Canterbury and set up by Mr. Brake, who also supervised the general equipping of the creamery. Power was supplied by a single horse. A cool-room was erected with solid walls and a double roof, and arrangements made for cooling from a nearby stream of water by means of a force pump. At the time, Mr. Breach was milking about 150 cows, and employed five milkers.

Mr. Breach made several shipments of butter in kegs to both Australia and England, and so far as can be ascertained his venture met with good success. His first shipment consisted of sixteen kegs of butter sent to Sydney via Wellington late in July, 1886, the price obtained being 1s. 4d. to 1s. 6d. per pound. It seems evident that the produce was of good quality and reached its market in satisfactory condition.

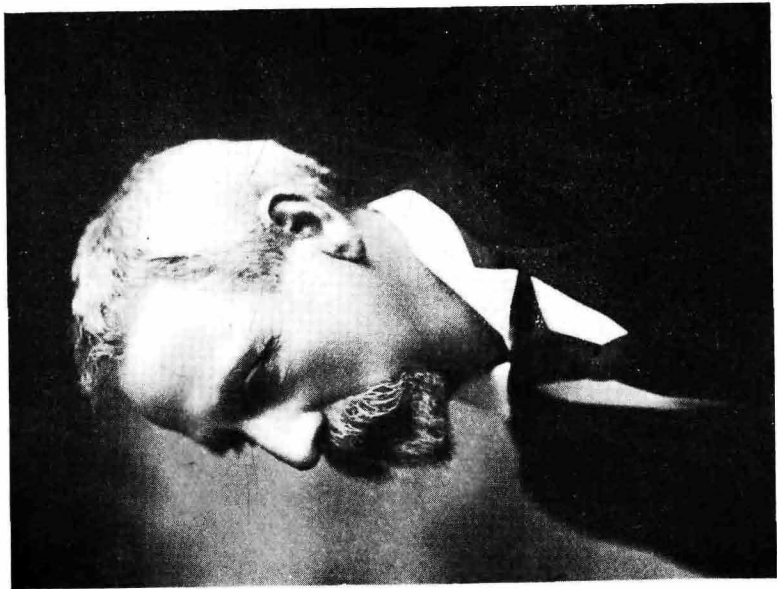
Other items relating to 1886 are that in this year Mr. John Sawers, destined to play an important part in the establishment of the industry, arrived in New Zealand to take over the management of Waiareka, and that the manufacture of hand-separators was commenced by the De Laval Separator Co.

The most significant event of 1886, however, was the establishment of the Pukekura Creamery. This name has been purposely saved till the last in order that special mention might be made of the work of its founder, Mr. Henry Reynolds.

MR. HENRY REYNOLDS.

No history of New Zealand's dairy industry would be complete without reference to Mr. Henry Reynolds, one of the outstanding founders and pioneers in the South Auckland Province. Mr. Reynolds was a Cornishman who came to New Zealand in the early "eighties" and took up dairy-farming in the Waikato. In 1886 he built a butter factory at Pukekura, near Cambridge, which was the first butter factory in the Waikato. Several cheese factories had, prior to this date, been adapted for buttermaking, but this is generally regarded as the first factory specially built for the purpose in that district. The factory was on Mr. Reynold's own farm, and originally under the management of Mr. David

FOUNDERS OF THE DAIRY FACTORY BUSINESS IN THE AUCKLAND PROVINCE.



WESLEY SPRAGG.



HENRY REYNOLDS.

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Gemmell, an American who had been dairy-farming in the Waikato and who had received training in buttermaking. The factory was originally capable of converting the milk of about one hundred cows, which were kept on the estate. Supply, however, was afterwards drawn from neighbouring settlers as well. The plant consisted of a steam-engine, a Burmeister and Wain separator, a churn, and a butter-worker.

Mr. Reynolds chose the brand "Anchor," and samples of "Anchor" butter sent to the Melbourne Exhibition in 1888 won the first prize. In view of his success on the local as well as the Australian market, Mr. Reynolds decided to extend the business, and arranged with two or three friends to invest some capital to enable other creameries to be erected. The outcome was the establishment in 1888 or 1889 of Reynolds and Co. From this date forward the business grew rapidly. In addition to the establishment at Pukekura, factories were built at Ngaruawahia and Newstead, and skimming-stations at Te Kowhai, Whatawhata, Paterangi, Te Awanutu, Kihikihi, Pukerimu, Hamilton, Waihou, and Te Aroha West. The company also took over the closed cheese-factory at Tauranga and converted it to a butter-factory. It was subsequently altered to a cheese-factory again. In 1891 the company decided to extend operations to Taranaki and built a butter-factory at Inglewood, and creameries at Kaimata, Egmont Village, and Tariki. The Taranaki venture, however, was not a financial success, and the Taranaki interests were disposed of in 1895. Messrs. Reynolds and Co. finally sold out the whole of their business to the New Zealand Dairy Association in 1896, which also took over the "Anchor" brand.

A writer with an intimate personal knowledge of the position pays the following tribute :—

"Like many other great, and ultimately successful enterprises, the dairy industry in the Waikato began under a cloud of doubt and disappointment, through which it grimly struggled for a decade. The difficulties in those pioneering days were tremendous, and Mr. Reynolds was fated to reap but little personal reward for his foresight and courage. He blazed the path for others to follow, and for that fine and courageous work his name will ever be honoured in the Auckland Province."

There was a brother, Mr. Richard Reynolds, who was dairy-farming in the Waikato over a long period of years. Though his name is known to a smaller circle, he too played an important part in the dairy industry of that section of New Zealand.

Mention should be made of the fact that Mr. Henry Reynolds used the principle of share milking in connection with a number of his factories and is said to have been the pioneer of this system in the Waikato.

1887.

Among the factories which commenced operations in 1887 were butter factories at Mangere, Waitara Road, Tikorangi, and Eltham, and cheese factories at Dalefield, Omimi, and Mataura, of which Mr. George Sawers was first manager. Several skimming-stations were erected during the year, but it is not considered necessary to record particulars of every new establishment, and from now on mention will only be made of what might be called pioneer institutions. It can therefore be accepted that the general rule has been to refer only to the more important initial events and those directly connected with them.

MANGERE.

The Mangere Butter Factory, near Auckland, was erected in 1887 by Messrs. Ambury and English, subsequently well known as milk-vendors to Auckland City, and proprietors of several skimming-stations near Auckland and in the Waikato. Mr. Joseph Ambury was first manager of the Mangere factory, and received valuable assistance from his wife, who was a skilled butter-worker. The butter was first made from the surplus of the town milk. This butter was made into 2 lb. pats wrapped in muslin, and packed into barrels containing salt brine, the barrels being kept in an underground cellar until the butter had hardened sufficiently to be sent into town for sale. In October, 1888, the company sent a shipment of butter to England through the agency of Messrs. Weddell and Co.

WAITARA ROAD.

With the exception of Mr. Brake's private cheese factory at Lepperton—the first dairy factory in Taranaki—all those Taranaki factories already referred to were south of New Plymouth. In 1887 dairying development commenced north of New Plymouth

in the Waitara district, and in January of that year Mr. Thomas Bayly erected a butter factory at Waitara Road. The milk-supply was obtained from Mr. Bayly's own herd, and he also bought milk from neighbouring farmers, the price paid the first season being 2½d. per gallon of 10½ lb. About three hundred cows were supplying the factory the first year. The first factory-manager was Mr. G. G. Andrews. Two Burmeister and Wain separators of a capacity of 160 gallons per hour were used. Butter from the factory was first exported in 60 lb. and 100 lb. kegs. The first kegs were made of kauri, and later tawa was used. These had to be lined with butter-cloth, with tops and bottoms cut the same as cheese caps. Tubs, of 100 lb. capacity, often called firkins (the Scottish term), were also used.

An interesting fact concerning Mr. Thomas Bayly's Waitara Road factory is that after the building had been completed it was found that the churn could not be got in, and a hole had to be cut in the side of the building. The churn in question was built by the Sash and Door Factory at New Plymouth, and was said to be the largest of its kind in the colony at that time. The barrel and stand were about 5 ft. 2 in. in height. The capacity of the barrel was a little over 400 gallons, and it would churn about 350 lb. of butter at a time. Steam-power was used. It is interesting to compare this with our modern churns, the majority of which have a capacity of 2,000 lb. butter, while churns of a capacity as large as 4,000 lb. are made.

TIKORANGI.

Shortly after Waitara Road came Tikorangi, which also was erected in 1887 and opened in September of that year. The suppliers to this factory were mostly men who had served in the Maori wars and who were given an opportunity to acquire holdings on what was known as the Tikorangi Block. The factory was started by Mr. J. C. George, who purchased milk from the surrounding district at 2½d. per gallon. Mr. J. C. George was afterwards a member of the Crown Dairy Co., an important organization of its day. Some notes on this company will be found on a later page. Tikorangi was taken over by the suppliers as a co-operative concern in 1890.

Mr. William Black, who, later with his brother, Mr. Alfred Black, took up land at Awakino, was the first manager of the Tikorangi factory.

Mr. John White Foreman, for many years chairman of directors, was largely responsible for the success of the company, as well as a leader in the affairs of his district. He was also for a term chairman of directors of the National Dairy Association.

CHEW CHONG.

One of the prominent personalities in Taranaki's early dairying history was Mr. Chew Chong, a Chinese, who came to New Plymouth in 1870, where he started buying fungus and selling toys. The same year Chew Chong set up in business as a store-keeper, and commenced buying butter from the farmers. There was *but a poor market locally*, although for a while the gold rush in the Thames district provided a payable outlet. In 1874 and 1875 Chew Chong sent a number of consignments of butter to Australia, but the venture was most uncertain—sometimes he did well and at other times lost money on the shipment.

In 1884 Chew Chong left New Plymouth and opened a store in Eltham. Again he bought butter from the farmers, but could not sell it in New Zealand, so tried his luck with a shipment to England. He paid 4d. a pound for the butter, the steamer freight was 3d. a pound, and he received 70s. to 75s. a cwt. for it, so that with incidental costs he would lose money. The London report said, among other things, "Your butter is only like cart-grease." Obviously there was little ground for optimism.

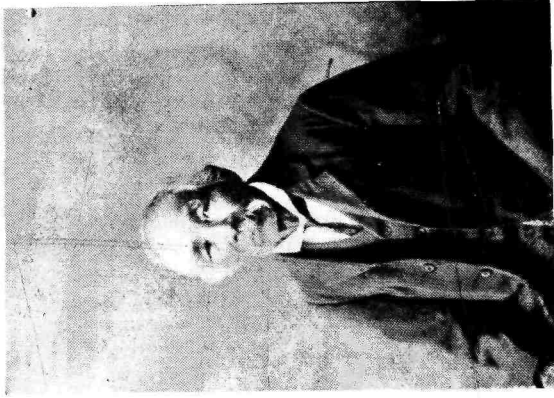
In 1887 Chew Chong built a butter factory at Eltham and called it the Jubilee Factory, because that was the year of Queen Victoria's jubilee. Later he erected creameries at Hunter Road, Te Roti, Mangatoki, and Rawhitiroa. Burmeister and Wain separators were used. In 1889 at the Dunedin Exhibition, Chew Chong won a silver cup for the best half-ton of butter packed suitable for export. It should be placed on record that while the Jubilee factory won this much-coveted honour, the man who actually made the butter was Mr. Sydney Morris, Chew Chong's dairy-factory manager and buttermaker, and previously manager of the Moa Dairy Factory. Chew Chong was not a practical buttermaker.

Chew Chong rendered invaluable service to many dairy-farmers in his district by way of financial assistance toward purchase of dairy cows, farm implements, stores, &c., and left behind him a lasting record of honest and often generous treatment.

TWO NORTH ISLAND PIONEERS.



CAPTAIN JAMES RUNCIMAN.



CHEW CHONG.

1 To face page 64.

He was so highly thought of that in 1910 representative dairymen from all over Taranaki presented him with an illuminated address, expressing their appreciation of the enterprise he had shown as a pioneer of the butter industry in Taranaki. Mention was also made in the address of his work in establishing the fungus trade. Chew Chong died on the 7th October, 1920, at the ripe age of ninety years.

Chew Chong invented a butter-worker, and is also said to have been the first in New Zealand to use an impress brand for butter—this particular one being of his own design. He also adopted the system of farm labour now commonly known as "share milking" on some of the farms in which he was interested. He was *not*, however, the founder of the system in New Zealand, though who was has not been definitely established. The earliest instance traced relates to the Henley Land Co. on the Taieri, whose manager, Mr. J. Stevenson, introduced share milking in 1884.

W. K. HULKE.

It is fitting, while mentioning Taranaki pioneers, to refer to the late Mr. William King Hulke. Mr. Hulke was born at Deal, England, in 1819, and died at Corbett Road, Bell Block, near New Plymouth, in 1908. He emigrated in 1840, landing at Wellington in December of that year, and was therefore one of New Zealand's earliest settlers. In 1841 he went to Sydney and purchased a herd of dairy cows with which he established a dairy at Evan's Bay, a suburb of Wellington. In the latter part of 1842 he went to Wanganui, transferring to New Plymouth in 1847, and to Bell Block in the early "fifties," where in the middle "eighties" he established a model dairy factory on the Corbett Road for the benefit of neighbouring farmers. Here for many years he experimented in dairying and became a strong advocate of the dairy-factory system. He was the founder of the Jersey breed in Taranaki, and built up a fine herd.

Mr. Hulke set an outstanding example for progress and was a powerful influence over a wide area. He introduced many of the most modern improvements at his own expense, giving lectures and practical instruction. In 1882 he published for free circulation a pamphlet entitled "Golden Rules for Buttermaking."

He imported purebred dairy cattle and kept pedigree bulls for service at low fees. In 1903 Mr. Hulke's services to the dairy industry were recognized by a commemorative illuminated address presented by pioneers and leaders of the dairy industry in New Plymouth and the surrounding districts.

DALEFIELD.

The original Dalefield Dairy Co. was formed and registered in February, 1887, the factory commencing operations on 3rd October, 1887. The first manager of the factory was Mr. Goss, and the first secretary to the company Mr. G. A. Fairbrother. The first shipment of cheese to Great Britain was made in December, 1887, through the New Zealand Loan and Mercantile Agency Co., Ltd., and realized 48s. per hundredweight. The factory had twenty-six suppliers during its first year of operation.

JAKINS BUTTER-PRINTER.

An invention of sufficient interest to justify its being placed on record was patented in 1887. This was a butter-printer designed by Mr. G. S. Jakins, of Christchurch. This appliance had quite a vogue and was considered a useful and successful invention, by which bulk butter could be moulded into bars and then cut off into short blocks or "prints" of 1 lb. each or other desired weight.

CHEESE TO INDIA.

In 1887 Mr. Begg, of Mataura, despatched his third shipment of cheese to India. Reports state that by the first shipment he was a gainer, but lost on the second, due to high railway charges and heavy tariffs. Needless to say, the consignments were small, and though the ultimate result was failure, this attempt to find a foreign market at so early a date is worthy of record.

1888.

Many matters of interest pertain to the year 1888. Sefton, the first butter-factory in Canterbury, was opened on the last day of the year. The Taieri Butter Factory, owned by Messrs. J. and R. Cuddie. Mosgiel, and the first factory in the South

erected solely for buttermaking, commenced operations in November, 1888. Waikouaiti opened on the 5th December. The foundations of the Crown Dairy Co., Taranaki, were also laid in 1888.

THE CROWN DAIRY CO.

As previously mentioned, it was during the early "eighties" that the settlers at Otakeho, Manaia, and Opunake started co-operative factories. The life of all these places, however, was very short. For the most part the settlers were struggling dairy-men with only a few cows, and, owing to insufficient milk-supply, bad roads, and lowness of market values, one by one the companies failed. In 1888 Messrs. Newton King and J. C. George, of New Plymouth, formed the still well-remembered Crown Dairy Co. Shortly after its inception, Mr. Richard Cock, also of New Plymouth, joined the company, the business later remaining solely in his hands. Prior to the formation of the Crown Dairy Co., Messrs. King, George, and Samuel were associated in the dairy-factory business (1886) and laid the foundations of the concern which developed later. Mr. Oliver Samuel was Member of Parliament for New Plymouth at the time, representing the electorate from 1884-1890, afterwards being appointed a Member of the Legislative Council. Mr. Cock took over the shares previously held by Mr. Samuel. The Crown Dairy Co. commenced by taking over the three factories which the settlers had been unsuccessful in working co-operatively, and also rendered them financial assistance toward purchasing their requirements for carrying on dairy-farming—that is to say, not only the farms themselves, but cows, dairy utensils, &c. By way of repaying the loans made, a certain percentage was deducted from the monthly milk cheques. This procedure on the part of the company resulted in increased supplies to the factories, thereby reducing the cost of manufacture and eventually enabling higher prices to be paid to the dairymen for their milk. The company, however, had its difficulties. There was no check on the fat content of the milk, and it is said that this was often very low indeed. For the first few years—up to 1894—the milk was paid for solely according to quantity. From that date a basis of 3.6 per cent. fat for buttermaking, and 3.4 per cent. for cheese was adopted, the company at first employing a chemist to make the fat determinations.

By 1897 the Crown Dairy Co. had acquired or erected eighteen factories and two skimming-stations in Taranaki, and also owned the Woodville Dairy Factory, which it had taken over from Mr. F. W. B. Greville, well known as late proprietor and editor of the *Dairyman*. Towards the end of the "nineties," however, there was a definite leaning towards co-operation again, and from then onward the factories were gradually taken over by co-operative companies. Except for one brief period when an opposition concern from the Auckland district built one or two factories and skimming-stations and unsuccessfully competed against it for milk-supply, the Crown Dairy Co. dominated the dairy-factory business in North Taranaki for approximately ten years—namely, from 1890 to 1900. It finally ceased operations in 1903.

THE TAIERI BUTTER FACTORY, MOSGIEL.

An early report tells us that the Cuddie brothers, who started this factory at Mosgiel in November, 1888, were storekeepers, and having to deal with a glut of farmers' butter for which there was no market, they conceived the idea of buying the milk from the farmers and converting it into butter for export. The report continues: "The farmers did not take kindly to the innovation at first, but in the end found it to their own advantage to support the butter-factory. The proprietors exported portion of their butter to Australia, and sent part of it to London. The first shipment realized about 10d. per pound. After a time several skimming-stations were established by the Messrs. Cuddie to supply cream to the central factory. Expert advice was not available, yet the venture was a success. It speaks well of the character of the work done at the Mosgiel butter-factory when it is known that Mr. David Cuddie, who gained his first experience there, is now (1904) Government Dairy Instructor in the North Island. Eventually the Cuddie Bros. sold out to the T. and P. Milk Supply Company, who had commenced the manufacture of butter in addition to the supplying of milk." Mr. David Cuddie, later Director of the Dairy Division, was a brother of the founders of the Taieri Butter Factory.

CROWN DAIRY COMPANY PROPRIETORS.



NEWTON KING.

J. C. GEORGE.

RICHARD COCKS.

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THE SEFTON BUTTER FACTORY.

This was established by a limited-liability company having a nominal capital of £1,500 in 500 shares of £3 each. The original plant was capable of dealing with the milk of 300 cows. The buildings were erected on a section of 2 acres adjoining the railway-station. The structure was of wood, with concrete floors, and double-roofed, the outer roof being of iron. The milk-cans were locally made. Among the machinery was a De Laval's 150 gallon turbine separator, a Cherry's butter-worker, and a 120 lb. capacity cylinder churn made by the North Canterbury Woodware Co. Mr. W. Gordge, late of Geraldine, was the first factory-manager; Mr. D. Dick, chairman of directors; and Messrs T. Wylie and M. Robertson, joint secretaries. The formation of the company and the ultimate establishment of the factory were largely due to the efforts of Mr. G. G. Stead, of Christchurch.

WAIKOUAITI DAIRY FACTORY.

The Waikouaiti cheese-factory was opened on the 5th December, 1888, Mr. James S. Dawson being the first manager. Milk was paid for at 3½d. per gallon, "milk to show at least 10 per cent. of cream by the test glasses." In 1895 milk was purchased on the butterfat basis at 7½d. per pound fat, Waikouaiti being the first cheese-factory company in New Zealand to adopt this method of payment. On the financial side it is worthy of record that in 1900 10s. on each paid £1 share was refunded to shareholders out of accumulated profits, an indication of the sound position of the company's financial affairs. One of the company's original rules provided that "no milk will be received on Saturday evening nor Sunday morning, but on Sunday evening the same as week days." This practice was adhered to for many years. Other interesting rules were that "cows must have calved seven days before the milk is fit for factory use," and that "milk from turnip-fed cows will not be taken."

CONDENSED MILK.

England and France were experimenting in the manufacture of condensed milk as long ago as 1830, while America brought the process to a partially successful commercial stage in the 1850's.

The foundation of modern practice appears to have been laid in the late "seventies," by which date milk-condensing had made considerable progress in several parts of Europe, as well as in England and the United States, France being especially prominent in the perfecting of the process. The great advance in machinery for condensed milk and allied products, however, did not commence until the beginning of the present century.

Roseville Dairy Factory, at Sawyer's Bay, Dunedin, the first factory for condensing milk established in New Zealand, commenced operations on the 20th January, 1888, and continued to make butter until about the 18th March. Milk-condensing was then begun, and up to the 18th June the number of 1 lb. tins of condensed milk manufactured amounted to 2,500, consignments of which were sent to Great Britain, China, Western Australia, and other places.

BUTTER-PACKING COMPANIES.

Two other factories which marked a new departure in the industry were the Cardiff Butter Packing Co. and the Peninsula Butter Exporting and Packing Co., Dunedin. These were the forerunners of several of their kind formed in New Zealand about that time. Dairy-produce prices were at a very low ebb and many of the factories were closing down. This was the period of evolution from proprietary to co-operative control. Farmers were finding they could get a better return by making butter on the farm to the granular stage and sending it to a central depot for final working and preparation for marketing. In the case of Cardiff the settlers contributed about £1 each to purchase timber and utensils and erected the factory themselves. The system was copied, so it is said, from Normandy, France. The manager of the Cardiff concern was a Mr. E. Gilshnan, who was paid so much a pound on the butter worked up, with a percentage on the price which it obtained beyond a certain figure.

In the case of the Peninsula Butter Exporting and Packing Co., each supplier was required to churn at least twice a week. Immediately on churning the buttermilk was washed out of the butter, and the lump taken to the factory, where it was worked, salted, and weighed, and the sender credited with the quantity forwarded. The lots were classed, those of each class blended,

and finally packed in Pond's boxes and marked. The New Zealand Loan and Mercantile Agency Co. were appointed agents in London for sale of consignments, and suppliers could obtain an advance on the quantity to their credit.

SECOND GOVERNMENT LECTURER APPOINTED.

The second step in Government assistance took place in 1888, Mr. R. M. McCallum, manager of the Edendale Estate, being appointed by the Minister of Lands to travel the colony and give lectures on the working and establishment of dairy factories. After completing his tour Mr. McCallum published his findings and opinions, together with a quantity of general information in a booklet entitled "Report on Dairy Factories in New Zealand, together with other Papers on the Subject," the publication being dated September, 1888. The main feature of Mr. McCallum's booklet was the stressing of the advantages of the general application of the co-operative principle to dairy factories.

PARCHMENT PAPER.

It was in 1888 that the use of parchment paper for wrapping butter was introduced into New Zealand. Mr. Wesley Spragg, of the New Zealand Dairy Association, Auckland, was the first to try out this method of butter wrapping.

1889.

There is little to record regarding the year 1889. This year and the following were depression years in the dairy industry, particularly in the butter trade, and a number of butter factories were forced to close down in 1889-90 owing to the low price of butter. Several butter-packing companies were formed, partly for the purposes of economy of production, but principally with the object of bringing about greater uniformity in the finished article. This lack of uniformity was the most serious fault in our butter at the time and was the cause of considerable adverse criticism on the London market.

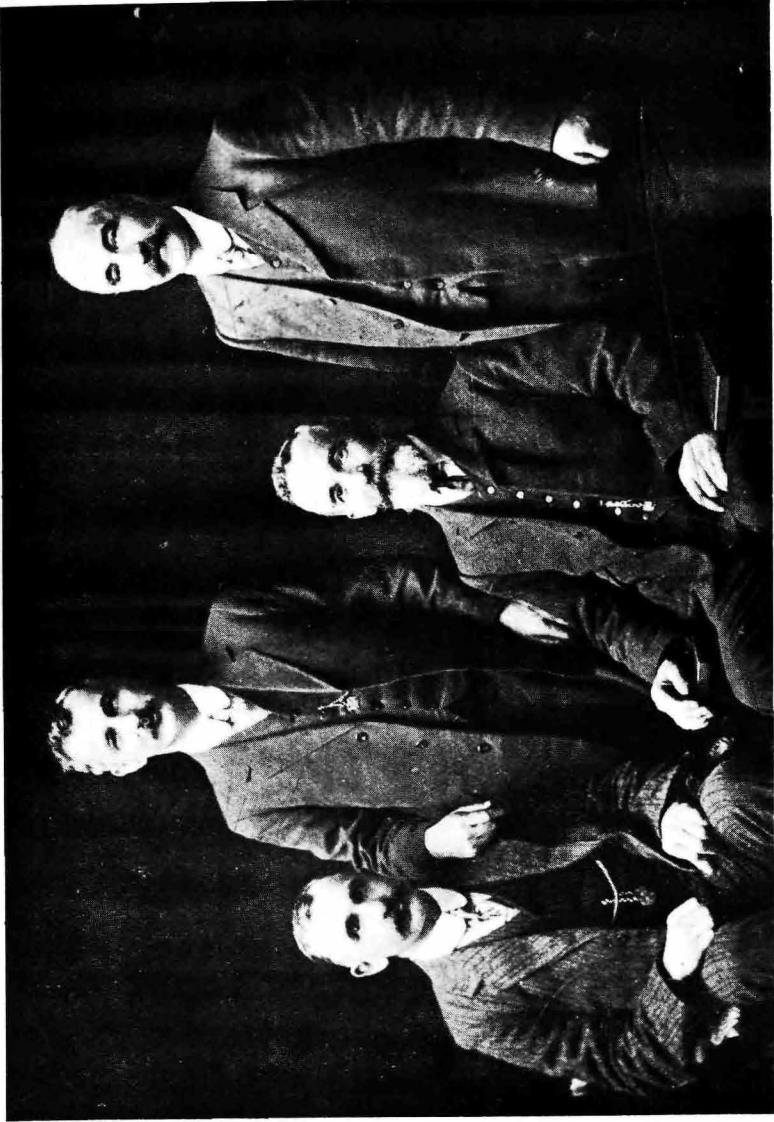
THE TAI TAPU BUTTER FACTORY.

The Tai Tapu Butter Factory was erected andⁿ commenced operations during the year, and appears worthy of mention on account of one or two special features concerning mode of operation and management. A Burmeister and Wain separator was used and the skim-milk raised by centrifugal force into a vat 9 ft. above the separator—this was something new in those days—and from thence ran into the cans for the farmer to take home with him. The cream was cooled by passing over a Lawrence cooler and then allowed twenty-four hours to ripen, after which it was churned in two Blanchard churns, each of which held 80 gallons of cream. A Delaitouse butter-dryer was used to extract the surplus moisture, and the whole process gone through without either milk, cream, or butter being touched by hand. About 1,500 lb. of butter a week was turned out the first year. The management was undertaken by Mr. H. D. C. Marr, who formerly had been engaged in condensing milk for the Roseville Dairy Co., and later at the Totara and Fortrose cheese factories. Mr. Marr contracted with the Tai Tapu company to do the work at 1½d. per pound of butter, an additional ½d. if his butter topped the market, and a £10 bonus every half-year, he providing all labour, oil, and coals required, the company merely finding kegs and stationery. This description serves to indicate the contract system of butter-factory management.

THE FIRST DAIRY INSTRUCTOR.

The most memorable event, however, pertaining to 1889, was the commencement of a practical and permanent instructional service, for it was in 1889 that Mr. John Sawers was appointed by the Government as the first Chief Dairy Expert. He was one of four brothers who came to New Zealand from Scotland, all good cheesemakers, and all prominent in our dairy industry over a period of years. John Sawers was born at Mains-of-Park Farm, Glenluce, Wigtownshire, Scotland, on the 4th February, 1866, and educated at the Leswalt, Inch, and Sorbie Parish Schools, and at the Stranraer Academy. He had taken an early liking for stock and dairy farming and the manufacture of dairy-produce, and his attention was naturally turned to these branches of agricultural work, with which he had every facility to become

THE SAWERS BROTHERS.



GEORGE.

JOHN.

WILLIAM.

JAMES.

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thoroughly acquainted. In 1881 he became interested with his father in the management of the White Hills and Broughton Mains dairies in Wigtownshire, of about 100 cows respectively, and in 1882 was placed in charge of Comlongan Mains Dairy, Ruthwell, Dumfriesshire, of over 100 cows. He managed this latter dairy until April, 1884, when his father relinquished the business on account of declining years. After a season spent under the teaching of Mr. J. B. Harris, Dairy Instructor for Scotland, Mr. Sawers came to New Zealand in 1885, and was appointed manager of the Waiareka Dairy Factory Co., Ltd., Oamaru. In 1888 he became lessee of the factory and also lessee of the Flemington Dairy Co.'s factory, Ashburton. In August, 1889, as previously stated, he was appointed to the position of Chief Dairy Expert. J. B. Harris, mentioned above, was regarded as one of the foremost cheese experts of Canada at that time (the early "eighties"). He came from the United States and was trained under Professor Arnold, and was an experienced cheddar-cheese maker, dairy instructor, and organizer. Harris was engaged by the South of Scotland Dairy Association to bring the latest-known methods to Scotland. John Sawers therefore brought to New Zealand the best then known process of factory cheddar cheesemaking, and also knowledge of the co-operative system of conducting dairy factories and a strong faith in the system. Briefly summarized, the cheddar system was evolved in England, the factory system on co-operative lines was made a success in the United States of America, while the factory cheesemaking process was brought to the highest standard in Canada.

Mr. John Sawers remained with the Government for seven years, and during that period rendered inestimable service to the industry. He was a man of wide experience, sound judgment, and attractive personality. The New Zealand dairy industry owes him a heavy debt, and it was a matter of great good fortune that our first dairy instructor should have been a man so outstanding.

Among the many achievements of Mr. John Sawers, apart from various reforms relating to manufacture, were the founding of the dairy associations, the institution of dairy-factory managers' conferences, and the establishment of *The Dairymen* journal as a medium for discussion of problems and the dissemination of advice and information regarding the dairy industry.

The first of the Sawers brothers to come out from Scotland was James, who arrived in 1875. On arrival he took up farm-work at Ngapara, near Oamaru, and afterwards went into the Waiareka Cheese Factory with his brother William, who followed Joseph Wood as manager. James and William Sawers worked Waiareka by contract for about two seasons, then William took over the managership of the Stirling factory. After working Waiareka by contract with his brothers—William and John—James Sawers took over the managership of Milton about 1888 or 1889, and was successively manager at Wyndham and Edendale. From the latter, in 1896, he was appointed a Government Dairy Instructor, resigning in 1902, being later reappointed for a season or two.

William Sawers came to New Zealand in 1883. George Sawers came out with John in 1885. He received his training under John at Waiareka and William at Stirling. He was first manager of the Maitaha Dairy Factory (1887). He is now (1935) Cheese Expert to the Victorian Government.

1890.

The first of the dairy associations—namely, the New Zealand Middle Island Dairy Association—was formed in this year, 1890. Its establishment was due to the efforts of the Government Dairy Expert, Mr. John Sawers, who had devoted considerable time and energy to advocating the advantages of some organization which would be a medium for co-ordination between the various branches of the industry, and particularly from the point of view of shipping and marketing. Mr. Thomas Brydone played a conspicuous part in founding the association, and was the first chairman. The headquarters of the organization were in Dunedin. Mr. Sawers temporarily acted as secretary, Mr. J. R. Scott later being appointed permanent secretary. A special chapter is devoted to this and other allied organizations in the second section of this volume. It should be mentioned, however, that in addition to being secretary of the South Island Dairy Association, Mr. Scott was regarded as a general dairy factory company counsellor, and was also commission agent for a number of companies. He did much to bring about regular shipments and

to cause continuous improvement in the methods of carrying cargoes, particularly cheese, concerning which there were more complaints and claims than with regard to butter.

Although it might be supposed that transport problems were solved with the advent of refrigeration in 1882, this was really very far from the case. The means were there, but they were not put into effect. In 1890 the dairy industry was still regarded as of secondary importance, attention being centred on the frozen-meat trade. As a consequence, very few steamers were suitably fitted for the conveyance of dairy-produce, and the dairying columns of the press of that day were filled with criticisms and complaints regarding the matter. Moreover, charges were considered unduly high. These shortcomings did not apply solely to overseas vessels, but to local transport by way of trains and coastal steamers. The dairy associations provided an effective medium for combined effort on the part of producers, and the next year, 1891, saw the commencement of improved conditions and greater attention to this important phase of the business.

Evidence of further effort in the direction of building up the dairy-export trade is to be found in the engagement by the Taranaki butter exporters of Mr. John Mynott, a dairy-produce expert and agent, to proceed to England to open up dealings with English firms for the sale of butter and other produce.

In December of this year the Government granted £250 to the Middle Island Dairy Association toward the expenses of sending an expert Home with an experimental shipment of butter and cheese. The man appointed was Mr. Charles Cox, a factory-manager, who had been managing at Geraldine just prior to his appointment. The experimental produce left by the s.s. "Doric" on the 4th February, 1891.

In 1890 the second condensed-milk factory commenced operations. This was established at Wallacetown, near Invercargill, by a Mr. Blair. This was the first factory of its kind to condense milk under vacuum. Whereas the Wallacetown factory was equipped with up-to-date machinery, Roseville did not have vacuum pans, but merely dried out the milk over a hot stove.

The event of outstanding importance attaching to the year 1890 was the perfecting by Dr. S. M. Babcock, America, of the method of testing milk and cream for butterfat. The Babcock

test was, before long, known to the entire dairying world, and played a particularly important part in the factory method of payment for milk and cream to dairy-factory suppliers.

It was also in 1890 that Baron Bechtelstein, of Munich, introduced the disc-bowl separator. His patent was purchased by the De Laval Separator Co., and marked an important advance in the design of this appliance.

1891.

Although 1891 was a quiet year from the point of view of happenings in the industry, and there is very little to record, it was at the same time a most significant year inasmuch as it marked a turning-point in the development of factory dairying. The industry had experienced strong adversities in the "eighties," and, as previously stated, many factories had been forced to close down towards the end of the decade. The "eighties" had come in auspiciously with the advent of refrigeration and the commencement of the factory system, and had also given the power separator. The first factories were proprietary, but by the mid "eighties" it looked as if the co-operative system of control was in a fair way towards establishment. The late "eighties," however, brought a serious general depression which gave a setback to the young industry and brought about the temporary failure of co-operation and a reversion to proprietary control.

The "nineties" opened with a brighter outlook. Market prices became more favourable and prospects were suddenly encouraging. The uphill fight of the preceding decade was not without its useful side and had taught producers and shippers the importance of thoroughness in all branches of the industry, so that dairy-farmers were now better fitted to cope with the development which was about to take place. There was a swing-back to co-operation, and it is generally accepted that 1891 marked the true successful beginning of co-operative development in the industry.

Among the co-operative dairy companies established in 1891 was Cardiff, which commenced operations on the 21st September of that year. This company was regarded by pioneers of the industry as a model of co-operative enterprise, and was also

considered to be the first successful co-operative dairy company in Taranaki⁹. It was inaugurated on sound lines and ran smoothly right from the commencement. Its predecessors all had great difficulties, and the majority of them failed after a short period of operation.

The Government's continued interest in an instructional and educational service was demonstrated by the appointment, late in 1891, of Mr. Carl W. Sorensen as a Dairy Instructor to assist Mr. John Sawers. While Mr. Sawers was mainly a cheese man, Mr. Sorensen had specialized in the manufacture of butter. At the close of the season, however, Mr. Sorensen, after having spent less than one year with the Government, resigned for the purpose of starting dairy factories, rejoining the staff a year or two later. During his first engagement as Dairy Instructor his attentions were devoted almost exclusively to the North Island and to butter factories. Mr. Sorensen's reports stamp him as a man of ability and knowledge of the business and indicate that he was able to render valuable service to the industry. An interesting statement contained in one report is to the effect that he was refused admittance at twelve factories, while at another he was not invited to examine the factory or the cheese. He was a strong advocate of the establishment of a permanent dairy school "where young men can learn everything about milk, butter, and cheese, from the milking of a cow to the selling of the 'finished product'." It must be remembered that in those days it was extremely difficult to find men of adequate training to suitably fill the managements of the factories which were being erected. He also strongly urged the removal of all duties on dairy appliances and requisites. Mr. Sorensen was a Dane, and was instrumental in introducing Danish appliances and methods to a number of New Zealand butter factories.

An item which may be of interest to some readers is that in 1891 the practice of sending Home Christmas parcels of butter was begun. The procedure was initiated by the Colonial Secretary's office.

COMBINED CHURN AND BUTTER WORKER.

In this year one of these appliances was installed by Messrs J. and R. Cuddie in their butter factory at Mosgiel. This appears to be the first of its kind in New Zealand.

THE MANGATOKI FACTORY.

Although this was not really one of Taranaki's earliest factories, it is frequently mentioned by the dairying pioneers of that province.

The Mangatoki factory was built in 1891 by Mr. C. A. Wilkinson, storekeeper, Eltham, later Member of Parliament for Egmont. Mr. Arthur Morris was the first manager. The factory was afterwards bought and controlled by the late Mr. Chew Chong, who in 1893 sold it to the New Zealand Loan and Mercantile Agency. In 1897 the factory was disposed of to the present co-operative ownership.

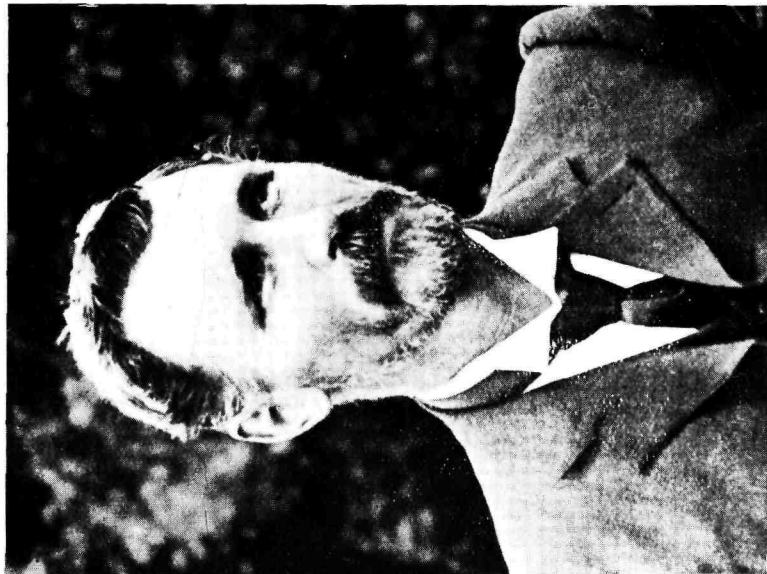
THE NEW ZEALAND DAIRY SUPPLY CO.

This company, which was founded by Mr. W. J. Birch, was established in 1891 and carried on the sale of milk and the manufacture of butter and cheese in premises in Moray Place, Dunedin, and differed from the Taiari and Peninsula Co. in that the shareholders were all non-producers, purchasing the milk from the settlers in the surrounding districts. The prices paid to the producers varied with the season of the year, and in the first year of operations were—in summer 4d., in autumn and spring 5d., and in winter 6d. per gallon delivered at the factory. In 1892 the company built a skimming-station at Hampden. The company ceased operations about five years later. It was one of the first three in New Zealand to install a Babcock Tester.

1892.

In contrast to 1891 this was a year of several important developments. First, it was the year in which the Department of Agriculture was formed, all agricultural matters prior to this date being under the administration of the Stock Department and the Lands and Survey Department. Condliffe, in his book "New Zealand in the Making," states: "An agricultural branch of the Lands Department was created in 1886 by the Stout-Vogel Ministry, in which Ballance was Minister of Lands. Dairy Instructors were appointed and were transferred in 1892 to the new Department of Agriculture. It was a cardinal feature of McKenzie's administrative policy to encourage closer settlement by

TWO EARLY DAIRY-FACTORY MANAGERS.



SYDNEY MORRIS.



ARTHUR MORRIS.

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the constructive method of providing the small farmers with expert advice and assistance. In the upshot this has proved to be the most valuable of all assistance. Great credit must be given to the unrecognized work of unnamed Civil servants who directed the attention of New Zealand dairy-farmers to methods of rural co-operation. They were not content with generalization, but prepared practical, simple, detailed forms of organization. In doing so they gave a bias to New Zealand rural development that will last. The growing-point of the Dominion's social and economic organization is the closer settlement of dairy lands. In that growth the co-operative factory is the most potent instrument of education."

In 1892, therefore, dairy instruction came under the administration of a new Government Department, the Department of Agriculture, Mr. J. D. Ritchie being appointed head of the Department as from the 30th March, 1892. The Department was formed by the amalgamation of the Stock Department and the Agricultural Branch of the Lands and Survey Department. The Dairy Division was not established as a separate branch until 1898.

The newly established Department of Agriculture gave early attention to the question of placing the dairy industry on a sounder footing from the export point of view, with the result that in October, 1892, the first Dairy Industry Act was passed "to regulate the manufacture of butter and cheese for export and to provide for the purity of the milk used in such manufacture." This measure dealt mainly with the branding of dairy-produce intended for export, and also provided authority for the appointment of officers and the inspection of dairy factories and farm premises. The Act, however, came into operation rather late to allow of shippers getting their trade-marks registered, and therefore its provisions were not strictly enforced the first season. It was, nevertheless, a foundation for the more important Act which was to follow in 1894.

The first annual report of the Department states that the number of factories and creameries in operation during the season 1892-93 was 104, an increase of 32 over the previous season. Among the factories to commence operations in 1892 was Riwaka, the first dairy factory in the Nelson province. Other factories established within the year were Canterbury Central, Ashhurst, and Maharahara.

A problem which now confronts the historian is that it has been necessary to refer to the Department's annual reports for the date of introduction of many items from this point onwards, and that the reports are based on the financial rather than the calendar year. Obviously, this classification complicates the position somewhat for the reason that it is equally difficult, where no exact date is given, to catalogue an event in either the calendar year, or what is now more commonly used, the dairying season—namely, 1st August to 31st July. It is proposed, from now on, to adopt the seasonal classification, though, where possible, events of importance will be assigned to their particular calendar year. Although, therefore, this section is headed "1892," it will also embrace matters referred to in the Department's annual report for 1892-93.

During the season three experts were engaged giving practical demonstration in the manufacture of butter and cheese.

These were Mr. John Sawers, Chief Dairy Expert, while Mr. Newman Anderson and Mr. W. W. Crawford were appointed assistant instructors. Mr. Newman Anderson resigned his post after serving only a portion of a season and does not appear to have left a report on his work. Mr. Crawford also resigned his position at the end of the season, but was able to render good service pertaining to the planning and equipping of a number of new factories in the South Island. Among other things, he conducted a series of lectures and schools of instruction on Banks Peninsula. It is said that Mr. W. W. Crawford was particularly capable in the matter of dairy-factory machinery and design.

In 1892 the Government granted further financial assistance to the Middle Island Dairy Association for experimental purposes connected with the dairy industry, this time to send home Mr. W. B. Walters to arrange for a more perfect system of ventilation on board vessels carrying dairy-produce. Mr. Walters was successful in having several steamers fitted up on a principle which he had designed. The Agent-General in London also devoted much attention to securing uniform temperature in ships' chambers, and by the aid of Messrs. Negretti and Zambra, a London firm of scientific instrument-makers, a tell-tale thermometer or thermograph was perfected, and fitted in several steamers.

Awakening interest in the industry is evidenced by the fact that duty was removed from parchment paper for wrapping butter, and that complete sets of plans and specifications for cheese and butter factories and creameries were prepared and issued free of charge to those interested.

It was in 1892 that the first lot of Babcock testers reached New Zealand. These were imported at the suggestion of Mr. John Sawers, and consisted of four hand-power machines, each of eight-bottles capacity, and made by Messrs. Burrell and Whitman, of Little Falls, Utica, New York State. Mr. Sawers carried one of these machines on his rounds and demonstrated the method of operating the test. Of the remaining three machines, one went to the New Zealand Dairy Supply Co. factory in Dunedin, one to the Edendale factory, and one to the New Zealand Dairy Association's factory at Pukekohe. Mr. Sawers' report for the 1892-93 season states that he tested 336 samples, results indicating the highest test to be 4.7 per cent., the lowest 2.8 per cent., and the average 3.6 per cent. butterfat. These figures are merely interesting. Seeing that, in the absence of detailed particulars, it can only be assumed they were odd samples, they throw little light on the average test of the average cow of that period. In the same report Mr. Sawers mentioned that a Fjord's centrifugal milk controller, commonly known as Fjord's test, was to be used at the Tai Tapu factory, and from the context it is assumed that this was the first of its kind to be used in New Zealand.

In his report on the season Mr. Sawers states that cheese was worth about £42 a ton, and first-class factory-made butter about £84 a ton on the British market. He also conveys the cheering information that "every one of our co-operative factories is now in a healthy financial state." Another extract from the report reads: "On the 17th August, 1892, a meeting of cheese and butter makers was held in Dunedin under the auspices of the New Zealand Middle Island Dairy Association for the purpose of discussing the theory and practice of their work as manufacturers and for the consideration of other matters affecting the interests of the industry." This was apparently the first of what were later known as Dairy Factory Managers' Conferences.

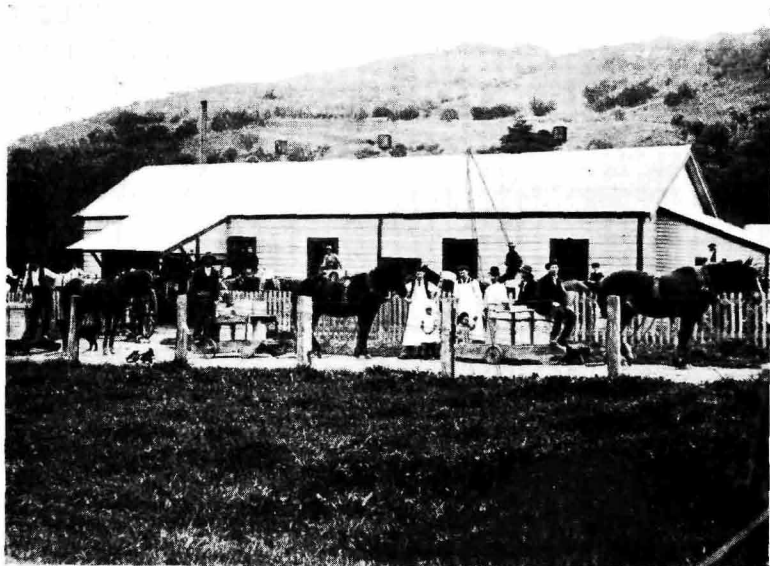
Some idea of the breadth of knowledge and interests required by those early instructors may be gained from the following paragraph: "Took an active part in promoting dairy factory companies, and also delivered lectures on 'Co-operative Dairying as an Economic Factor in the Prosperity of New Zealand Agriculture' and 'The Dairy Industry in its Relation to Agriculture' at thirty places."

The following paragraph from the report of Mr. W. W. Crawford for the same period (1892-93) seems worthy of inclusion because of the historic details which it conveys: "In Canterbury I assisted in the organization of the Canterbury Central Co-operative Dairy Company, specifying and arranging the machinery for their Central factory at Addington, and creameries (skimming-stations) at Oxford, Springston, Doyleston, Halswell, and Marshlands. The Little River settlers have joined this organization, and plans are being prepared by me for large skimming-stations in connection with the Canterbury Central Dairy Company at Little River, Ladbrooks, and Lakeside. I look upon this as the most important dairying organization in New Zealand for the reason that it is purely co-operative. They are providing themselves with freezing machinery and every modern appliance. I have also prepared plans for a large skimming-station for the Tai Tapu Dairy Company at Greenpark."

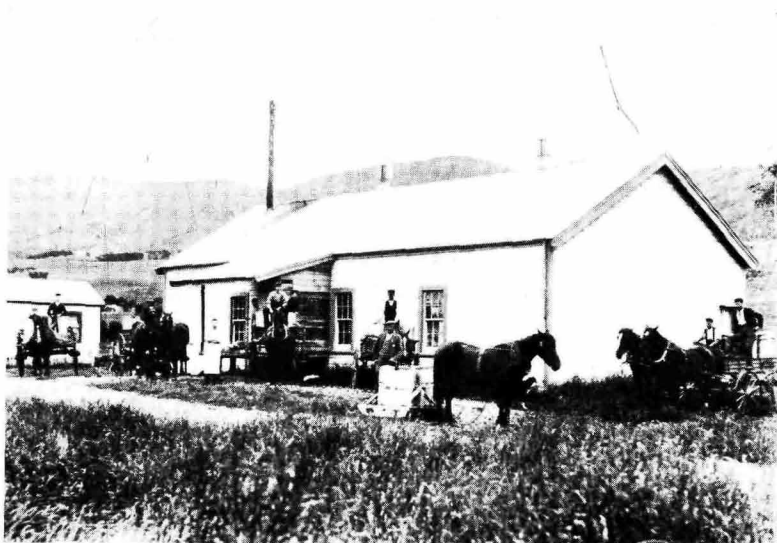
THE CHESTER FACTORIES.

What were known as the Chester factories commenced operations in October, 1892, and were situated on the main road from Woodville to Eketahuna, in the Bush District. This was before the days of the railway in that locality. There were two factories, Ballance and Mangatainoka, and a creamery at Makakahi. The factories were erected by Mr. Herbert Chester, representative for J. W. Dotteridge and Co., provision importers, Tooley Street, London, who provided most of the finance. Mr. Chester had been buying butter, on behalf of the firm, in and around the Pahiataua district. The buildings were planned, and their construction and equipment superintended by Mr. A. H. Wilson, a dairy-factory architect and mechanical engineer from Australia, who designed and supervised the erection of several New Zealand factories, built during the

TWO EARLY BANK'S PENINSULA FACTORIES.



GERMAN BAY (TAKAMATUA).



WAINUI.

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“nineties.” An interesting feature of the three factories mentioned was the attaching of a pipe to the steam-driven water-pump to enable each roof to be flooded when required to reduce the temperature, or in the case of fire. This was an Australian idea, and apparently the first and only instance of its use in New Zealand, though a somewhat similar practice with regard to cooling was followed at several of the early creameries.

The Chester factories were not a financial success and passed under new management after some two or three seasons of operation. Ballance was bought by Mr. F. W. B. Greville, was burned down, and subsequently rebuilt as a co-operative concern. Mangatainoka was taken over by the suppliers on a co-operative basis, and Makakahi later became the Konini Co-operative Dairy Co.

THE GERBER TEST.

A matter of foreign origin but of outstanding interest is that in 1892 Dr. N. Gerber, of Zurich, Switzerland, published details of his method of testing milk and cream for butterfat. The original method was modified in 1895 when it assumed its present form. The Gerber test has never come into prominence in New Zealand, though it is used extensively in Europe and is favoured in many parts of the United States and in Great Britain.

1893.

The Dairy Industry Act, 1892, was strictly enforced during the 1893-94 season, and several convictions secured for neglect properly to brand the produce. A good deal of trouble was experienced with the packing and shipping of produce and reports tell us that while inspecting different shipments Inspectors found “a very large quantity” of damaged and inferior butter, in fact, some of it was almost unfit for human consumption. It is obvious that shipping conditions were far from satisfactory and about this time considerable attention was focused on this phase of the export trade. An important step toward improving the position was the appointment in 1893 of Mr. Samuel Lowe to report on the condition of produce on arrival in London, as well as on the condition of cool chambers on steamers and facilities generally as applied to shipping.

On the 14th October, 1893, Mr. C. R. Valentine was appointed Chief Dairy Expert. Mr. Valentine's principal service to the industry related to assisting in laying the foundation for the system of grading dairy-produce inaugurated a year later. Mr. Sawers continued as a Dairy Expert, while Mr. J. T. Lang was appointed an Assistant Instructor. Mr. Valentine was an Englishman, while Mr. Lang came to New Zealand from Ireland in 1881. He commenced his acquaintance with modern factory dairying at Pukekohe in the cheese and bacon factory there.

The number of dairy factories and creameries given as at work during the 1893-94 season was 178, an increase of 74 over the previous season.

The Department's annual report includes a "Tabulated Statement showing Number of Factories and Creameries and Extent of their Ramifications." This, apparently, was the first time such information was collected. Viewed in comparison with the present-day position the particulars shown in the table on the following page are extremely interesting.

The only comment which appears necessary is that the factories and creameries total 177 and not 178 as previously stated. It can only be assumed that one institution failed to return the desired particulars. Noticeable features are that Otago and Southland dominated the position so far as cheese factories are concerned, while the majority of the butter factories were in Taranaki, and, further, that the creamery system was firmly entrenched in the Auckland Province. Taken by and large, the colony had made a fair start in co-operative dairying.

New factories which commenced operations during the year were: Canterbury Central, opened 20th June; Dairy Union, Palmerston North, 7th November; Sandymount Creamery (Taieri and Peninsula Co.), 13th September; Cheltenham, November; Dannevirke Butter Factory, 24th October; Heretaunga; W. Booth's private butter factory at Carterton; Smith and Anderson's private butter factory at Ormondville; Hurleyville; and Le Bon's Bay Butter Factory, the first on Bank's Peninsula. The first manager of Le Bon's Bay was Mr. W. K. Anderson. Although originally butter, the factory later turned to cheese.

District.	Number of			Approximate Number of Cows milked for Factory and Creamery Supply.	Approximate Annual Output of Cheese, and Value.			Approximate Annual Output of Butter, and Value.			Number of Workmen employed in Factories and Creameries.	
	Factories.		Creameries.		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
	Cheese.	Butter.										
Auckland ..	5	9	21	11,400	lb.	£	lb.	£	lb.	£	s.	d.
Taranaki ..	7	26	5	12,820	1,372,500	11,953	1,713,461	64,254	1,590,961	63,411	15	9
Hawke's Bay ..	4	5	4	3,300	360,000	24,304	432,092	16,225	886,153	16,225	0	9
Wellington ..	6	7	10	6,870	787,500	6,375	51,923	33,230	103,846	33,230	14	9
Nelson ..	..	1	..	300	..	..	..	1,947	..	1,947	2	3
Marlborough ..	..	1	2	600	..	..	..	3,894	..	3,894	4	0
Canterbury ..	4	5	10	6,300	315,000	5,578	969,230	36,346	804,807	36,346	2	6
Otago ..	12	7	8	9,500	2,182,500	38,648	69,230	30,180	..	30,180	5	3
Southland ..	17	1	..	5,900	2,475,000	43,828	..	2,596	..	2,596	2	6
	55	62	60	56,990	8,167,500	144,632	6,722,303	252,086	..	252,086	7	3

During the season Mr. Sawers tested by the Babcock method 3,222 samples of the bulk milk delivered to factories by suppliers. Of these samples 531 tested 4 per cent. or over of butterfat ; 2,644 tested between 3 per cent. and 4 per cent. ; and 47 tested below 3 per cent. Mr. Sawers refers to the growing interest in the Babcock system of gauging the richness of milk and cream, and his report indicates that considerable time was devoted to instruction and education in the use and advantages of this apparatus.

MILKING-MACHINES.

In 1893 Mr. Withell, of Brookside, patented the Brookside patent mechanical milker. The principal was stated to be similar to the Nicholson and Gray patent milking-machine, Murchland's patent milking-machine, and various others, which is evidence that mechanical milkers were by no means a novelty forty years ago. The Brookside milker was officially inspected on the 13th March, 1894, and favourably reported upon. One remark in the report states that "as regards the method by which the milk is abstracted, it is more natural in every respect than hand-milking, as it is similar to that employed by the calf—namely, sucking." Those with experience of the history of milking-machines will know that the present-day machine operates on the principle of suction combined with a squeezing action on the teat somewhat similar to hand-milking.

While the Brookside milker was not the first milking-machine patented by a New-Zealander, it was the first to show possibilities of success. For historic reasons, if for no other, it should perhaps be recorded that on the 5th August, 1890, Mr. Herbert Woodham, school-teacher, Foxton, patented what was described as "a milking syphon for cows." The machine, however, was not a success, for the reason that it was based on a wrong principle, nor is there any evidence to indicate that it was ever placed on the market. Nevertheless, it is entitled to the historic distinction of having been the first mechanical milker patented by a New-Zealander,

A third New Zealand milking-machine invention of early origin was a device designed by Mr. H. J. Cunnington, of Christchurch, who later formed the Cunnington Pulsator Milking Machine Co. The Cunnington "improved pulsator for milking-machines" looked for a while as if it might find favour among

dairymen, but faded out of public interest after a brief existence. The date of the first patent in this connection was the 6th February, 1897. Cunnington and Co. were the manufacturers of Withell's Brookside milker.

For the benefit of those who may wish to make date comparisons, the following brief historic summary may be found useful. As early as 1819 Americans tried to replace hand-milking with other methods, but it was not until 1840 or thereabouts that much was done. Originally milk-syphons or milk-tubes were used, but were soon discarded. Suction machines were first used in America in 1878. Although Sweden and Denmark were experimenting with mechanical milking in the "seventies," Scotland appears to have been the first country to specialize in the milking-machine and to develop the appliance to a successful stage. Early in the "eighties" Scotsmen began to work on milking-machines, the first machine patented in Scotland being that of Murchland, of Kilmarnock, in 1890. Gray and Nicholson, of Stranraer, invented their machine in 1891, the Thistle came out in 1895, the Lawrence-Kennedy about 1905, and the Wallace in 1907. Kennedy was one of the directors of the Thistle Co., while Lawrence was a Glasgow engineer. (Note.—The foregoing particulars have been extracted from the "Transactions of the Highland and Agricultural Society of Scotland," Vol. XXIX, 1917.) Gillies, an Australian, later co-operated with Lawrence and Kennedy, and by his invention of the air-inlet on the teat-cup, considerably improved the efficiency of milking-machines. The Lawrence-Kennedy-Gillies, or L.K.G., is now a familiar make of milking-machine.

NEW ZEALAND FARMERS' DAIRY UNION, LTD.

This organization, established in 1893, with headquarters at Palmerston North, was at one time one of the largest concerns of its kind in New Zealand, its operations embodying two butter factories and thirty-six skimming-stations. The first manager of the Dairy Union was Mr. W. J. Birch, founder of the Taieri and Peninsula Milk Supply Co., Dunedin, and later superintendent of the Crown Dairy Co., Taranaki.

AMBURY, ENGLISH, AND CO., AUCKLAND.

This company was formed in 1893, although Mr. J. Ambury had laid the foundations of a dairying interest as far back as 1887 by building a butter factory at Mangere. By 1901 Messrs. Ambury, English, and Co. had very wide interests, owning two mair factories and twelve skimming-stations scattered well into the Waikato on the south side of Auckland and as far as Kaukapakapa in the north. In addition, the company owned a large number of dairy-farms. Later the skimming-stations south of Auckland were sold to the New Zealand Dairy Association, although the factory at Auckland was for a number of years supplied with home-separated cream from farms owned by the company. By 1913 Messrs. Ambury, English, and Co. had closed most of the North Auckland skimming-stations, but continued a butter factory and the milk-treating factory in Auckland, which now trades under the name of Ambury's Limited, this firm having a large city milk-supply business.

Mr. John Sawers' report for the 1893-94 season includes the following paragraph :—

“ The efforts of Messrs. G. G. Stead and M. Murphy, of Christchurch, Mr. Henry Reynolds, of Auckland, and others who in their respective districts recognized the great importance of dairy-farming, and assisted to their utmost in its development, call for the highest eulogy. These gentlemen have worked hard and zealously in the desire to promote the industry in the face of unavoidable opposition. They have earnestly and sincerely tried to benefit an industry which is of supreme importance to a large and increasing section of our farming community.”

This is high praise, and records prove it to be richly deserved.

1894.

The year 1894 witnessed the passing of the second Dairy Industry Act, which wholly repealed the Act of 1892. The 1894 Act marked a true starting-point of dairying progress in New Zealand, for it included such vitally important legislation as that bearing on the

introduction of the grading-system, the establishment of cool stores, the appointment of dairy-produce graders, the payment for milk according to its productive character, and also for the registration of dairy factories and the use of the registered number in the brand. This Act provided for a continuance of the powers of inspection conferred by the 1892 Act, and dairy factories were inspected for certificates entitling them to use certain marks, and these certificates could be suspended on the report of an Inspector that the dairy was not kept or the produce not manufactured to his satisfaction. The Dairy Industry Act, 1894, was indeed comprehensive but its general aim, which, in fact, has been the general aim of the legislation of the dairy industry since the first Act in 1892, has been to ensure the manufacture of dairy products in reasonably good surroundings from pure milk or cream ; to provide for efficient packages and honest branding and grading ; and to safeguard the buyer and consumer to the extent that when purchasing New Zealand dairy products he will receive foods which are not adulterated and which comply with the legal requirements of the importing countries and more particularly with those of the United Kingdom.

The first four cool stores were those at Auckland, Wellington, Lyttelton, and Port Chalmers, the officers appointed to carry out the grading being Messrs. Büsck, Thornton, McWilliam, and Lang, respectively. The Act was passed late in October, 1894, and the first graded produce to be exported was a shipment of butter which left these shores on the 13th December of the same year. The marking of cheese according to grade was not commenced until the 1899-1900 season.

Mr. C. R. Valentine resigned at the close of the 1893-94 dairying season his place being filled by Mr. J. B. MacEwan, whose appointment dated from the 22nd November, 1894. He was appointed to the position of Chief Dairy Expert as from the 1st May, 1895, and designated Dairy Commissioner. Mr. MacEwan was a Canadian, and prior to coming to New Zealand had been a Dairy Instructor in the service of the Canadian Government under the leadership of Professor Robertson, Dominion Dairy Commissioner. Mr. MacEwan resigned in October, 1896, to enter the merchandising side of the dairy business.

Two other Dairy Instructors in the persons of Mr. S. M. Robbins and Mr. B. Wayte were appointed in 1894. Mr. Robbins was an American and came from the far-famed Mohawk Valley in Central New York State. He had farm and factory experience in cheddar-cheese making (curd cheddared on the pan—*i.e.*, in the cheese-making vat without racks), and was also several years in charge of the large experimental factory owned by Messrs. Burrell and Whitman, afterwards D. H. Burrell and Co., whose name is known throughout the dairying world as makers of dairy machinery and appliances. After he had spent several years with the firm, they, in 1885, were asked by the Wyndham Dairy Co., to whom they were shipping machinery and plant, to select a manager. Mr. Robbins was selected, and arrived in Wyndham in October, 1885. The next season he took the management of the Gore cheese factory, which position he held until his appointment to the Government service. During his brief stay of one season with the Department he planned a number of dairy factories, and many of the most successful southern factories were built on plans and fitted with appliances furnished by him. He acted as agent for Messrs. Burrell and Co., and consequently these factories were equipped with American machinery manufactured by this firm. Mr. Robbins also devoted a great deal of attention to butter-boxes and cheese-crates.

Mr. Benjamin Wayte was born in Warwickshire, England, and obtained his early training with the Cheshire Dairy Institute, having gained experience in both butter and cheese. He came to New Zealand in 1887 and with his brother formed the Otama Bridge factory at Otamita, Southland. He returned to England in 1892, and during his stay spent some time at the British Farmers' Institute in Aylesbury, Buckinghamshire, where he won the diploma and silver medal of that Institute in 1893. He studied milk analysis under F. J. Lloyd, F.C.S., F.I.C., one of the best-known dairy chemists of his day, and writer of, among other things, a standard work on cheesemaking. Mr. Wayte returned to New Zealand in 1893, and, as stated, was appointed to the dairy staff of the Department of Agriculture in 1894. He later took charge of the milk-testing departments at the dairy schools.

A good idea of the general dairying situation during the 1894-95 season may be obtained from the following paragraph, which has been extracted from the 1895 annual report of the Department of Agriculture :—

“ The past season cannot be said to have been a profitable one in any sense of the term. The prices received for both butter and cheese have been much lower than anything previously experienced. This fall is due to several causes, amongst them being the continued strikes and general depression at Home, the greater activity of the Danes in forcing their produce on the market, and the very large increase in the exports from other countries. The Canadian Government undertook to guarantee a return equal to 10d. per pound on butter to the shipper, and as this price was several pence per pound above the quotations ruling in London, it follows a very large sum must have been paid to make up the deficiency. Therefore the experiment is not likely to be repeated. The industry is making steady progress, and by latest returns we have 218 factories and creameries at work, or an increase of 40 for the year.”

Mr. John Sawers, in his report, comments that “ substantial progress has been made, and settlers have shown great faith in the industry, despite the fact that prices of butter and cheese have ruled extremely low.”

The Babcock test was gaining ground, although, as might be expected, there were many complaints concerning the results of the test, and much bitter controversy and scepticism as to whether the butterfat-test was an accurate basis for assessing the value of milk.

Graders reported that, despite the short time the grading system had been in operation, a decided improvement in quality was noticeable. One report refers to the export of six boxes of roll butter to Rio de Janiero.

The only reference that appears necessary regarding new factories is that in 1894 the first Bay of Plenty creamery commenced operations at Tauranga, and that German Bay (now known as Takamatua), and Wainui, the second and third factories on Bank's Peninsula, commenced operations. The first manager of Takamatua was Mr. J. Adamson, while the late Andrew Cunningham was first manager of the Wainui cheese factory.

CORPE AND WARNE.

These were pioneer dairy-factory proprietors in the Fielding district and probably started their factories between 1885 and 1890. Mr. W. W. Corpe owned butter factories at Makino, Halcombe, and Campbelltown (the old name for Rongotea), while Mr. C. Warne ran a cheese factory on the Pohangina Road. It has not been possible to discover the exact date of establishment of these factories nor the exact date of cessation of operations as proprietary concerns. It should be stated that an early official report (1884) refers to a butter factory at Makino as being expected to commence operations in 1885. In all probability this was Mr. Corpe's factory, though it has been impossible to obtain authentic information on the subject. Mr. Corpe was a sawmiller and started his butter factory at Campbelltown (Rongotea) in 1890 by buying milk from the neighbouring farmers. The factory is said to have been little more than a shed, and inquiries indicate that no trace of it remains.

REGISTRATION OF FACTORIES.

A point which should be mentioned in this connection is that when, under the 1894 Act, the registration of dairy factories was introduced, the names of factories then operating were apparently arranged in alphabetical order and numbers allotted in that order. From time to time the factory register has been purged and numbers originally given to factories which have gone out of existence reallocated to later established concerns. In other words, the registered numbers do not indicate and never have indicated the order of establishment of the factories.

NORTH ISLAND DAIRY ASSOCIATION.

Following upon the successful initiation of a dairy association in the South Island in 1890, Mr. John Sawers, in 1894, was instrumental in having a similar organization established in the North Island. The preliminary meeting was held at Hawera on 1st June, 1894, and the North Island Dairymen's Association of New Zealand, as it was originally called, was launched. This later developed into the National Dairy Association, the history of which is told in the second section of this volume.

DUNEDIN WINTER SHOW.

The year 1894 marked the inauguration, at Dunedin, and under the auspices of the Otago Agricultural and Pastoral Society of New Zealand's first Winter Show, an outstanding feature of which was the prominence given to the display of competitive cheese and butter exhibits. This fixture became an annual event, and its increasing popularity was influential in bringing similar shows into being throughout the colony.

1895.

In 1895 the Government conducted dairy schools at Edendale in the South Island and Stratford in the North. These were short courses held for approximately one month, in the winter-time, and included lectures and demonstrations in all branches of dairy-factory practice. The officer in charge was Mr. J. B. MacEwan. At the Stratford school the combined churn and butter-worker, a Disbrow, first introduced by Messrs. J. and R. Cuddie at Mosgiel in 1891, was demonstrated. It was many years before the combined churn and butter-worker came into general use, the main point which justified its introduction being that, in conjunction with refrigeration, it enables the moisture content of butter to be regulated and increased. This also necessitated the checking of results, and the practice of testing each churning for moisture was introduced. A special feature of the school at Stratford was the setting-up and demonstrating of a Hall refrigerating machine. At Edendale there were 105 students and at Stratford 107. The Edendale school was in operation from the 19th June to the 18th July and Stratford from the 1st to 31st of August.

It was also in 1895 that iced trucks were provided on the Taranaki-Wellington railway-line for conveying butter consigned from Taranaki to Wellington for export to Britain.

Two more Bank's Peninsula dairy factories commenced operations during this year—namely, Okain's Bay and Barry's Bay—the first manager of Okain's Bay being a Mr. Tattersall, while Mr. W. K. Henderson, previously of Le Bon's Bay, was first manager of Barry's Bay.

The position regarding grading of dairy-produce is summed up in the 1895-96 annual report as follows: "The grading of butter in the cool store has been carefully carried out and is meeting with universal praise. A large proportion of the butter is now purchased subject to Government grade. The cost of freezing all butter exported to London was, as last season, borne by the Government. The bulk of the cheese was examined at the wharf, and a copy of the grader's report sent to each factory. It is satisfactory to know that the grading is now recognized and taken advantage of by purchasers. The Victorian and New South Wales Governments are arranging to carry out a similar system."

Climatically, the season was not a normal one. The winter of 1895 was very severe and was followed by a drought, these conditions having a serious effect on the milk-supply. The export of butter was about 300 tons and of cheese about 400 tons less than in the previous year. There was, however, a decided improvement in the quality of both butter and cheese.

With regard to the official staff, Mr. C. W. Sorensen was re-appointed on the 14th October, 1895; Mr. J. T. Lang resigned and Mr. H. R. McWilliam took his place. Mr. John Sawers also severed his connection with the Department.

An Act to regulate the manufacture and sale of margarine was passed in October, 1895. This Act made it illegal (1) to mix, colour, stain, or powder margarine with any ingredient or material so as to imitate butter, (2) to mix margarine with butter, butter-fat, or milk, (3) to manufacture, sell, or offer for sale as butter any margarine or other substance which contains, or with which is mixed, any animal fats, or animal, mineral, or vegetable oils.

The production of margarine has never been encouraged as far as quality for table use is concerned. All classes of people in New Zealand appreciate and use high-quality butter. Even during the war period a suggestion to introduce table margarine was objected to by the New Zealand workers generally, and the proposal was dropped.

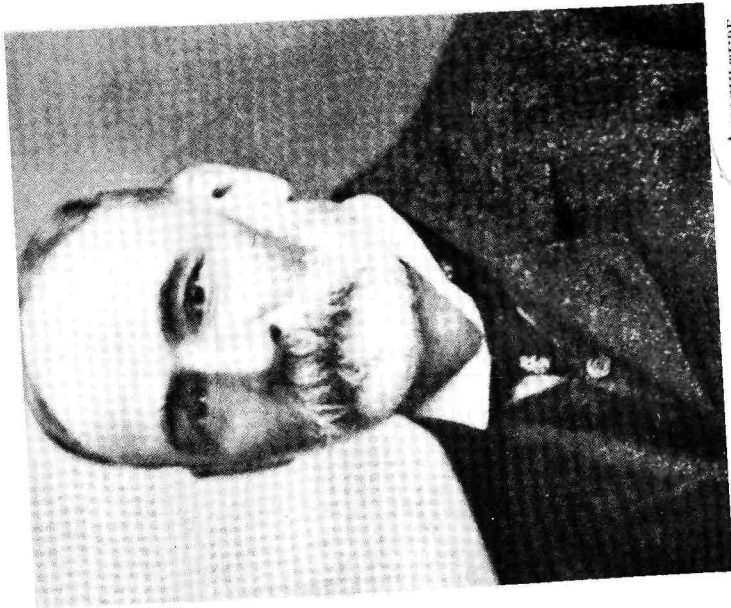
THE NORTH OTAGO DAIRY CO.

This fairly large co-operative concern had its origin in the Pukeuri Co-operative Dairy Co. (which started operations at Pukeuri Junction in 1895), and in 1899 absorbed the Awamoko



J. B. MAC EWAN, DAIRY COMMISSIONER (1895-1896).

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J. D. RITCHIE, FIRST SECRETARY FOR AGRICULTURE
(1892-1909).

Dairy Co., Georgetown, and the Enfield Proprietary Dairy Co., Enfield, and in 1900 established a central factory at Oamaru. The company opened skimming-stations at Duntroon, Kurow, Red-cliffs, Waituna, Kapua, Studholme Junction, Morven, Windsor, Ngapara, and Awamoa. Mr. W. T. Guild was first manager of the company. In 1904 the North Otago Dairy Co. amalgamated with the Taieri and Peninsula Milk Supply Co., for which it is still a branch.

An interesting feature of the North Otago Co.'s operations was that the cream was pasteurized in the creameries after separation, while on receipt at the central factory it was repasteurized.

SUMMARY.

This brings us to the end of 1895 and to the close of what was termed in the introduction to this volume the period of establishment of an export trade in dairy-produce—1882 to 1895. As will be apparent from what has been written up to the present, a great deal had already been achieved under Government assistance and encouragement. Co-operation was the keynote of the whole service. The Government was decidedly sympathetic towards the industry in all its branches and was generous in its support, having devoted considerable sums of money indirectly by way of service and directly by special grants and freezing charges. A good foundation for a grading and instruction service had been laid, while the producers as well as the overseas consumers were well protected by sound and common-sense legislation. In addition to the services in New Zealand, the beginning of a linking up with the Home market had been established by way of the appointment of agents to study the market requirements and report on storage and shipping conditions with the object of bringing about improvements where necessary. The young industry in the "eighties" had an uphill fight. Experience was lacking and had to be dearly bought; carriage and shipment were unsatisfactory. This general handicap, however, was not without its useful side; it taught the producers and shippers the importance of thoroughness in all departments of the industry. At this critical stage the New Zealand Government gave serious attention to the industry, and appointed its first expert Instructor. The producers, for their part, responded by improved organization

for the manufacture of their produce, and in matters of shipping and freight. In the meantime the science and practice of mechanical transport refrigeration had also been steadily advancing. By the middle "nineties," the close of the period under review, the co-operative movement was coming into full swing, and the decade was also notable for the establishment of the Government grading system and the extension of practical instruction.

In view of the shortage of available experts the industry was singularly fortunate in the type of men who filled the post of Instructors and Graders. The position was made the more difficult by the fact that it was almost impossible to retain capable men on the Government staff because of the plentiful and attractive openings on the production and marketing side of the industry.

The chief development of the industry, after the foundation factories already mentioned had been established, took place in the "bush" districts, the dairy-farms for the most part being converted from heavy forest. The bush districts, with a generous rainfall and lush growth of grass among the stumps and logs of the clearings, consisted of cattle rather than sheep country. They were also the home of the small settler, and so provided a good foundation for the new industry. Broadly speaking, it was only after the successful development of the industry that the more agricultural districts came into the movement at all largely. By dairy industry is, of course, meant modern dairying on factory lines. Before the advent of that system the bush settlers, as pointed out elsewhere, made a certain amount of butter of a sort in the rough farm dairies, but in the flush of the season they were glad to get 6d. a pound for it, and often had to take considerably less for what they could not salt down. Even this had frequently to be "taken out" in stores. Seldom was there a more radical change than that from the beginning to the close of the period 1882-1895.

Among the difficulties which confronted the promoters of the early co-operative dairy companies were, first, the raising of the necessary capital to build and equip the factories, and, second, the provision of payments for milk received. In most instances the business people of a district came to the assistance of those who were actually suppliers and subscribed capital as "dry shareholders," and when the finances of the company permitted interest was paid on the capital of the company.

The early shipments of produce were usually made through established business firms, but it was largely due to this difficulty of finance that many of the early co-operatives did not survive and the businesses were taken over by proprietary interests.

At a later stage the London importers came into the business and provided the necessary finance to equip the factories and advanced money against shipments of produce, a practice which was carried on up till the time when the Government became the purchaser of the butter and cheese under the guaranteed price scheme (1936).

The assurance that advances would be available on the finished produce had the effect of inducing the banks to provide the capital necessary for the establishment of new dairy factories on the security of the subscribed capital, the buildings erected, and either a "joint and several" agreement or on promissory notes signed by each shareholder. As payments were not made till the 20th of the month following delivery of the milk, by which time the butter or cheese manufactured from it had usually been shipped and the advances received from the London merchant, the difficulties of the early promoters disappeared.

CHAPTER IV (1896—1913).

STEADY EXPANSION OF THE INDUSTRY.

Dairy instruction and grading (*continued*)—Pasteurization—Home separation—Dairy Commissioner—Dairy Division formed—Dairy Industry Act, 1898—Breeder's Associations established—Dairy Industry Extension Act, 1903—Butter Export Act, 1907—Acidimeter—Overrun experiments—Herd-testing inaugurated—Cream-grading—Check-testing of milk—Payment of milk for cheesemaking—Casein—Soft and fancy cheese—Tests for moisture in butter—Farm dairy instruction—Summary.

1896.

THIS year marks the beginning of a period of steady expansion which continued until the outbreak of the Great War. Despite several temporary setbacks and years of difficulties and problems, regarded in its entirety it would have to be considered a fairly smooth-running period.

The close of 1895 found Mr. J. B. MacEwan in charge of the dairying service and a system of grading and instruction working comparatively satisfactorily. Mr. John Sawers had resigned. In October, 1896, Mr. MacEwan also severed his connection with the Department, and after doing so visited Canada, Great Britain, and the Continent of Europe for the purpose of studying the marketing aspect of the industry. He later returned to New Zealand in the capacity of representative of a Home firm of dairy-produce merchants. Earlier in the season, in response to an invitation from the Victorian Government, Mr. MacEwan paid a visit to Victoria with the object of demonstrating the Canadian system of Cheddar cheesemaking, and otherwise conferring with their Department of Agriculture.

After the departure of Mr. MacEwan the work proceeded under the guidance of Messrs. C. W. Sorensen and James Sawers (brother of John Sawers) as Instructors, with Messrs. J. T. Lang, B. Wayte, A. A. Thornton, and R. W. D. Robertson as Graders of Dairy-produce, Mr. Robertson having been appointed during the year. It was in 1896 that New Plymouth was gazetted a grading-port for dairy-produce. Dairy schools were held during the winter of 1896 at Edendale and Waverley, opening on the 15th June and 23rd July respectively, and, as in the former year, continuing for approximately one month at each centre. There were sixty-three pupils at Edendale and fifty-nine at Waverley.

The grading of butter continued smoothly, and cheese was examined as far as possible when passing from railway-truck or other conveyance to the ship, although this did not permit of a close inspection.

In February, 1896, Mr. Henry Gray was appointed by the Agent-General to examine and report upon the condition of New Zealand produce on arrival in London. Later in the year he submitted a very full report which indicated that conditions pertaining to the carriage and storage of dairy-produce were far from satisfactory.

In June, 1896, Messrs. Clay, Stoker, and Jones, delegates from the Manchester Co-operative Wholesale Association, visited the colony, and advantage was taken of every opportunity to place them in possession of information in connection with the meat and dairy-produce industries. They visited many of the dairy factories and freezing-works, and at several left sample orders for butter, cheese, and preserved meats. This would appear to mark the entry into New Zealand of the now well-known C.W.S. organization.

It was also in 1896 that Mr. Benjamin Wayte, Dairy Instructor and Grader, carried out some cow-testing experiments on a farm in the Waikato. These were the first experiments of their kind in New Zealand and, as will be noted from the special chapter on this subject, predated the establishment of the movement by some thirteen years.

The main points of controversy about this time were containers for butter and cheese, and pasteurization. Every officer in his report for 1896 pointed to the need for improved butter boxes and cheese-crates and to the necessity for concentrating on this matter. The Babcock test was still a bone of contention the principal trouble being caused through the widespread belief among suppliers that they were being cheated by the factory managers. For a while it looked as if the situation could only be successfully met by the appointment of independent officers to carry out the factory testing. However, this was merely the melting-pot through which all reforms are liable to pass, and tact and judgment ultimately won the day.

Pasteurization had been widely discussed for two or three seasons before any factory put the process into operation. During the 1896-97 season the Waverley dairy factory adopted the process of pasteurization of milk as a part of the regular routine, and was the first factory in New Zealand to do so.

INSPECTION OF MILKING-SHEDS.

In 1896 two officers were appointed to the Department of Agriculture as Inspectors of Dairies. There had been strong criticism of the type and sanitary condition of milking-sheds and these were the first of a number of officers engaged in carrying out instruction and inspection in this very important phase of the industry. Mr. August Büsch was in charge of this work.

HUMANIZED MILK.

An item of more general interest is that in this year, 1896 humanized milk was patented by Dr. Backhaus, of Germany.

"THE NEW ZEALAND DAIRYMAN."

This, New Zealand's oldest dairying journal, issued its first number in October, 1896. The *Dairyman* was founded by Mr. John Sawers, who for several years prior to its establishment stressed the need for such a publication as a medium for the discussion of dairying problems and for the dissemination of information regarding the industry. The promoter's ideal was fully realized, for

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: the *Dairyman*

earned the respect of the dairying public and has continued to operate successfully as a comprehensive and fair-minded advocate for all branches of the business, including the dairy-factory manager. In his venture Mr. Sawers had the able association of Mr. F. W. B. Greville and Mr. C. E. Cuming. Mr. Cuming was later editor of the *Journal* of the Department of Agriculture for some years, and subsequently founded the *Dairy Farmer*, afterwards incorporated in the *Exporter*.

In 1899 Mr. Greville took the editorial chair of the *Dairyman*, and in 1902 became proprietor as well as editor, a position which he filled with distinction until his death in 1923. The present managing-editor of the paper is Mr. W. G. K. Wright.

1897.

The year 1897 is notable for the introduction, by Messrs. Finn, Chisholm, and Co., Cornhill Street, Wellington, of the home separation of cream—that is to say, the separation of the milk on the farm by means of a separator, and the delivery to the factory of the cream only, rather than the large bulk of whole milk. This subject of home-separation is so comprehensive and the system played so important a part in the making of our dairy industry that a special chapter has been devoted to it later. All that need be said here is that it would be truer to say that 1897 marked the origin rather than the introduction of the system in New Zealand, as it was not until some ten years later that the practice began to develop.

In this year the instructional work of the Department was continued by Mr. C. W. Sorensen, as Chief Dairy Instructor, and Mr. James Sawers, as his assistant, while the grading was in the hands of Messrs. J. T. Lang, A. A. Thornton, R. W. D. Robertson, T. Marshall, and A. Büsck, Mr. Marshall having been appointed and Mr. Büsck reappointed during the season.

It was also in 1897 that the Department conducted experiments at Waverley in connection with the pasteurization of cream. Separator trials were also arranged, but only one firm consented to enter, so that the Government was unable to determine the merits and demerits of the different makes of separators on the market and thereby answer a question they were frequently being asked.

These seem to be the principal items relating to 1897, it being a year of somewhat scant historic interest with regard to initial events. From the point of view of a general summing-up, prices for butter were reported to be uniformly good but low for cheese. A considerable quantity of butter was shipped to Australia at good prices. The Department's report points out that Victoria was our principal Australian competitor, and her exports had fallen off steadily during the previous three years, and that it was largely due to Victoria's misfortunes that New Zealand owed the satisfactory butter prices for her autumn make during that period. The report continues: "Without the Australian demand we should have found it hard indeed to dispose of our March and April butter at anything like a profitable figure. The shortage from Victoria has also favourably influenced the Home markets, causing the colonial season to finish up far more satisfactorily than was at one time anticipated."

Regarding cheese, the report states that "the cheese market during the past season has been very depressed, chiefly owing to heavy production in Canada and the United States. New South Wales and Queensland have taken a fair quantity of loaf cheese at fair prices."

The spread of co-operation is referred to and the following well-deserved tribute paid to the proprietary interests: "While admitting the force of the co-operative movement, and recognizing the soundness of principle underlying it, one should not forget that the industry owes much to the enterprise of the factory-proprietors. When so-called co-operation had started the factory system, and brought it to a standstill through bad management, it was the syndicator who stepped in, bought up the discredited factories and built new ones, offered the public a fair price for their milk, and put the industry on a sound financial basis." This may be claiming a little too much, nevertheless one can scarcely overestimate the courage with which those earlier proprietors staked their scanty capital against a very doubtful return, well aware of the labour and worry and risk involved. Those pioneers were nearly always between two stools. They contracted for supply at so much a gallon of milk, and it was necessary to make their offer before the season commenced. If the market prices turned out lower than anticipated, the proprietor often lost money.

If, on the other hand, the rate paid to the suppliers gave him a more favourable return than he allowed for, he was classed as a profiteer and thereby incurred the displeasure of his clients. Surely an unenviable position.

1898.

The outstanding items of 1898 were the appointment of Mr. J. A. Ruddick as Dairy Commissioner, and the passing of the third Dairy Industry Act. This was also the year in which the Dairy Division was first classified as a separate branch of the Department of Agriculture. Mr. Ruddick, like Mr. J. B. MacEwan, was a Canadian, and although yet a young man was even then a well-known figure in the dairying world. He only remained in New Zealand a year, but during that short time accomplished much in the direction of placing both the administrative and manufacturing side of the industry on a better footing than hitherto.

The principal provisions of the 1898 Act related to monetary advances to dairy companies by the Government for the purchase of land for dairy-factory sites and for the erection of buildings and purchase of suitable plant. This portion of the Act was not popular with dairy companies, who could obtain suitable finance from banks more expeditiously and with fewer restrictions, and the Government lost money on some of the few occasions when loans were advanced under the special provisions of the 1898 Act. The powers of the Department were considerably enlarged inasmuch as the Act made provision for the power whereby the control of the local milk-supply might be removed from the local authority and placed in the hands of the Department.

With regard to Dairy Division Staff, Mr. C. W. Sorenson resigned during the year, while a new appointment was made in the person of Mr. J. Johnston, Dairy-produce Grader, who prior to his appointment was manager of the Waverley Dairy Factory.

Prior to 1898 only dairy-produce intended for shipment to the United Kingdom was graded. Australian buyers had been asking for two seasons that produce shipped there should bear the Government grade-mark. Commencing with the 1898-99 season, the grading was extended to all butter and cheese shipped to the

Australian colonies. As little or none of this butter was frozen, special stores were set aside where the produce had to be sent twenty-four hours prior to the departure of the steamer, so as to give the grader time to examine and grade. The grading of the produce for Australia was undertaken at the urgent request of the shippers, as the conditions of purchase required it to be passed by a Government officer. The report on the subject concludes with the statement that "the value of the grading is now fully recognized by both sellers and buyers."

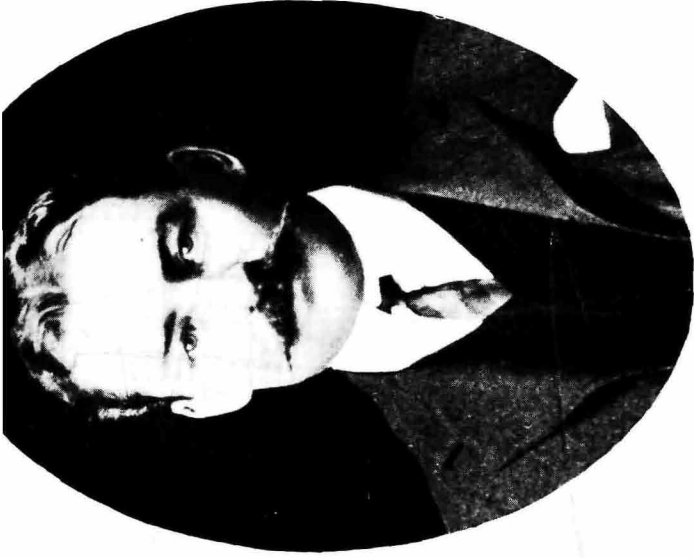
The principal problems of the year related to shipping facilities and containers for butter and cheese—that is to say, butter-boxes and cheese-crates. Both matters were receiving close attention. Regarding shipping, the good influence of the dairy associations is revealed by a paragraph which appears in the Department's report for 1898-99. The paragraph reads:—

"The facilities for shipping were better, but there is still room for improvement. An agreement has been entered into by the National Dairy Association with the New Zealand Shipping Company and the Shaw, Savill, and Albion Shipping Company for a fortnightly service. If this is satisfactorily carried out, shippers will have reason to be grateful."

An innovation connected with the grading system was the date-stamping of butter to indicate the date of manufacture. This procedure was commenced with the 1898-99 season. Concerning the matter, the departmental report states: "The date-stamp, also introduced at the close of the past season, proved of great service in identifying parcels of butter on which reports were required after passing through the hands of several vendors. This system also acted as a safeguard to the reputation of our grade-marks, and gave a clear statement of the length of time butter had been stored." It was not long, however, before this practice was dropped as the result of protests by British importers, although it was continued for a few years with respect to butter reserved for local consumption in the off-season. Date-markings by cypher subsequently took its place (1908).



J. A. RUDBECK, DAIRY COMMISSIONER (1898-1900).



J. A. KINSELLA, DAIRY COMMISSIONER (1900-1905).

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1899.

In 1899 Mr. J. A. Kinsella, another Canadian, was appointed to the position of Dairy Instructor. He was originally engaged to assist in establishing and subsequently to conduct a permanent dairy school. About that time there was a strong agitation for such an institution, and much controversy as to where the school should be located, and what form it should take. The end of it was that agreement could not be reached, and the project was dropped, but not before preliminary plans of the building had been prepared, and the offer of a gift of land at Palmerston North accepted from the Manawatu and West Coast Agricultural and Pastoral Association.

Another new appointment was that of Mr. E. Townshend as Dairy Instructor and Grader, with Auckland as headquarters.

The voluntary checking for accuracy of milk and cream testing glassware and thermometers was introduced in 1899, this work being in the hands of Mr. B. C. Aston, the Department's Chemist.

In perusing the annual reports of officers of the Dairy Division it is noticeable that these were beginning to develop into more or less routine statements of the year's work, signifying that the departmental organization was operating more smoothly, and that the more serious problems regarding administration had been overcome. There apparently was still some criticism of milk-testing at dairy factories, but it is stated that careful observations failed to show much ground for it. The position, however, was being met by the introduction of the glassware-testing service, already mentioned, and by provision for an officer of the Division to be at liberty to visit any factory asking for his services, for the purpose of inspecting the milk-testing appliances, giving instruction where necessary, and ascertaining if proper methods were employed in making the test. Ever since the introduction of the system of payment for milk and cream on the basis of the butterfat-test there had been considerable dissatisfaction among dairy-factory suppliers and acrimonious criticism of the work of factory testing, many suppliers holding the opinion that they were being cheated of their just reward. The system of inspection inaugurated by the Division and carried out by Mr. R. W. D. Robertson did much to correct this impression as well as to put the work of factory testing on a better footing.

Mr. Ruddick has some interesting comments to make regarding pasteurization of cream for buttermaking. He states that he is in favour of the system, but states "the dairying service has not, during the past year and a half, advocated the adoption of the system, because it was realized that the majority of the factories were not in a position to carry it out properly. It requires perfect control of temperature in the cream, and a thorough knowledge of the principles of cream-ripening on the part of the butter-maker, in order to handle it successfully. The Department is able now to lend assistance to any factory desiring to introduce pasteurization, by sending an Instructor to help put the system in working order."

1900.

In 1900 Mr. Kinsella was appointed Dairy Commissioner in place of Mr. Ruddick, who had relinquished his post and returned to Canada. Messrs. Robertson and Lang also resigned. In the same year Mr. D. Cuddie joined the staff, and later, as Dairy Commissioner, became an outstanding personality in the industry. Mr. D. J. McGowan, late manager of the Inglewood factory, was also appointed a Grader and Instructor. Mr. D. Dickie was also appointed in 1900.

In this year the winter short-course dairy schools were revived and classes were held at the Wyndham Dairy Factory in the South Island and at the Moa Farmers' Dairy Factory, Inglewood, in the North Island, the former from the 4th to 25th July and the latter from the 21st August to the 13th September, 1900. There were forty-four students enrolled at each class.

A complete system of grading, similar to that followed with butter, was applied to cheese as from the 1st October, 1900. Prior to this date cheese was not stamped according to grade, although an official examination was carried out, and the manufacturer supplied with a copy of the grader's report. The graders were called together in conference three times during the year for purposes of uniformity in grading standards.

During the year 126 new factory registrations were effected. The factory register was purged and brought up to date. Regarding this matter, the Dairy Commissioner reports that "in all, 300 registered numbers have been cancelled, leaving 899 effective

registrations, for which certificates have been issued. This total is made up of 178 creameries (*i.e.*, butter factories, exclusive of skimming-stations), 88 cheese factories, 442 private dairies (365 butter, 77 cheese), and 191 packing-houses."

INVERCARGILL DAIRY SUPPLY CO.

This organization was established in 1900, and by 1904 its operations covered eleven skimming-stations in addition to the central butter factory at Invercargill. The company ceased operations in 1906. Mr. G. C. Tohill was the founder of the concern.

Further pasteurizing experiments were carried out at Waverley with ripened and unripened cream.

And so we reach the close of the century, and in reviewing statistics find that our export trade had already assumed important dimensions and was climbing steadily year by year. Customs returns indicate that for the year ending 31st March, 1900, New Zealand exported 161,792 cwt. of butter and 98,001 cwt. of cheese, representing a total value of £901,959.

1901.

On account of the tempting prices offered for butter and the dullness of the cheese market at the beginning of the season, a number of cheese factories directed their attention to butter-making, which resulted in a falling off in our cheese exports. Throughout the whole season prices were more than maintained, owing to the continued drought in Australia and the increased demand for both butter and cheese in South Africa.

During the year a large quantity of New Zealand butter was purchased by Melbourne and Sydney merchants for transshipment to South Africa. The trade had grown so important that Mr. Kinsella, the Dairy Commissioner, was sent to Australia to make full inquiries concerning the position.

DRIED MILK.

It was also in 1901 that Messrs. Joseph Nathan and Co., Ltd., entered the dried-milk business by commencing the manufacture of milk-powder in a small way in their butter factory at Makino

a concern which they had taken over from Mr. W. W. Corpe, previously mentioned in these pages. Later, Messrs. Nathan and Co. built a large factory for the manufacture of this product at Bunnythorpe. One of the most prominent personalities in the development of the dried-milk business was Mr. H. E. Pacey, who has been associated with the New Zealand dairy industry since 1888, when he joined the New Zealand Dairy Association as office boy. He retired as managing director in 1919, to join the board of Nathan and Co., with which firm Mr. Pacey is still on active service.

MESSRS. JOSEPH NATHAN AND CO., LTD.

It may be appropriate here to make reference to an old established firm which merits tribute for many useful and important services rendered in connection with the upbuilding and carrying-on of the dairy industry. In particular the late Mr. David Nathan deserves mention. He was an enthusiastic advocate of dairying, a man of sound judgment and bold in commercial enterprise. He was the prime mover in the establishment of the Dairy Union (1893) and of casein-manufacture at Rapanui, near Wanganui, in 1911. He also founded the dried-milk industry here, though Mr. Fred. Nathan did most of the organizing work when the dried-milk boom came during the period of the Great War. The firm of Messrs. Joseph Nathan and Co. promoted and financed many dairy companies, both proprietary and co-operative, during difficult years for those in need of financial assistance. Messrs. Nathan's founded the Defiance Dairy Co. with a factory in Wellington City and another at Makino, the latter eventually being taken over by the Cheltenham Co-operative Dairy Co., becoming the headquarters of this concern. As buttermakers Nathan's were amongst the most efficient, while Mr. Fred. Nathan was an ardent and influential supporter of the farm-dairy-instruction system. The firm commenced the purchase of home-separation cream as far back as 1903, when the system was still regarded most unfavourably by the great majority of butter-manufacturers. No other firm outdid Nathan's in forceful enterprise with respect to straight-out purchase of outputs, nor in efforts to secure the popularity of our products on the British and overseas markets generally. Their London agents, Trengrouse and

Nathan, were, amongst other things, the first to pat New Zealand butter at Home and sell it under the maker's brand. They were also the first to mature New Zealand cheese in London in order to try to secure a share for New Zealand of the trade in matured cheese.

THE WAIKATO.

The year 1901 marked the commencement of rapid dairying development in the Waikato. A very great interest was being manifested in the industry in the Auckland district, and several new factories were erected.

GENERAL.

It was in 1901 that the Division began to pay closer attention to the moisture content of butter, and a number of tests were carried out in Taranaki by Mr. B. C. Aston, Chief Chemist to the Department. Another item of interest pertaining to the year 1901 is that the Government offered a bonus to a total of £1,000 for encouragement of the manufacture of condensed milk in New Zealand. Messrs. W. T. Murray and Co., Ltd., Auckland and Invercargill, were the only firm to qualify, the total payments to them amounting to approximately £600.

From the beginning of the 1900-1 season shippers were required to contribute to storage charges in connection with grading prior to export at the rate of 2½d. per 56 lb. box of butter, all costs previously having been borne by the Government.

During the year attention was directed to the investigation and analysis of dairy factory water-supply.

In the same year Mr. W. M. Singleton, the present Director, and a Canadian, was appointed a Dairy Instructor and Grader. His services to the industry during his period as an Instructor included the introduction of such important and far-reaching factors as the curd-test, the acidimeter, and prepared pure-culture starters, all of which are still of major importance in cheese-manufacture.

At the close of the season Mr. James Sawers resigned to take up the managership of the Edendale Dairy Factory.

Dairy Instructors appointed during the year were Messrs. A. G. Shirley, S. A. Dumbleton, and T. C. Brash, who had been managers of Inglewood, Dalefield, and Maketawa respectively. Mr. Brash resigned in 1903, Mr. Dumbleton in 1904, and Mr Shirley in 1912.

Mr. T. C. Brash later played an important part in the development of New Zealand's dairy industry. He was born at Mosgiel and received his first training at the butter factory of his uncles, Messrs, J. and R. Cuddie, of Mosgiel, where he remained six years. From there he went to the Wyndham factory where he learned cheesemaking. His next step was the management of the Totara Flat Factory on the West Coast, where he remained two years. From here Mr. Brash went to Taranaki, where he was factory managing for six years, and it was while in Taranaki as manager of Maketawa that he received his appointment as a Government Dairy Instructor and Grader. Mr. Brash resigned from the Government service and later became Assistant Secretary of the National Dairy Association, which position he held for eleven years, afterwards becoming secretary. In 1924 Mr. Brash was appointed secretary and chief executive officer of the New Zealand Dairy-produce Board, which position he still holds.

On the 8th November, 1901, Patea was gazetted a grading-port, the premises of the West Coast Refrigerating Co., Ltd., being chosen as the grade store.

DAIRY SCHOOLS.

During the early part of the 1901-2 season arrangements were made with two of our dairy factories—Stratford and Stirling—for the purpose of holding short-course dairy schools for factory managers and assistants. The Stratford classes were held from the 1st to the 13th August, 1901, and the Stirling classes from the 1st to the 13th September. At Stratford Mr. Singleton assisted with the milk-testing branch, and also gave instruction on the use of the fermentation test in the improvement of the milk-supply. At Stirling his subjects included instruction in cheese-manufacture. These were the last of the dairy "schools" at dairy factories.

It had been the custom for a number of years for a Cheese Instructor of the Dairy Division to hold classes during October and November at different centres in Banks Peninsula for the benefit of cheese dairies, as distinguished from factories. Limited time during the spring of the season under review prevented the usual routine being adopted, and to overcome the difficulty classes were held at three of the co-operative cheese factories, to which private makers were invited. In this connection the German Bay, Barry's Bay, and Wainui factories placed their premises and plant at the service of the Dairy Division. Instruction was given at these classes by Mr. Singleton. From this year the Banks Peninsula dairy classes were also discontinued.

NORTH AUCKLAND.

While there were several dairy factories in operation in the northern peninsula prior to 1900 it was during the first decade of the present century that the rapid dairying development of North Auckland began. Pioneering difficulties in the north were as great as anywhere in New Zealand, and much could be written regarding the hardships endured by early settlers in that district. Lack of roading created a major problem. While there was much good agricultural land, there were also many barren or semi-barren wastes of gum and swamp land quite unsuited to dairying, and distances required to be travelled were in many instances considerable. The early trade of the far north was principally in kauri timber and kauri-gum, these commodities being floated down the creeks and linked up with sea transport. Consequently little attention was paid to roads, and seeing there had been no provision through taxation for roading purposes, the position was an extremely difficult one when the necessity for railways, roads, and bridges at last arose.

Mention has already been made of the Maungakaramea cheese factory (1884). This company was financially unsuccessful and wound up in 1889. Mr. J. Mead started another cheese factory later, and ran it for a season or two, when it was bought by the suppliers. Waipu, the first co-operative butter-factory in the Northern peninsula, commenced operations in 1899.

In 1896 Messrs. Murray and Co. opened a milk-condensing factory at Maungatapere (North Auckland) and made condensed milk and butter alternately until 1900, when they opened Whangarei as a milk-condensing and butter-making factory. On the decease of Baird of the Wallacetown condensed-milk factory, Southland, Messrs. Murray acquired the property and ultimately closed down their Whangarei factory. In turn, Murrays' business was later on taken over by the New Zealand Milk Products Co., Ltd.

In the "nineties" there were many small proprietary concerns in the North Auckland district, among them being Tokatoka, Rehia, Paparua, and Waikiekie. In 1903 Mr. W. T. Cowperthwaite started a factory near Maunu, and later another at Parua Bay. In 1909 he erected a factory at Mercury Bay, which in 1910 was taken over by the suppliers as a co-operative company.

Waikiekie started as a co-operative concern in 1905, receiving whole milk until 1910, when it turned to the home-separation system. It may be mentioned in passing that in the early days of home separation in the North the cream was so thick on arrival that in some instances the sample bottles were sent out to the suppliers for them to put the samples in themselves.

The Wayby Co-operative Dairy Co. opened in 1902. Port Albert was run in conjunction, but formed a separate company in 1904. In 1911 Wayby went into liquidation and rebuilt at Helensville as the Kaipara Co-operative Dairy Co., part of the plant from Wayby being bought by the new company. An interesting feature of Wayby and Port Albert is that a butter-radiator was installed in these factories. This was a machine which delivered the butter direct from the milk.

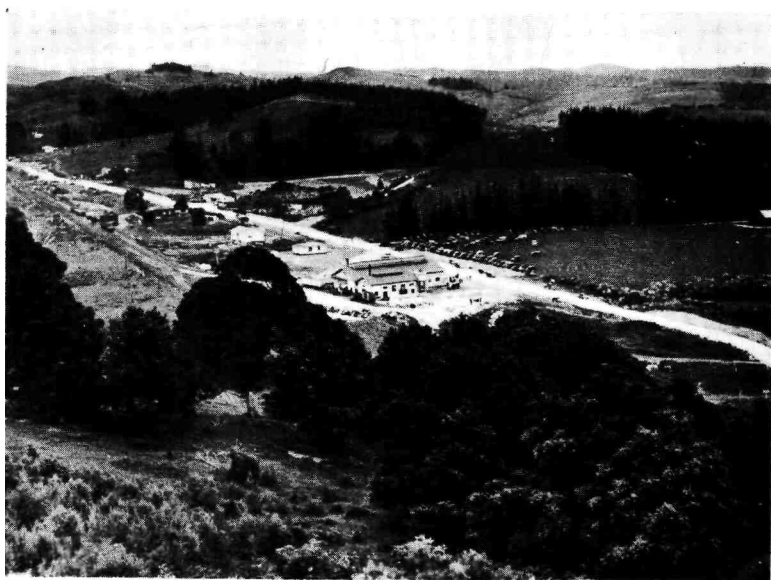
Kaitaia and Bay of Islands both started in 1901. Maungaturoto opened in 1902. Hikurangi started in 1904. The present Whangarei Co-operative Dairy Co. was formed in 1906.

An outstanding figure in the development of factory dairying in the North Auckland district was the late Mr. Thos. Bassett, who was an effective man in every way and a much respected pioneer farmer. Mr. Bassett was a founder of the Northern Wairoa Dairy Co. and chairman of directors from its inception. In addition, he was chairman of the North Auckland Dairy Conference and a director of the National Dairy Association.

OLD AND NEW FACTORIES IN THE NORTH AUCKLAND
PENINSULA.



WAIPU, 1899.



ALBERTLAND, 1934.

1902.

The Department's annual report for 1903 makes the following summing up of the 1902-3 season from the point of view of butter prices and market conditions: "At the opening of the dairy season the prices offering for butter were exceptionally high, and in consequence the bulk of the factories sold outright the whole of their make. In this they were fortunate, as a very considerable fall took place as the season advanced. Owing to the drop in prices and the falling-off in demand from the Commonwealth, a much larger quantity of the autumn make than usual has had to be stored, but will no doubt be worked off before another season opens."

During the year 1902 Mr. H. W. Lawrence, a qualified chemist attached to the Chemistry Division of the Department, was specially detailed to test butter for moisture. Results indicate that in 266 samples of butter taken throughout the colony the average moisture content was 10.33 per cent., whereas in a report on some 105 samples of Canadian butter analysed by the Dominion Government the average was given as 12.31 per cent. There was, however, a considerably wider range in the Canadian butter.

In 1902 the Government offered prizes for the best plans of a cow-shed and silo. There were thirty-eight entries, but that the desired result was not achieved is apparent from the decision of the judges, whose summing up was short and to the point. It read: "We have to report having gone through the plans, but regret to say that in our opinion none of them are of sufficient merit to warrant their acceptance as a guide to settlers as to what a cow-shed or silo should be, therefore none of the competitors are entitled to the bonus." Consequently, no prize was awarded.

Mr. Kinsella, Dairy Commissioner, tells us that "a number of new butter factories were started during the year on sound co-operative lines; some of them are operating in new districts which were once thought not entirely suitable for dairying," and that "the assistance given to settlers in new districts during the past two years has been largely instrumental in inducing and encouraging the farmers in isolated districts to adopt the co-operative system of dairying"; and still further that "most of the new factories started during the preceding three years were in the Auckland Province" From those remarks the steady expansion

of the industry is apparent, and the evidence of later years has also demonstrated that the Government Dairy Instructors played a leading part in the laying of those early foundations. That they were solidly and skilfully laid is beyond question.

There was a slight falling off in quality about this period, with the result that the Dairy Commissioner found it necessary to issue a note of warning. He pointed out the tendency of producers to become over-confident on account of the ease of production and marketing, and the good prices, and stressed the importance of quality and economic and improved methods of production and manufacture. Reading between the lines, we can see once again the intoxication which so frequently follows too easy success. The warning was very timely, for the industry was, as will be referred to later, on the verge of a depression, though, fortunately, one of short duration.

During the 1902-3 season there was a slight overseas demand for small varieties of hard cheese. Small quantities of Edams were made at several factories, and three shipments sent to South Africa. No definite information is given as to how they turned out, and one can only assume the venture was not a financial success, the manufacture of this type of cheese being discontinued.

It was in 1902 that the New Zealand Jersey Cattle Breeders Association was formed, their first herd-book being issued in 1903. The first president was Mr. J. O. Batchelar, and the first secretary Mr. J. C. Lane. The progress of the association is illustrated by the fact that in 1903 there were thirty-nine members, whereas to-day (1935) the membership is over two thousand. Mr. W. M. Tapp, the present secretary and one of the original committee, was appointed to the secretaryship of the association in 1913. Mr. Tapp, himself one of the pioneer breeders of the Dominion, has seen the breed grow from its earliest days of infancy in New Zealand to its present strong position. He has rendered outstanding service not only to the Jersey breed, but indirectly to the advancement of purebred dairy cattle generally. He is a highly gifted judge of the breed, and has acted in this capacity at innumerable New Zealand shows and has also judged in Australia at the Sydney Royal and other leading exhibitions. He assisted to introduce the certificate-of-record testing of purebred dairy

cattle and has always been an enthusiastic supporter of the system, to which he has devoted much helpful service.

The association has now (1935) issued thirty-one herd-books and, according to the latest volume, 74,787 males and 105,472 females have been registered.

1903.

From 1902 onwards the records appear to have been compiled on a basis more nearly conforming to the accepted dairying year, so that it is found more convenient to abandon the calendar year classification in the remainder of this section in favour of a seasonal survey.

Officers appointed to the Dairy Division staff during the 1903-4 season were Messrs. E. A. Dowden, L. Hansen, W. Wright, and J. Pedersen. Mr. Dowden had been connected with the staff for some years as a clerk. A natural aptitude and liking for the grading-work led him to study the business, with the result that he became so skilled as to merit appointment as a grader and ultimately became an excellent judge of butter. Prior to his appointment Mr. Wright was manager at Northern Wairoa. He later assumed the important position of first inspector of New Zealand dairy products in London. Mr. Pedersen was imported from Denmark with the express object of assisting in the introduction of the Danish system of pasteurizing cream for butter-making. He will be remembered for his work in this connection, for his ability as a buttermaker and instructor, and also in connection with the introduction and development of casein-manufacture in the Dominion. Mr. Hansen, also a Dane, was formerly manager of the Thames Valley Dairy Co. at Paeroa, and after a brief period with the Government resigned to engage in a proprietary butter-factory business. Mr. J. A. Kinsella resigned during the year to take up a position under the Imperial Government in the Transvaal.

It may be of interest to mention here that from this period onward all appointments to the official staff of Dairy Instructors have been filled from the ranks of dairy-factory managers whose experience and training has been obtained in New Zealand.

equipment, also owing to the growth of the auxiliary system, the usual figure of the average-sized business rose to nearer £5,000. The typical New Zealand country dairy factory of this day was a weather-boarded wood structure, sitting on a concrete base, and with galvanized-iron outer roofing. The building was divided in approved style for the purpose of the various processes, lined with dressed matchboards and floored with concrete. Another tendency was to confine shareholding to milk-suppliers, making the companies purely producers' concerns. The movement, in fact, became strong enough to dispense with the help of outsiders or semi-outsiders indirectly interested.

1904-5.

Mr. J. A. Kinsella was re-engaged as Dairy Commissioner from the 1st January, 1904, although he did not return to New Zealand until November, 1904, in the interval having investigated the latest developments in the industry in the Argentine, Great Britain, and Canada. Mr. D. Cuddie was appointed Assistant Dairy Commissioner.

The Department continued its contribution towards the storage of butter prior to shipment, but the amount was reduced to 2d. per box of 56 lb. No storage charges were yet being made in connection with cheese-grading.

A number of experimental tests were made with regard to the keeping-quality of butter and also with regard to the cool-curing and cold-curing of cheese. It was also during the 1904-5 season that a system of testing the dairy herd was inaugurated at the Department's Experimental Farm at Weraroa, near Levin.

The thirteenth annual report of the Department of Agriculture contains the following useful general comments on the seasonal position :—

“ The Auckland district is rapidly coming to the front in dairying, and, although the settlers have many difficulties to contend with in the shape of bad roads and distance from the port of shipment, the produce is meeting with favourable comment from the graders. There are a number of new creameries and skimming-stations in course of building for next season.

“ At the beginning of the season the prospects of the Home market were far from bright, and it was feared that the “ slump ” which many were anticipating had at last arrived. Fortunately, their fears were not confirmed, as before any business was done prices went up with a bound, and the output has realized the highest average yet obtained.

“ Prices throughout the season have been very satisfactory ; in fact, the value of New Zealand butter on the British markets for the latter part of the season has been quite phenomenal, being from 10s. to 12s. per hundred-weight higher than for the corresponding period of last year. The higher price ruling is ascribed to the shortage of supplies on the Continent, and partly to the Siberian butter trade being interfered with on account of hostilities between Russia and Japan. Prices of cheese have been firm and advancing all the season, and have proved satisfactory to buyers and sellers alike, although the prospects in the early spring were not too promising.

“ The dairy companies which at the commencement of the export season decided to ship their produce on consignment will, it is considered, this year net higher prices than those who sold their outputs outright in the colony ; this was not usually the case in former years. It would appear that there is a tendency amongst the dairy companies to sell their outputs at a fixed price in the colony, and thereby avoid any risk of a drop in the market price ; a number of the companies will, however, continue to transact their business on a consignment basis.”

Cheese quality was advancing season by season, the improvement being largely due to the more general use of the acidimeter as introduced by Mr. W. M. Singleton. The following extract from a report on the instructional work of the 1904-5 season gives a good idea of the position in this respect :—

“ The uniformity of body and texture which was last season a prominent characteristic in New Zealand cheese was due in a large measure to a more general use of the acidimeter or the alkaline test. It is now quite exceptional

to find a factory without one installed. An intelligent use of this test is of great assistance towards getting a more uniform article from day to day and from factory to factory. The majority of managers in our cheese factories can now make and standardize their own solutions. Frequent visits of an Instructor who can test the strength of the solution in use at factories at intervals is of a decided advantage, since it keeps the several factories working along uniform lines. The rarity of acid-cut cheese, and the great decrease in cheese made from undercooked curds, has been brought about largely in this way. An intelligent use of the test enables the manager of less experience to discern when his curds have not the proper development of acidity. In this case he is in a position to rectify his trouble on the following day, whereas he might await an Instructor's visit, or the arrival of a grade-note, and then find that there were two more similar shipments yet to follow. Weak-bodied open cheese also show a decrease."

The checking of the marked net weight of butter and cheese was again carried out by the grading staff. From 3 per cent. to 5 per cent. of the total number of packages sent in for shipment were weighed and reported on. Every care was being taken in the interests of accuracy. The scales used for this work were tested daily by a 56 lb. weight, guaranteed correct, and were also checked at intervals by an Inspector of Weights and Measures. Contracts between buyers and sellers were now accepted as on Government weights, and this was conducive to less friction over disputes in connection with irregular weights than formerly. We also learn that "The Home and Foreign Produce Exchange, London, decided a little over a year ago that shippers' weights should be taken as the basis of business transactions, and that the Government weigher's certificate should be final. Should no Government weigher's certificate be furnished, the buyers would be entitled to an allowance for short weight, if any. The acceptance by the Produce Exchange of the Government Grader's certificate of weight (as is done in regard to quality) will naturally greatly assist and simplify matters in business transactions."

All this points to the fact that the New Zealand grading system and accompanying services were fast assuming a position of respect, and we are justified in regarding with pride the thoroughness and foresight of those who laid the foundations of the grading of dairy-produce and all the term implies.

DEXTER-KERRY CATTLE.

In 1904 the Department of Agriculture, in pursuance of its policy of practical assistance with regard to promoting the development of the pure breeds of dairy cattle, imported from Ireland a consignment of Dexter-Kerry cattle comprising two bulls and six cows in calf. From this beginning a small herd was built up at the Government Experimental Farm at Weraroa, but the breed failed to meet with approval among New Zealand dairymen, and in 1916 the Department's Dexter-Kerry herd was disposed of.

1905-6.

The Government's contribution towards the cost of cold-storage of butter for grading prior to shipment was stopped at the beginning of the 1905-6 season. During the year Mr. J. Pedersen resigned and left the colony. Messrs. D. Dickie and E. Townshend also resigned their positions on the staff. Mr. James Sawers re-entered the service, and Messrs. N. Fulton and F. Thomson were newly appointed. To assist those settlers making butter on their farms, Miss Nora Breen, a late arrival from Ireland, where she had gained considerable experience in the making of butter, was appointed to visit the farms and give instruction.

Butter exports for the season showed a decrease of approximately 18,000 cwt., while cheese exports went up over 34,000 cwt. The explanation given was that the decrease in butter was partly due to some dual-plant factories making cheese only, and partly to the fact that there was practically no butter held in store the previous winter for early shipment—September and October—while in former years fairly large quantities were held.

Tables of Danish and New Zealand butter prices and Canadian and New Zealand cheese prices for 1904-5 and 1905-6 given in the official report indicate that in cheese the average prices for Canadian were 47s. 6d. and 58s. per hundredweight, and for New

Zealand 48s. 6d. and 62s. 8d. per hundredweight, being a difference in favour of New Zealand of 1s. and 4s. 8d. for 1904-5 and 1905-6 respectively. Danish average butter prices were 112s. and 118s. 3d. per hundredweight, and New Zealand 102s. 10d. and 109s. 8d. per hundredweight, being a difference in favour of Denmark of 9s. 2d. and 8s. 7d. respectively. Our cheese had the advantage of being placed on the Home markets at a time when practically no other cheese was coming forward, but the fact remains the average prices were higher than Canadian.

The home separation system was still spreading, and its spread still being deplored. The Dairy Division's views on the matter left no room for doubt, as will be gathered from a report which states that "the introduction of home separators is a menace to the industry, and unless the utmost cleanliness is insisted upon the quality of the butter made from home-separated cream cannot be expected to score first grade."

Milking-machines were beginning to increase in numbers as well as efficiency, as will be apparent from the following extract from the Department's annual report for 1906: "During the past year very considerable progress has been made in perfecting the Lawrence-Kennedy-Gillies and Hutchinson machines. The former is now installed in a number of sheds, and where properly attended to appears to give general satisfaction. The Hutchinson is now being fitted into several sheds, but it will be some time before any definite decision regarding it can be arrived at." The report concludes with the following prophecy, which cannot be read without provoking a touch of humour, so safely has the writer protected himself on this, at that time, somewhat dangerous subject: "If the dairy experts can assure dairymen that the use of the machines will not damage the teats or interfere with the milking qualities of the cows, and that the milk is not deteriorated for butter or cheese making, then the general introduction of the machines will only be a matter of time, and a great impetus will be given to the industry." The L.K.G. (Lawrence-Kennedy-Gillies) was destined to become one of the best-known milking-machines in the Dominion, but the Hutchinson apparently had but a brief existence.

One of the important achievements of the 1905-6 season was an improved coastal-shipping service in regard to the transhipment of dairy-produce to Home steamers. The report states that "for the first time in the history of our dairy industry it can be said that the carriage of the season's butter from all northern ports for transhipment at Wellington has been placed on a satisfactory basis. Practically the whole of the cargoes have reached Wellington in a frozen condition throughout the season."

The first systematic herd-testing, apart from that carried out on the Government Experimental Farm at Weraroa, was conducted during the season under review. This was on the farms of Mr. W. P. Harre, Rata; A. C. Perry, Rongotea; and Mr. J. Burt Veale, Woodville. Mr. Veale, in particular, was an enthusiastic believer in the principle, and figured prominently for many years in the establishment of the system in his district, later becoming a well-known Jersey breeder. Mr. Veale was also placed first in a dairy-farm competition conducted by the Department in 1905.

1906-7.

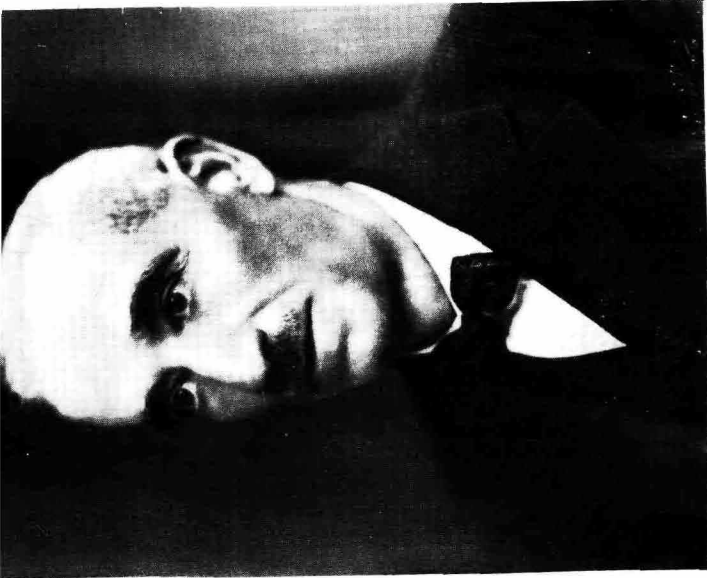
Mr. Kinsella resigned during the 1906-7 season, and Mr. D. Cuddie took over the directorship of the Dairy Division as from the 1st November, 1906. Mr. David Cuddie was born in Otago in 1864, and brought up on a dairy-farm. He received early dairy-factory training with his elder brothers in their butter factory at Mosgiel, and also at the Stirling Cheese Factory; was two years manager of the Waverley Dairy Factory; Dairy Produce Grader 1900-6, and Dairy Commissioner from 1906-1921, when he retired. On Mr. Cuddie's shoulders fell the burden of the War period with its many problems and onerous duties relating to increased production and transport and handling difficulties. He was responsible for the inauguration of Farm Dairy Instruction, casein-manufacture, and herd-testing, but will be remembered principally for his building-up of the instruction and grading service, which was brought to a high standard under Mr. Cuddie's capable supervision.

During the season Mr. S. Bowman was appointed a Dairy Instructor and Grader. Experiments in the cool-curing of cheese were conducted in co-operation with the Dalefield Dairy Co.,

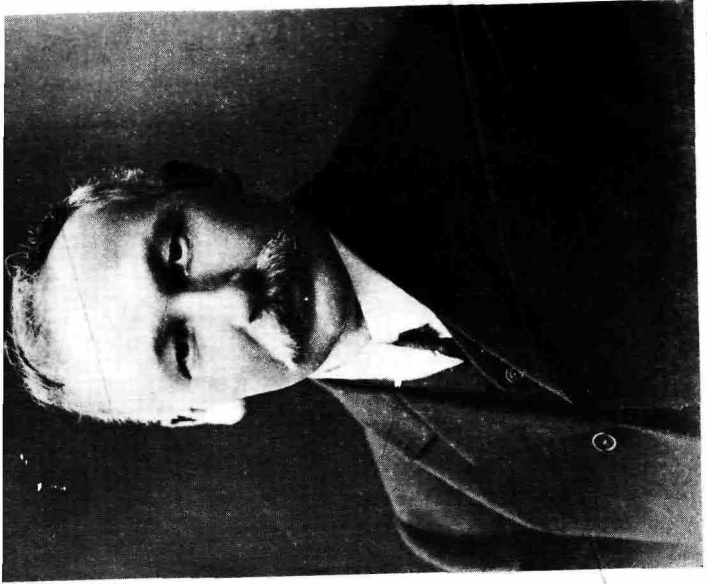
financial and expert assistance being given by the Department. Herd-testing was continued at the Weraroa Experimental Farm, the milk being weighed night and morning and samples taken once a month. Milking-machines were installed and were being tested at the Government experimental farms. The Lawrence-Kennedy had been in operation in New Zealand for four years, and at the Weraroa Farm for two seasons, while a Hartnett machine was also installed at Weraroa during the season under review. We are told that "a great number of farmers in all parts of the country have already installed machines or made arrangements to adopt the system."

The prejudice against the farm-separation system was beginning to break down, and the number of hand-separators installed on dairy-farms was increasing steadily. The quality of milk for cheesemaking was causing concern, and Mr. Singleton pointed out that "the time must come when inferior-flavoured milk must be paid for accordingly, and clean milk, kept cool, will realize nearer its full value."

The most important feature of the season from the broader aspect was the remarkable increase in the production of cheese. Nineteen new cheese factories were started during the year, and some factories formerly making butter turned over to cheese, due to the higher prices ruling for cheese, which enabled the producer to obtain from 2d. to 3d. per pound more for butterfat in milk for cheesemaking than for buttermaking. The quantity of cheese exported during the season increased by approximately 55,000 cwt., while butter decreased nearly 5,000 cwt. The falling-off in butter shipments would have been still heavier had it not been for the large increase in butter-production in the Auckland Province, where many new butter factories were to be built in readiness for the next season. The Dairy Commissioner, in his report on the season, has the following interesting comment to make regarding the butter position: "Owing to lower prices now ruling on the British markets, large quantities are being held in the colony, and as the local market cannot absorb any larger quantity than usual it will be necessary to ship some of the produce Home later on. This is to be regretted, more especially if the butter is stored until the beginning of next season. Past experience has proved that the placing of stored butter on the market has a tendency to reduce prices and to maintain lower prices for some considerable time."



D. J. MCGOWAN, DAIRY COMMISSIONER (1903).



L. CUDDE, DIRECTOR OF DAIRY DIVISION (1906-1921).

[To face page 124.]

The pasteurization process for buttermaking was gradually increasing in favour. Several factories in the North were pasteurizing their milk or cream for buttermaking, and the practice was increasing generally in the Auckland Province. Some 132 samples of butter analysed were found to possess an average water content of 11.7 per cent. A milk regenerator was in use at Aramoho.

HERD-TESTING.

Commencing with the 1906-7 season systematic herd-testing was carried out by Mr. J. Burgess, of Warea. As will be noted from what has been written previously, Mr. Burgess was not the first in New Zealand to undertake this work, but because of the thoroughness of his investigations, and particularly because of the intelligent dissemination of information through various articles and addresses he became an important influence and must be regarded as one of the principal founders of the herd-testing movement. Right from the commencement he used high-quality purebred bulls (of the Ayrshire breed), and thereby added breeding and herd-building to herd-testing.

With regard to this subject, however, it must not be overlooked that Mr. J. G. Harkness was a strong advocate of herd-testing from about 1900, and in 1906 published an important bulletin which did much toward persuading dairy-farmers to test their herds. Mr. Burgess's entry into the business was very largely due to the influence of Mr. Harkness, although it has been stated that Mr. Burgess was testing odd cows for some years before he decided to test his whole herd systematically.

1907-8.

The year 1907 is memorable for the passing of the Butter Export Act, the main provision of the measure being the limiting of the moisture content of butter to a 16 per cent. maximum. The Act came into force on the 1st January 1908, selected churnings being tested at the various grade stores. The idea of the Act was to keep New Zealand butter in conformity with the provisions of the Imperial Butter and Margarine Act, 1907, as regards moisture content.

In the spring of 1907 Mr. Cuddie went to England for the purpose of establishing a service in London for the inspection of New Zealand dairy products, and while away visited Denmark, Holland, and Canada in connection with dairying matters.

During the same season greater attention was paid by the Division to the question of overrun in buttermaking, and experiments were conducted at the Mangatoki, Whenuakura, Okoaia, and Kaitaia dairy factories. The fact that the results averaged 12.22 enables an interesting comparison with the average overrun of to-day, which is 17 per cent. to 18 per cent. for milk and 21 per cent. to 22 per cent. for cream. These experiments were the outcome of the spread of pasteurization. The making of butter from pasteurized cream had been on the increase in New Zealand during the previous few years, until during the 1907-8 season some twelve factories were manufacturing butter made from cream treated in this manner. A number of these factories were receiving cream which had been separated on the farm, and from which the ordinary treatment, with non-pasteurization, would produce a second-quality butter, whereas by pasteurizing the quality could be brought to the first grade standard. Considerable discussion, however, was taking place regarding the overrun from pasteurized cream, there being a considerable weight of opinion that pasteurization had an unfavourable influence on output. Results of the experiments were definitely reassuring and indicated—(1) that a normal overrun can be obtained from pasteurized cream, and (2) that the losses are not greater than those that occur in ordinary treatment. Moreover, in answer to criticism in another direction, the experiments referred to demonstrated—(1) that the butter from pasteurized cream kept better than the butter made from non-pasteurized cream; (2) that, although higher temperatures were used in the manufacture of the pasteurized butter, the keeping-quality was superior to that of the non-pasteurized made at lower temperatures; and (3) that the pasteurizing of the cream and the subsequent treatment to give an average overrun is quite consistent with getting good body, texture, and colour.

Other experiments conducted during the season related to the yield of cheese from cooled milk. The Dairy Division had since its inception recommended the cooling of milk as a decided advantage in getting a better-flavoured milk-supply. It was also

contended by officers of the Division that in cases where such cooling had the effect of preventing curds developing acidity faster than a normal rate, or where it had been the means of preventing the curds developing gas, which necessitated a longer time for maturing after dipping and prior to salting, such cooling enabled the manager to get more cheese from a given quantity of milk.

During the previous season reports were circulated stating that the direct effect of proper cooling was an increased yield amounting to about 10 per cent. At first the point was not considered sufficiently serious to warrant attention, but the Division was finally prevailed upon to investigate the matter. The experiments went to show that if curds work normally—that is, not too fast nor too slow—the cooling of the milk has no influence whatever on the yield of cheese. All variations obtained in these experiments were slight, and sometimes in favour of the uncooled milk, and the variations in quantity were in every case within the limit of error which must be allowed when making such experiments.

These things are interesting as indicating that every year had its problems, great or small, important or unimportant, but particularly in portraying the development of the industry from the point of view of manufacturing processes. Moreover, it is interesting to keep in mind that present efficiency has only been achieved at the expense of great pains and patience in overcoming innumerable prejudices as well as by painstaking trial and experiment. In view of the many complications and the length of time which had to elapse in many instances before the results of experiments could be determined, it is somewhat remarkable that so few serious mistakes were made.

Among the services introduced by the Dairy Division during 1907-8 were an extension of the inspection of milking-sheds, dairies, and herds, and the supplying free of cost of prepared acid solution. The introduction of the acidimeter caused a demand for a solution suitable for testing the strength of alkaline solutions, and especially for use in titrating trial alkaline solutions when preparing stock quantities. It was considered, however, that this was a service which factories were entitled to pay for and was really a matter for private firms, so that from January, 1908, the Department ceased to supply standard acid solution.

While Mr. Cuddie was absent from New Zealand, Mr. W. M. Singleton acted as Dairy Commissioner. Mr. J. Pedersen rejoined the staff during the year, while Mr. W. E. Gwillim, late manager of Eltham, and Mr. A. C. Ross, late manager of Cardiff, were appointed Dairy-produce Graders.

The season was very unfavourable climatically. The previous winter was severe, consequently the cows came in in poor condition. The spring was cold and wet and was followed by one of the hottest and driest summers on record. Exports of butter decreased some 49,000 cwt., while cheese exports increased approximately 115,000 cwt. The prices for butter were high, having risen rapidly. Cheese prices were also good. The reason for the high price of butter was that Australia, New Zealand, Canada, and the United States as well as the Continent, all showed a falling-off in the production of butter. The new British Butter and Margarine Act was also stated to have had a favourable influence.

Minor facts relating to the season are that the farm separation of cream was becoming more widely practised, and was still extending; some of the Auckland factories were still using the cube box; and the partial neutralization of acidity of cream was being tried out at Whangarei and one or two other factories in the North Auckland district.

1908-9.

The important feature concerning 1908 was the passing of a Dairy Industry Act which represented a review and consolidation of all previous dairy legislation. The Dairy Industry Act, 1908, is generally regarded as the basis of present-day administration of the industry.

Commencing with the 1908-9 season a system of cipher-date marking of butter was introduced. While in England Mr. Cuddie had recognized the necessity for some means of knowing how old the butter was at time of sale to the British retailer, and on his return to New Zealand made provision that every box of butter should bear a code mark to indicate the date of grading. For example, A10 would indicate that the butter was graded on August 10th. At first the cipher letter was changed fortnightly

to correspond with fortnightly grading and shipment. Later on the letter was changed each month, which method still obtains. A similar system obtains in connection with cheese.

In this year (1908) Mr. Robert McNab, Minister of Agriculture, recognized the need for improvement in the condition under which milk was produced on dairy-farms supplying creameries and cheese factories. A comprehensive scheme was planned and developed. A number of men were temporarily appointed and given some instruction in sanitation as it applied to farm dairies and to diseases in dairy stock before each was allotted a district for his work.

While, however, regulations were prepared and laid upon the table of the House, they were never brought into force, and subsequently were dropped, and although a certain amount of work was done the Inspectors were really acting without statutory authority. The scheme was based on the assumption that supervision over the milk-production was essential in the best interests of the dairy-farmer and his industry, and while the system never had a fair trial results as far as they went were regarded as satisfactory by the Department.

The idea was good, but was not accepted favourably and was of short duration, although there was no direct cost to dairy companies or suppliers. The work as carried out by the men appointed was considered to savour more of inspection than of instruction. The farm-dairy-instruction work as now carried on by the Dairy Division covers much the same scope of work, but whereas dairy-farmers strenuously objected to the inspection work as carried out in 1908, dairy companies have during more recent years voluntarily asked the Dairy Division to appoint Farm Dairy Instructors on the basis of these companies paying one-half the salaries and providing locomotion and travelling-expenses. The Inspectors of Mr. McNab's day were possibly appointed somewhat before the time was ripe.

Mr. McNab's practical interest in the dairy industry is further evidenced by the fact that he was instrumental in the erection, largely at his own expense, of three small cheese factories in the South. These were Waikawa Valley, built in 1895, and Haldane and Heathfield, built in 1897 or 1898.

The season, in contrast to 1907-8, was a particularly good one climatically. Butter exports increased by, roughly, 26,500 cwt. and cheese by 35,500 cwt. Prices all round were lower than expected, mainly owing to labour unrest in Great Britain, where there were strikes, &c.

The pasteurization of cream was spreading, but very slowly, some twenty factories now carrying out the process.

Experiments in the wax-coating of cheese were carried out in co-operation with the Edendale Dairy Factory, while experiments in connection with the pasteurization of separated milk and whey were carried out in co-operation with the Hawera Dairy Co. from the 18th to 24th February, 1909.

In 1908 the Hikurangi, Whangarei, and Maungatapere dairy companies agreed to eliminate competition for supply by not accepting milk or cream from a supplier to a neighbouring company without the consent of the company. This was a wise and far-sighted move, and has a present-day parallel in the regulation prohibiting transfer of supply during the season.

In 1908 the Hokianga Dairy Factory was built and commenced operations. The whole of the supply was farm-separated cream. Moreover, the cream was graded, though without differential payment according to grade. This was the foundation of a most desirable innovation, which took many years to come into general practice.

1909-10.

The season 1909-10 will be remembered as the season in which the Dairy Division inaugurated systematic herd-testing. It was at Dalefield, in the Wairarapa, that the foundation was laid for the extensive movement which exists to-day. The association was organized by officers of the Dairy Division and conducted in co-operation with suppliers to the Dalefield Dairy Factory, some 815 cows being tested during the first season. The herd-testing movement is dealt with in the second section of this work.

During the season some assistance was given to factories in the direction of visiting the farms of milk-suppliers, and giving

instruction in the treatment of the milk and the general care of the cows and premises—in other words, the beginnings of what was later known as farm-dairy instruction.

The investigational work of the season included the carrying-out of whey-butter experiments in co-operation with the Kaponga Dairy Co., and also experiments in co-operation with the Scarborough Creamery of the Ballance Dairy Co., and with the Glen Oroua Dairy Factory for the purpose of ascertaining the cost of pasteurizing skim-milk at dairy factories. In addition, experiments in the pasteurization of whey were also carried out at Glen Oroua.

Climatically, the season was propitious. There was a large increase in the production of cheese, no less than forty new factories *having started*. *Prices were good*. The advent of the combined churn and butter-worker made possible the incorporation of more moisture as well as enabling a more uniform moisture content, having a general good effect on butter-quality. About 25 per cent. of the season's butter output was manufactured from pasteurized cream. The use of milking-machines was extending rapidly. Investigations concerning the moisture content of cheese were being carried out.

Officers appointed to the Dairy Division staff during the season were Mr. E. E. C. Wood, Dairy-produce Grader, and Messrs. C. Stevenson, W. Graham, and W. Dempster, as Dairy Instructors.

Mr. W. M. Singleton was appointed Assistant Director of the Division.

THE AYRSHIRE CATTLE BREEDERS' ASSOCIATION OF NEW ZEALAND.

This association was formed at Palmerston North in 1909, the first herd-book being published in 1910. Mr. E. C. Bensemenn, of Upper Moutere, Nelson, was the first secretary, and Mr. J. Kyle, of Palmerston North, the first president. The association's office is now at Hawera, Mr. R. McCay acting as secretary. To date (1935) the association has issued 20 herd-books, 5,770 males and 16,572 females having been registered.

1910-11.

There does not seem very much which it is necessary to record concerning the 1910-11 season. Farm-dairy instruction, which had been inaugurated in 1909, was continued by Butter and Cheese Instructors as time and opportunity permitted. A step forward with regard to this service was marked by the transfer to Stratford of Mr. N. Fulton, Dairy Instructor, for the purpose of co-operating with a number of dairy factories in the district and specializing in the farm-dairy-instruction work.

During the season dairy-farmers were taking a lively interest in the pasteurization of skim-milk and whey. The system was introduced into seventy cheese-factories and twenty-eight creameries, and is said to have been attended with much success. As a means of bringing about the adoption of pasteurization in this connection, the demonstrations given by the Department during the two previous seasons were an important factor.

Commencing with the 1910-11 season the Oruru-Fairburn Dairy Co. adopted cream-grading with differential payments between first and second grade and low test (36 per cent.) cream.

Whey-butter experiments were continued at Kaponga, and from 1911-12 the making of whey-butter became a regular practice at cheese factories.

Another matter worthy of mention is that officers of the Division who for some years had been assisting in the judging of dairy-produce at shows were now doing practically the whole of this work, and continue to do so at the present day.

One new officer was appointed to the Dairy Division staff during the season—namely, Mr. J. O'Dea, Dairy Instructor and Grader.

Dairy-cow testing was continued at Dalefield, while three new associations were started through the co-operation of the Kaupokonui, Stratford, and Cambridge dairy companies and some of their suppliers.

TESTING OF MILK.

It is interesting to be reminded by the Department's annual report for 1911 that there was still a considerable amount of dissatisfaction in some districts with regard to the testing of milk at dairy factories and that the Division's work in this connection

was extending. Where the directors of a dairy company found that there were serious complaints amongst the suppliers, the usual plan was to arrange for the presence of a Dairy Instructor on testing-day. The testing was done either by the officer himself or under his personal supervision, and as the work proceeded he explained to the dairy-farmers (who were usually invited to attend on such occasions) the whole process of testing. Fluctuations in the percentages of fat in milk, and their causes, were also discussed.

The Division also extended its system of check-testing at Wellington, inaugurated in 1907, to a somewhat large scale. Under this system, which still exists, dairy-farmers have the privilege of sending forward samples to check the tests credited to them by the factory to which they supply their milk; but where this privilege is taken advantage of the Division insists that such samples be taken and sealed in the presence of the supplier concerned and a representative of the dairy company. For many years, the number of check samples put through in the testing-room connected with the Wellington grading-stores was considerable, but to-day the receipt of samples is comparatively rare. There is no doubt that this service achieved a great deal by way of engendering faith in the testing-system as well as in the work of factory-managers. Later, as will be told in due course, the Government appointed special Inspectors to supervise this work.

Only education and adequate supervision can disperse the doubt which still exists to a certain extent regarding the honesty and accuracy of milk and cream testing at dairy factories. There are some who do not consider the butterfat-test an equitable basis of payment, particularly for milk for cheesemaking, and periodically controversies arise concerning the subject. There is no method of payment made compulsory by the Dairy Industry Act or its regulations, and dairy companies can therefore adopt any method upon which they decide. A common statement is that milk for cheesemaking should be paid for according to "cheese contents." This implies the testing of milk for casein. The ratio of casein to fat varies with different milks, and even when the milks contain the same percentage of butterfat. A test for the casein content of milk as reliable and accurate and as easily operated as the Babcock test for fat content has yet to be devised before any system of payment for milk on "cheese contents" acceptable alike to suppliers and dairy companies can be expected to succeed.

EXPORTS.

Butter exported during the year showed an increase of approximately 11,000 cwt., representing a decrease in value of over £111,000 compared with the previous year. Obviously, the prices ruling on the London market were considerably lower than for the previous season, the average price being 107s. as against 117s. per hundredweight.

Cheese exported evidenced a decrease of approximately 9,000 cwt. in quantity and £37,500 in value. This decrease in quantity was stated to be due to the exceedingly dry season experienced in some parts of the Dominion, and also to the fact that a number of the larger factories with dual plants continued the manufacture of butter well on into the spring months of the season before taking up the manufacture of cheese.

The total number of creameries and cheese-factories registered with the Department and in active operation during the year 1909-10 was 187 and 193 respectively. Registrations added to these during the period under review, 1910-11, were eight butter and twenty-seven cheese factories, beside which thirty-five private dairies and six packing-houses were also registered.

THE NEW ZEALAND HOLSTEIN-FRIESIAN ASSOCIATION.

This association was founded at Palmerston North on the 23rd June, 1910, and issued its first herd-book in 1911. The first president, and an important influence in establishing the organization, was Mr. Coleman Phillips, well known not only as a breeder of Friesian cattle, but for the conspicuous part which he played in early dairying and land-settlement in the Wairarapa. The first secretary of the association was Mr. W. McKenzie, of Palmerston North, who held the position for approximately fifteen years. The association's headquarters are now (1935) at Auckland, Mr. J. P. Kalaugher being secretary. Up to the present twenty-three herd-books have been issued, and in these are included particulars of registration of 13,570 males and 34,624 females.

" JOURNAL OF AGRICULTURE."

In June, 1910, the first number of the *Journal of the New Zealand Department of Agriculture* was issued. This monthly publication, profusely illustrated, contains articles and notes on all branches

of agriculture, written principally by the Department's expert officers, dairying having been prominent in its pages. Over fifty bound volumes have now been issued, and these represent almost an encyclopædia of New Zealand agriculture.

1911-12.

The season 1911-12 stands out in the memory as the date when one of the long-standing and definitely serious troubles of the industry was brought to an end—the problem of “fishy” butter. Ever since the storage and exportation of butter had begun, what was known to merchants and dealers in dairy-produce as “fishy” flavour had made its appearance in the outputs of some factories. During the first decade of the present century it reached a really disturbing stage, causing much worry to all concerned in the manufacture or sale of butter. Moreover, it was regarded as the only serious defect of New Zealand creamery butter. The fault was very puzzling, inasmuch as it would sometimes develop in one particular day's make from the same factory. As a rule “fishiness” cannot be detected until the butter is about two months old, after which time it becomes noticeable almost immediately after the produce is defrosted. There were, however, exceptions to this rule, and, taken by and large, the whole thing was most elusive. Scientists and others had been trying on and off for many decades to solve the problem, and, although many theories were advanced and several guaranteed solutions announced, the defect evidenced no lessening of prevalence.

In 1911, however, at the direction of Mr. D. Cuddie, Instructor J. Pedersen, previously mentioned, conducted a number of experiments at the Konini Dairy Factory and was successful in discovering the cause of the trouble. “Fishiness” in butter was proved to be due to too high a percentage of acidity in the cream. Thus, as is so often the case, a most puzzling problem was ultimately found to have—once known—a comparatively simple solution.

In the same year Mr. Walter Wright was sent to London for the purpose of residing there as Inspector of New Zealand Dairy-produce. This was an important and much-needed appointment, and provided the very necessary link between the New Zealand

manufacturer and the British consumer. It also enabled an indication of whether the New Zealand grading standards harmonized with the ideas of quality and suitability as evidenced at the marketing end.

PAYMENT OF MILK FOR CHEESEMAKING.

It was during this season that Mr. N. Fulton, Dairy Instructor, in co-operation with the Tariki Dairy Factory, carried out trials in connection with the Hart casein-test. This was the basis of a payment for milk for cheesemaking according to its cheesemaking value as opposed to a straight-out butterfat-test, both fat and casein content being taken into consideration. The results were not convincing, and the test was never adopted in New Zealand. The Tariki Dairy Co. abandoned this method of payment after two seasons' trial.

CASEIN.

In 1911 Mr. Pedersen was sent to Europe to investigate the casein industry with regard to its manufacture and market prospects. On his return arrangements were made to give instruction in the making of this product and to grade all exports. Rapanui, near Wanganui, the first factory in New Zealand for the manufacture of casein, began operations during the season.

STAFF.

Messrs. S. Bowman and A. G. Shirley left the staff of the Division at the beginning of the season. Mr. S. Clayton, previously manager of the Northern Wairoa Dairy Co., was appointed a Dairy Instructor and Grader.

SOFT AND FANCY CHEESE.

As the result of the appointment of Miss G. N. Davies, N.D.D., as an Instructress in soft and fancy cheesemaking, a new branch was added to the services of the Dairy Division to the industry. Miss Davies had received a very thorough training in England and Wales and obtained her diploma at Reading. She remained in New Zealand from 1912 to 1921, and during that period trained

many farm and factory cheesemakers and others in the arts of the small, fancy cheeses. There are a great many varieties of such cheese, some of the better known being Little Welsh, Miniature Wensleydale, Coulommiers, Gervais, Camembert, Pont l'Eveque, Cream Cheese, Club Cheese, &c. Despite a hopeful outlook at the time, however, the demand for this class of product has never developed to any extent. Among those worthy of mention as having persevered with the manufacture of the fancy varieties of cheese are Messrs. A. Moreland and Sons, of Papatoetoe (now of Te Rapa), and the Boys' Training Farm at Weraroa.

STILTON CHEESE.

While on this subject mention should be made of the Saxelby family of Woodlands. Their Roslyn Bush Factory was founded by Mr. J. Saxelby over forty years ago, and has always specialized in the manufacture of Stilton cheese. The business has been handed down from father to son, and their brand of "Antler" is favourably known to a wide circle of connoisseurs in New Zealand and Australia.

During the following season (1912-13), the T. and P. Milk Supply Co. of Dunedin commenced the manufacture of Stilton cheese under the guidance of the Instructress, Miss Davies, and were reputed to have received a fairly large overseas order for this variety of produce.

WATER CONTENT OF BUTTER.

During the season stricter attention was paid to the water content of butter. Altogether 1,985 samples were tested for moisture at the various grading ports, the average water content of these being 14.25 per cent., the legal maximum being 16 per cent. A number of factories gave trouble by exceeding the limit, and finally two dairy companies were prosecuted for breaches of the Act in this connection, the Magistrate inflicting fines in both cases. This was the first legal action of its kind by the Division, and is reported to have had the desired effect.

PASTEURIZATION OF SKIM-MILK AND WHEY.

Towards the end of the season the Whenuakura Dairy Co. installed in their factory a plant for treating the skim-milk, consisting of an ordinary milk-pasteurizer and a regenerative pasteurizer. This was the first of its kind in New Zealand, and was reported to be working "very satisfactorily indeed; in fact," the report continues, "it would seem that the question of handling skim-milk at butter-factories, which has presented so many difficulties in the past, has at last been answered by the use of this plant."

EXPORTS.

Butter exports decreased by 8,400 cwt., while cheese exports increased by 69,000 cwt. Prices were the highest on record, mainly due to the prevalence of a drought throughout the Northern Hemisphere during the previous summer. It was stated that the production of cheese in the Northern Hemisphere during the previous summer was the smallest for many years and 50,000 tons lower than for the previous year. The average price of cheese based on weekly reports from the High Commissioner was 68s. 6d. per hundredweight, and of butter 120s. per hundredweight. A very profitable market for New Zealand butter was available in Vancouver during the season, 1,207 tons being shipped at good prices.

1912-13.

CONTROL OF COASTAL SHIPPING.

Having experienced difficulty in obtaining satisfactory transport of their produce, dairy companies in South Taranaki decided to co-operate in the control of the coastal shipping of their butter and cheese from the Port of Patea to Wellington for transshipment to overseas vessels. A certain amount of capital was subscribed by the dairy companies shipping through the Port of Patea to enable the purchase of insulated and refrigerated vessels then in the trade. In 1912 a separate company, the South Taranaki Shipping Co., Ltd., was duly formed, the controlling interest being held by the South Taranaki dairy companies.

The new company took over three steamers then in the trade, two of which were later disposed of as unsuitable, and in 1913 a new vessel was built in Auckland. She was insulated throughout

and fitted with a CO₂ refrigerator. In 1923, owing to the growth of the dairy exports of South Taranaki, it was decided to build another vessel. The company's manager, Mr. F. W. Grainger (now shipping expert to the Dairy Board), designed a suitable vessel and proceeded to the United Kingdom to arrange for the building and delivery.

The shipping company handles all the dairy-produce exported from South Taranaki, carrying general cargo on the return voyage. During the twenty-four years of its existence it has successfully coped with the large volume of trade out of the Port of Patea. The method of transport has proved economical and a safeguard to the quality of the produce.

CERTIFICATE-OF-RECORD TESTING.

In 1912, in co-operation with the N.Z. Jersey Cattle Breeders' Association and the N.Z. Holstein-Friesian Association, the Department inaugurated the certificate-of-record testing of pure-bred dairy cows (originally known as semi-official testing), a service which has had a far reaching and beneficial effect on the improvement of our dairy herds. The subject is fully dealt with in Section II of this work under the heading of "Dairy Cow Testing in New Zealand."

FARM DAIRY INSTRUCTION.

Another matter of outstanding interest and importance which relates to the 1912-13 season is that in this season farm-dairy instruction was put on a proper footing. The first dairy company to conduct this service among its suppliers was Kaupokonui, the officer appointed being Mr. E. Beatson, formerly manager of Raetihi.

Other officers appointed to the Dairy Division Staff during the same season were Messrs. J. R. Curle, formerly manager of Melrose; C. C. Robertson, of Ngaere; G. M. Valentine, of Marlborough; J. P. Stuart, of Eketahuna; and W. R. Harkness, manager of Taratahi. Death has since removed the last two from our company.

CASEIN-GRADING.

There was still only one central casein-drying factory in operation (Rapanui), although eighteen precipitating stations were at work during the season under review. The grading of casein commenced this season, the marking being done by affixing to each sack a departmental seal indicating the grade of the contents. As a result of the first year's grading only 2 per cent. was second grade, this being withheld from export by the makers and disposed of on the local market. Casein grading has never been made compulsory, and is only carried out by officers of the Dairy Division at the request of the manufacturers.

MOISTURE TESTING OF CHEESE.

Hitherto the testing of samples of cheese for moisture had been confined to the Wellington grading-port, but during the season 1912-13 steam drying-ovens for carrying out this work were installed at the other principal cheese-grading ports. The interest taken in this subject led a number of dairy companies to install drying-ovens during the season for their own use in testing cheese-samples. In several instances officers of the Dairy Division gave instruction in the method of procedure to be followed when carrying out the work. The data obtained soon convinced sceptical cheesemakers and dairy companies that no specific percentage of moisture content of full cream cheese could be laid down, a well-made cheese containing the requisite amount of moisture—neither more or less. Also, once made, the moisture content cannot be altered as can the content of butter. Testing at the factory was destined soon to fall into abeyance.

EXPORTS.

Butter exports during the 1912-13 financial year increased by approximately 32,700 cwt., and cheese by 135,908 cwt. The average butter prices for the year represented 117s. per hundredweight and cheese 65s. per hundredweight. Heavy quantities were still going to Vancouver, the 57,360 cwt. exported there during the twelve months representing an increase of 137 per cent. over the previous year's shipments to Canada.

THE NEW ZEALAND MILKING SHORTHORN ASSOCIATION.

This association was founded at Palmerston North on the 19th June, 1913, their first herd-book being issued in 1915. The first president of the association was Mr. James Grant, Woodville, and the first secretary Mr. W. Hunter. The association's headquarters are now at Hamilton, with Mr. A. W. Green as secretary. Twelve herd-books have been issued (1935), and, according to the latest volume, 8,156 males and 27,206 females have been registered.

1913-14.

This season, which marked the close of the period 1896 to 1913, described in a previous chapter as a period of steady expansion in the industry, comprised very little of historic interest.

Dairy-farmers had another good season, for although prices were not specially high the season was very favourable in other respects. Unfortunately, a serious delay took place in getting away the early season's shipments of butter and cheese. This was brought about by the great labour upheaval which commenced in October, 1913, now remembered as the waterside workers' strike. The result was a huge accumulation of both butter and cheese in the available storage accommodation throughout the Dominion. The general position had a bad effect on the marketing of a considerable quantity of our dairy-produce for the 1913-14 season, as it caused first a shortage and then a glut on the Home market, and this undoubtedly resulted in less money coming into the Dominion than would otherwise have been the case.

Exports for the season showed an increase, in round figures, of 87,500 cwt. of cheese and 23,000 cwt. of butter over the previous season. The greatest expansion of the cheese industry took place in the Taranaki and Wellington provinces, while the biggest increase in the output of butter, provincially, was in the Auckland district.

PASTEURIZATION.

In 1913 the pasteurization of milk for cheesemaking was commenced in New Zealand. Several cheese factories in Taranaki pasteurized a small portion of their supply during the season

1913-14 with a view to testing the results. The "experimental" cheese made from pasteurized milk evidenced a decided improvement in flavour as compared with that made from raw milk, and London reports on this initial attempt were of a favourable nature.

CASEIN.

The casein industry showed some progress, and during the season twenty-two factories were engaged in the preparation of casein-curd—fifteen in Taranaki and seven in the Auckland Province. A new drying-factory capable of dealing with an annual output of 1,000 tons was erected at Frankton Junction by the New Zealand Dairy Association, Ltd., curd being received from the association's own skimming-stations only. The casein exported during the season was reported upon very favourably by Home buyers and was stated to be of more uniform quality than that sent away during previous seasons.

SUGAR OF MILK.

During the season New Zealand's first and only sugar-of-milk factory was erected. This was at Edendale, the organization being known as the New Zealand Sugar of Milk and Casein Co., Ltd.

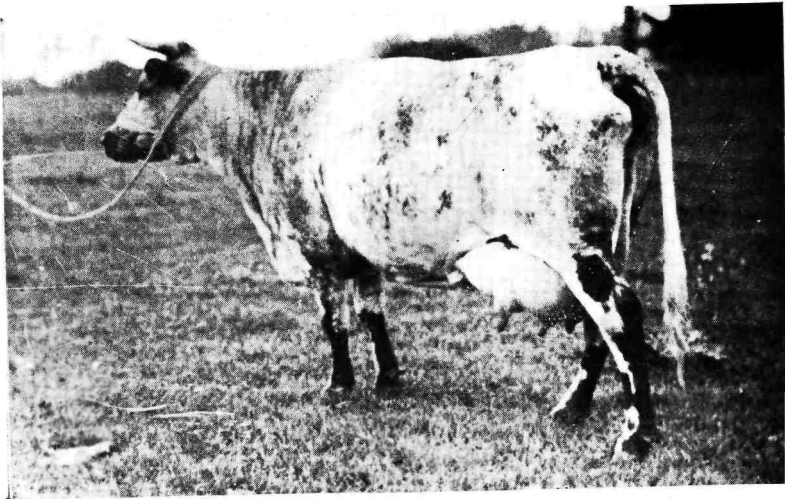
SUMMARY.

From the point of view of this history we have come to the end of the most interesting and in a way most important period historically. Problems are always with us, and the problem of the moment is apt to seem the greatest of all; nevertheless the really great technical difficulties had been solved, and until recent years practically all the problems of the dairy industry have been technical.

The important starting-point in our dairying progress was 1882, which marked the advent of refrigeration. A severe depression in prices set in about 1878, and pastoralists were facing a crisis by 1880. The production of meat, &c., had developed beyond local requirements and the prices received were extremely low. Surplus stock was boiled down for tallow. The export trade of the colony was not great enough to meet its trading requirements, while low wool prices and several bad harvests completed



THREE OF THE FIRST FRIESIANS BRED IN NEW ZEALAND.



MILKING SHORTHORN COW, "MATANGI QUALITY 4TH."

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the depression. Refrigeration, however, completely changed the outlook and marked the commencement of a new era not only for meat, but for dairying, an occupation which so far had received scant attention.

With regard to the export of dairy-produce, stress should be laid on the incentive of the Government bonus offered in 1881. This move had a most important bearing on the industry. It anticipated refrigerated transport of foodstuffs by way of meat, butter, and cheese, and inspired confidence in the future of these products. Frozen meat had to outlive a prejudice, but not so with butter and cheese, since the bulk of the butter sold during the winter trade at Home was not fresh. New Zealand cheese, too, was immediately popular and usurped Canada's highest priced marketing period.

But while refrigeration made possible an export trade in dairy-produce it did not by any means solve the production problem. An export trade now being possible the next step was to develop a scientific method of production, farm manufacture being quite unsuitable for a number of obvious reasons. The effect of refrigeration, therefore, was to concentrate attention upon manufacture, and it was not long before the factory system grew into being, the true start being made in 1882-83. The factory method in turn necessitated an instruction or supervision service not merely to teach methods of manufacture, but to bring about some uniformity in the finished product. It was discovered very early in the history of the export trade in butter and cheese that the wide range of quality and character, not only of the produce but of the containers, detracted from its value on the foreign market. The instruction system, however, while partially filling the breach, soon proved the necessity for a further link between the producer and the consumer in the form of some classification of the produce exported, and so, in 1894, the grading of dairy-produce was begun.

In addition, there were internal troubles. An important one related to the payment for supply. This was where the Babcock tester played its part. All over the world factory-managers were having trouble with watered milk and with suppliers who were dissatisfied with the payment they received for their raw material.

Long years of experiment brought the conclusion that butterfat was the only satisfactory basis, and though there have been many appliances and methods for ascertaining the richness of milk and cream, the butterfat test is to-day, in New Zealand at least, synonymous with the Babcock tester.

Next came the labour problem. Dairying was advancing so rapidly, moving in harmony with a general agricultural development, that dairy-farmers had difficulty in obtaining sufficient labour to milk the cows. One unfortunate effect was the employing of young children, and the child-labour problem was the subject of bitter controversy for several years. It was this general labour shortage, ultimately brought to a head by the child-labour position, that stimulated the development of the milking-machine, a mechanical appliance which has been brought to higher perfection and more general use in New Zealand than in any other dairying country. Additional improvements in milking conditions, such as concrete yards, walk-through sheds instead of the old back-out type, &c., also contributed to the removal of the drudgery of milking as a means of livelihood.

Later still came home separation, also enforced by the rapid increase of land-development in relation to dairying. In a new country settlement always tends to keep ahead of good roads, and dairy-farmers in isolated districts found it impossible during several months of the year to convey a large bulk of milk to the factory. The separator converted the milk into a fraction of its original bulk, and thus still another obstacle was largely removed. One effect of home separation, however, was to create a number of new problems for the factory-manager, who found it a more difficult task to make a high-quality, finished product from the average class of cream received, and was immediately confronted with difficulties he had not hitherto experienced. And so came pasteurization and neutralization. Better roads, followed by mechanical transport, also played a part by enabling rapid collection to be undertaken, with a consequent improvement in quality of products.

Several of the more important breeds of purebred dairy cattle—Jersey, Friesian, Ayrshire, Milking Shorthorn—were now represented in fairly large numbers and rapidly increasing,

breeders' associations and herd-books established, and much foundation work accomplished towards bringing about good-milking strains in the average dairy herds.

These are only the very broad aspects of the development, but will serve to indicate how one problem led to another and how many obstacles there were to overcome on the road of progress. It will also be apparent that a great deal had been accomplished in the brief term of roughly thirty years which elapsed between the start of the factory system and the close of the period under review.

CHAPTER V (1914-1919).

THE PERIOD OF THE GREAT WAR.

Production and price trend—Cream-grading—Imperial Government commandeering—Labour problem—Fixation of prices—Rennet—Casein—Exporters' Association—Dried milk—New Zealand Co-operative Dairy Co.—Summary.

1914-15.

THE period which began in 1914 proceeded to the inseparable accompaniment of war. The influence of war was apparent in all phases of agriculture, sometimes directly dominating the entire position, at others exerting only a minor influence, but, nevertheless, ever present. The Department's annual report for 1915—the first after the outbreak of the Great War—contains a paragraph by the Right Hon. W. F. Massey, P.C., then Minister of Agriculture as well as Prime Minister, which is worthy of inclusion here for the reason that it concisely summarizes the general effect of the war in its early stages on New Zealand agricultural development. Mr. Massey wrote: "No review of New Zealand agriculture for the year 1914-15 can fail to take large account of the world war now being waged. The abnormal economic situation created by the war has caused an appreciation in the values of the Dominion's staple produce exports, which is already influencing the trend of our rural industries in several directions. While the cause of this upward movement cannot but be regretted, the outstanding fact remains that the great inflow of funds in exchange for our exports has brought abundant prosperity to the farming industry, and through it to the country as a whole, thereby

materially assisting the Dominion to meet the heavy sacrifice and strain involved by the war. Never before in the late-time history of New Zealand has the value of its agricultural output reached such a high ratio to the total production. The saying that agriculture is the mainstay of New Zealand was never more axiomatic than at present."

But that was only the first glimpse of the picture, and from the most favourable angle. In a very short space of time rising prices were to be accompanied by rising costs of production and, consequently, of living. Agricultural industry was to be beset with acute problems arising from a labour shortage, and butter and cheese manufacture, because it required skilled labour, was to suffer most of all. The rapid pace at which butterfat-production increased merely helped to aggravate the position, and as a result quality suffered. Every branch of the dairy industry was affected in some way or another—production on farms, manufacture in the factories, storage, transport, and marketing—throwing tremendous labour and responsibility on the workers in the industry, from the dairy-farmer to the administrator.

The most prominent feature of the dairy industry of New Zealand during the decade 1905-14, and more particularly during the latter part of that time, was the enormous development in the production of Cheddar cheese. The extension of this branch of dairying was phenomenal and showed every indication of continuing. In 1905 the export of cheese stood at 86,920 cwt., whereas in 1914-15 it was 755,300 cwt., or an increase of 770 per cent. The number of cheese factories established in both Islands rose to 327, no fewer than 26 being added to the total during the year under review.

The average selling-prices of butter and cheese were respectively 125s. and 75s. per hundredweight, the highest prices yet reached. The supplying of large quantities of New Zealand cheese to the Imperial Government for the use of the British troops was undoubtedly one of the principal factors in maintaining the price of cheese since the beginning of the season. Trade with the United States and Canada fell off owing to New Zealand butter prices being far above market value in America. Another factor which

had some influence on the trade in butter between New Zealand and Canada was the raising of the tariff by the latter Dominion to the extent of about 5 per cent. *ad valorem*.

The casein business was badly hit owing to the closing of the German market, and our exports of this product fell off rapidly, only 87 tons being shipped during the season. Of the two central drying-stations, one closed down indefinitely.

CREAM-GRADING.

A matter of historic importance attaching to 1914 relates to the introduction of the cream-grading system. The Dairy Division had been urging the adoption of the system for some years, but without result. In 1914, however, a group of dairy factories operating in the district north of Auckland entered into an agreement to have their cream graded as from the commencement of the season. Relative prices were fixed for first and second-grade creams, the difference being about $\frac{1}{2}$ d. per pound butterfat. The fat content of the cream was fixed at a minimum of 35 per cent. Delegates from the various factories met in Auckland and the proposal was carried out in a thorough and businesslike manner. The Kaipara and Northern Wairoa dairy companies were the conveners of the meeting. The agreement entered into between the various companies provided that suppliers rejected at one factory on account of defects would not be accepted by the others. It is interesting to recall that this very necessary restriction was not legally enforced generally until almost twenty years later.

In his report for the season the Director of the Dairy Division stated that the result of the year's cream-grading operations showed that better cream was received at the factories participating in the scheme, while in a number of instances the quantity of second-grade butter made was also reduced. The objective of cream-grading is to grade the cream according to its suitability for buttermaking, a first-grade cream being one which under normal conditions of manufacture would be expected to make first-grade butter.

Herd-testing showed no progress, but interest was attached to the certificate-of-record testing by the fact that the Friesian heifer "Netherland Princess IV" put up a world's record for the breed according to age. Commencing her record at the age of 2 years 341 days she produced in the 365 days the yield of 805.77 lb. butterfat from 19,621.60 lb. milk. This splendid animal was bred and tested by Mr. John Donald, of Westmere.

1915-16.

The noteworthy feature of the dairying year 1915-16 was the requisitioning, on Imperial account, at a fixed price, of one-third of the output of the cheese factories, an operation covering approximately 15,000 tons at an outlay of £1,000,000 sterling. Prices continued to rise, being, on an average, 150s. per hundred-weight for butter, and 88s. per hundredweight for cheese. These higher values were unquestionably due mainly to causes governed by the war. Supplies of butter to the English market from Denmark were considerably less than usual owing to the higher prices offering for butter in Germany. The interference with shipping greatly reduced the quantity of butter reaching England from Siberia. The embargo placed upon the export of butter by the French Government, and a disastrous drought experienced in the Commonwealth of Australia were also operating in favour of higher prices for butter on the market of Great Britain. The prices for cheese were influenced principally by the large quantities required by the British War Office for the use of the army, the remainder being insufficient to meet the demands of the ordinary trade. On the other hand, expenses incurred in the marketing of dairy-produce from New Zealand increased considerably since the outbreak of war, freight on butter being 50 per cent. and that on cheese 37½ per cent. above normal rates, with additional charges for marine insurance amounting to 33¼ per cent., and a war risk of 21s. per cent. These advanced costs obviously tended to offset the benefits of the higher prices received.

A great deal of additional responsibility was falling on the shoulders of the Director of the Dairy Division, who was made responsible for the purchase and inspection of supplies of butter for military camps and transports. It also fell to the Dairy Division to apportion the total quantity of cheese which each dairy

company and cheese-factory proprietor would have to supply in order to fill the large amount represented by the Commandeer, to see that the quantities were supplied, to grade the cheese, and to check the weights of each company.

1916-17.

By an Order in Council dated 16th January, 1917, the whole of the output of cheese available for export from New Zealand was, in effect, requisitioned on behalf of the Imperial Government. The price fixed was 9½d. per pound f.o.b. ocean steamer, for first grade, with a reduction of ¼d. per pound for any second grade. Provision was also made for the payment of an advance up to 90 per cent. of the value of cheese which had been in store awaiting shipment over one month. On the recommendation of the Dairy Division advance payments were subsequently made on any cheese six weeks after manufacture, irrespective of the time it had been held in grading-store.

Up to this season the war had exerted a favourable influence on our dairy industry, inasmuch as it had caused an increase in production and a very definite improvement in prices. During the 1916-17 season, however, other factors entered the position. The depletion of rural man-power necessitated by the requirements of the Expeditionary Forces began to tell heavily. In relation to the local consumer maximum prices had to be fixed for several foodstuffs, and other kindred measures taken to reduce the cost of living. Our overseas trade was seriously hampered by a shortage of shipping, causing enormous accumulations of produce in the Dominion, with an attendant locking-up of funds. Labour difficulties in regard to dairying were so acute that a number of dairy-farmers were compelled to milk fewer cows. It was also difficult to get experienced men for dairy factories. In view of this position it is worthy of record that despite the staffing problems of the factory-managers, a considerable improvement in cheese-quality was apparent. This was attributed to the spread of pasteurization of milk for cheesemaking. During the season seventy-six factories were operating regenerative pasteurizers and the necessary coolers for treating the milk. The South Island had previously held aloof from the pasteurizing process, but during the 1916-17 season a start was made with this system in the southern factories.

RENNET AND PEPSIN.

When the season opened it was feared, on account of a threatened shortage of rennet, that the production of cheese might be seriously interfered with. As the usual supplies were drawn mainly from Denmark and Sweden, and in small quantity from England, it was considered that the ramifications of the war might easily prevent supplies reaching New Zealand. Fortunately, this did not happen. It was ascertained later on that the majority of dairy companies had taken the precaution to obtain stocks of rennet in advance of their requirements. Subsequently, shipments of later orders, about the arrival of which there was some doubt, came to hand, much to the relief of those companies which had no surplus supply. Further relief was afforded when it became known that a substitute in the form of pepsin could be used.

Early in the season the question of utilizing pepsin was considered, and information having been received from the Dairy and Cool Storage Commissioner of Canada as to the success which attended trials of pepsin in that country, the Division was able to take the matter up without delay. A series of trials were then made at the Kaponga Dairy Factory, which proved conclusively that pepsin of the right quality could be used for supplementing the supply of rennet, or for replacing the latter if found necessary. Pepsin in quantities being available about this time, many of the dairy companies decided to procure a sufficient amount for early use. It should also be recorded that the Dairy Division took the precaution of buying up a large quantity of pepsin and holding it against a possible shortage of supply of rennet.

The newly formed New Zealand Co-operative Rennet Co., Eltham, established 1916, was fairly successful in collecting calves' vells during the early months of the season, and some twenty-five thousand of them were shipped to England to be made into rennet for return to New Zealand. The first lots of rennet from this source arrived in the Dominion late in the season. The story of the rennet company is told in the second section of this work, from which it will be seen that this company later developed into a large and highly efficient organization, manufacturing both rennet and cheese colouring. It is interesting to recognize that this important industry would probably not have materialized except for the war.

CASEIN.

The casein industry showed an improved position during the year, although it was still confined to the North Island, where nine precipitating casein factories and one drying-station were in operation. Other factories were running for a portion of the time. Some experiments in connection with the saving of casein from buttermilk were also undertaken, though the results were not very encouraging.

NEW ZEALAND DAIRY-PRODUCE EXPORTERS' ASSOCIATION.

This organization was established in 1917, Mr. J. T. Martin, of Wright, Stephenson, and Co., was the first chairman, and Mr. W. H. Evatt (at one time on the staff of the Department of Agriculture) was the first secretary. The association was formed by New Zealand exporting houses and New Zealand representatives of British dairy-produce importing firms for the purpose of generally watching the interests of New Zealand exporters and British importers of New Zealand dairy-produce.

1917-18.

DRIED MILK.

The salient feature of the dairy year 1917-18 was the boom in dried-milk or milk-powder manufacture, from which phenomenally high returns were being received. The principal development related to the preparation of a food primarily intended for infants and invalids, packed under the name of Glaxo, and now a well-known product in many quarters of the globe. Four large factories dealing with many thousands of gallons of milk daily were in operation, the production of dried milk for the year exceeding 2,500 tons. The founders of this branch of the industry were Messrs. Joseph Nathan and Co., who hold the patent rights for the manufacture of Glaxo. The bulk of this product made during the latter war years was purchased by the Imperial Government on a butterfat basis (for use principally as a substitute for fresh milk), and at a price considerably above that paid at cheese and butter factories. Consequently, many dairy-farmers gave the dried-milk industry their liberal support, and also agreed to continue supplying milk for this purpose for a period of years under

certain specified conditions. For a time there was some apprehension on the part of directors of co-operative dairy companies manufacturing cheese and butter as to the effect of the competition for supplies of milk between the milk-drying factories and their own companies, their contention being that some of the latter might have to close or be so weakened by the withdrawal of support in milk-supply that it would not pay to carry on. The fears, however, were never realized, the dried-milk industry failing to develop beyond a certain moderate maximum. Associated action on the part of the banks was an important factor at this juncture, inasmuch as restrictions were placed on the amount of money which would be made available to dairy companies for the establishment of milk-drying factories. It may be mentioned that the cost of building and equipment for a standard plant was at least £60,000.

SALE OF BUTTER AND CHEESE TO THE IMPERIAL GOVERNMENT.

The Imperial Government bought the season's output of cheese at 10d. per pound f.o.b. for first grade, with a reduction of $\frac{1}{4}$ d. per pound for second grade, producers to pay cost of storage up to three months and cost of insurance until the cheese was placed on board the steamer.

The exportable surplus of butter was sold to the Imperial Government at 157s. per hundredweight f.o.b. with a reduction of 1s. per hundredweight for each point below first grade. It was also provided that 50 per cent of any profit made on the butter be paid to the producers, the terms as to storage and insurance being the same as in the case of cheese. No profit, however, materialized, and it would appear that this proviso was scouted. Ninety per cent. of the value of the produce was made available free of interest as soon as the cheese or butter was twenty-eight days in store, thus facilitating dairy companies' monthly payments to suppliers.

RENNET AND PEPSIN.

The position regarding rennet supplies was still by no means comfortable, though, fortunately, supplies came forward from Denmark and Sweden in fairly large quantities, and some was also obtained from England, thus enabling dairy companies to carry on

the manufacture of cheese. Regarding pepsin, the Director of the Dairy Division made the following interesting comment in his report on the year's operations: "For some time past rennet has been supplemented to a considerable extent by the use of pepsin, but for some reason best known to themselves many of the cheesemakers have preferred to use rennet only, instead of eking out their short supply by utilizing a proportion of pepsin, as recommended by the Dairy Division. Some of the more enterprising factory-managers have prepared small quantities of rennet from calves' vells obtained in their own district, but the volume of this locally manufactured article has been comparatively small." The Co-operative Rennet Co., previously mentioned, had so far not been successful in the attempts made to provide a suitable supply.

CASEIN.

A considerable amount of progress was made during the year with regard to the development of the casein industry. In all, some 341 tons of lactic-acid casein and 49 tons of rennet casein were prepared for export. In addition to this quantity, some 20 tons of casein were saved from buttermilk, the increase in total production representing 100 tons over the figures of the previous season.

1918-19.

This was a year of difficulties. It was a very bad season climatically, being severely cold and wet. In the Province of Taranaki there was a heavy mortality of dairy cows, due to the lack of sufficient feed during the winter and early spring months. Even many of those that survived were in such low-condition owing to semi-starvation that they gave a poor yield of milk for some time after calving. Fortunately, the season improved as the year progressed, and milk-production developed to normal. Labour shortage reached a very acute stage, and finally came the influenza epidemic, which for a while considerably disorganized the dairy as well as other industries.

DRIED MILK.

The factories already established received larger supplies of milk for drying than formerly, resulting in a total production of 3,200 tons for the year, practically all of which was packed under the trade name of Glaxo and sold to the Imperial Government at 1s. 4½d. per pound. Much of the product found its way to France for use by the soldiers. In 1918 the managers of three of the larger Waikato factories were sent to the United States and Canada "to make exhaustive inquiries as to the wisdom of building and equipping several large factories on the most modern system for the production of milk-powder." The New Zealand rights for certain processes in the making of powdered milk were secured by the companies concerned.

In June of the following year (1919) a further delegation left New Zealand for North America for the purpose of making inquiries into the manufacture and marketing of milk-powder, sugar of milk, and other milk by-products. Messrs. Forsyth and Murdoch represented a dairy-industry committee set up in Taranaki, while Mr. T. C. Brash represented the National Dairy Association. The delegation was accompanied by Mr. W. Dempster, representing the Department of Agriculture, who subsequently extended his range of investigation to the United Kingdom and certain parts of the Continent of Europe. The New Zealand dried-milk, milk-sugar, and allied industries have been considerably assisted as the result of Mr. Dempster's experience.

BUTTER-BOXES.

In 1918 the oblong box was made compulsory as an export package for New Zealand butter.

CREAM-GRADING.

The grading of cream on a systematic basis was still confined mainly to the Auckland Province, where a number of factories had adopted it. At the outset a difference of only ½d. per pound of butterfat was made as between first and second-grade cream, but this narrow differentiation had not been the means of stimulating a satisfactory degree of care on the part of the suppliers.

During the season under review a number of factories increased the difference in price to 1d. per pound of butterfat, which subsequently proved a step in the right direction by tending to bring about the improvement desired. The whole subject, however, was receiving wider attention, and during the year several cream-grading conferences were held and attended by a large number of factory-managers along with Instructors of the Dairy Division, the principal object being to gain further experience and also ensure a greater degree of uniformity in the work. The acquisition and retention of uniform standards is, after all, the most essential and at the same time the most difficult feature of all grading systems dependent on personal judgment.

TESTING OF MILK AND CREAM.

During the season the Kaupokonui Dairy Co., one of the largest concerns in Taranaki, adopted the practice of having the milk delivered by suppliers tested by an independent tester instead of by the factory-manager. The work was undertaken by Mr. S. McKenzie, the company's farm dairy instructor. Although one or two other dairy companies later followed the same procedure the system has shown no tendency to increase.

Dr. C. J. REAKES.

Mention should be made of the service rendered to the industry by Dr. C. J. Reakes, who in 1918 was appointed to the position of Director-General of Agriculture. While Dr. Reakes's name has seldom figured in press reports of matters connected with the dairy industry, nevertheless his wise counsel and sound judgment has on many occasions been a most important factor in the launching of new enterprises or the improving of existing services. The establishment and successful operation of the New Zealand Herd-testing Central Executive was largely due to his influence, while the founding of a dairy laboratory at Wallaceville also had his sympathetic support. Dr. Reakes also played an important role in the many conferences connected with the industry during the depression years 1930-35, when problems relating to quality, production, and marketing were causing much concern to those in administrative positions.

1919-20.

The dairy industry continued to enjoy prosperity under the *system of Imperial Government purchase contracts, which were renewed* at the commencement of the season. The expansion of cheese-manufacture continued, and New Zealand was now one of the principal cheese producing and exporting countries of the world. Cheese factories numbered 384, of which 260 were situated in the North Island. Of the total, 347 were co-operative and 37 proprietary. The system of pasteurization of milk for cheesemaking was definitely past the novelty and experimental stage, and during the season under review pasteurizers were in 155 factories manufacturing 32,000 tons of cheese or 53 per cent. of the year's production.

In 1919 the Dairy Division issued a plan of a model cow-shed as a working basis for dairy-farmers. The need for improvement in this direction had been long apparent, and not only did the Division's plan fill a long-felt want, but it did a great deal, through turning attention to this subject, toward educating dairy-farmers in this branch of their activities.

THE NEW ZEALAND CO-OPERATIVE DAIRY CO., LTD.

This organization was the outcome of the amalgamation of three of the largest dairying concerns in the Waikato, the amalgamation being finally effected in 1920. Most of the particulars which follow were taken from the booklet "The Empire's Dairy Farm" published by the company in 1923. The three companies which in combination constituted the New Zealand Co-operative Dairy Company, Ltd., were the New Zealand Dairy Association, the Thames Valley Dairy Company, and the Waikato Dairy Company.

The New Zealand Dairy Association.—The New Zealand Dairy Association, Ltd., began its existence as a co-operative concern in 1901, when 847 shareholders agreed to take over at a price of £40,000 the business operated by the New Zealand Dairy Association, in which the partners were Messrs. Lovell and Christmas and Mr. Wesley Spragg. The association then had an output of 1,200 tons, of which 400 tons were consumed on the local market

and 800 tons exported to London. The first directors of the new company were Messrs. Wesley Spragg (managing director), Jos. Gane, W. E. West, T. C. Blackett, C. Hosking, H. J. Greenslade, and G. P. Ewing.

The business equipment consisted of two central factories, one at Pukekohe and one at Ngaruawahia, and forty skimming-stations. The skimming-station system was the basis upon which the business had been developed. The company undertook to erect a skimming-station in any district which would guarantee 250 cows. Payments to suppliers were based upon the size of the skimming-station—that is, the supplier to a small skimming-station where the operating-expenses were high received a differential rate compared with a supplier to a big skimming-station where the supply was big and the working-expenses small per unit of product in each case. In other words, although all the skimming-stations were branches of one organization, each skimming-station was apparently regarded as a separate institution so far as running-costs were concerned.

One or two interesting experiences are recorded. For instance, an unexpected drought in 1905 left the company short of butter for the local winter trade, and supplies had to be reimported from Britain. The same position arose again in 1908 when a parcel of 62½ tons had to be brought back from England to supply the local market. Another interesting experience related to 1908, when advice was received by the company that the London agents were holding a shipment by the “Ionic” for 148s. and 150s., at which figure 1,700 boxes were finally sold. This was said to be the first recorded instance of an effort being made to hold for a high figure on account of short supplies, and was also said to be the highest price realized up till then for New Zealand butter.

Thames Valley Dairy Company.—The Thames Valley Co-operative Dairy Co., Ltd., was formed in 1901, and for the season ending 1902 had sixty-seven suppliers. The original factory is still standing in Thames Road, Paeroa.

In the first season 94 tons of butter was made, of a gross value of £7,275. The turnover in the final year of independent existence was over 100 times greater. The office of the company in 1902 consisted of one wooden room, but by 1920, when the amalgamation



N.Z. Co-op. DAIRY Co.'s DRIED-MILE FACTORY AT WAITOA, WAIKATO.

was effected with the New Zealand Co-operative Dairy Co., Ltd., the company owned an up-to-date concrete suite of offices costing £3,000, and the office staff had increased from one to fourteen. The suppliers had increased from 67 to 1,200. The first factory on the Hauraki Plains was erected at Kopu in 1913, and from that date that district has contributed an increasing proportion to the production of the province. The first cheese-factory operated by the company was opened in 1916 at Waitoa, and in that year 316 tons of cheese was made. The company went in largely for cheese, and finally had ten factories in operation with a total output in 1920 of 3,606 tons. In its later stages the company began an ambitious enterprise in a large dried-milk factory at Waitoa, the largest of its kind in the world.

Waikato Dairy Co.—The Waikato Co-operative Dairy Co., Ltd., had a rather dramatic birth. While engaged in business as a hardware-merchant, Mr. William Goodfellow imported from the United States of America for a client a plant for the manufacture of butter from home-separated cream, but the client failed to take delivery. To make use of the plant Mr. Goodfellow, associated with Mr. F. Blomquist, a dairy-factory manager conversant with the home-separation system, established the business as a proprietary concern in a small way at the back of the Hamilton Horse Bazaar in 1909, but at the end of the first season re-formed the company upon a co-operative basis. The farmer suppliers, however, were slow in taking up shares, and it was not until it was made worth their while by an extra bonus paid to shareholders as against non-shareholders, as an inducement to take up shares, that the company began to feel its way into active co-operation.

The certificate of incorporation as a co-operative company is dated December, 1912. Mr. Goodfellow was managing director, and Mr. T. L. Hames was secretary. The company advanced so rapidly that the small building in Hamilton was insufficient for the output, and consequently a new factory was erected at Frankton, and opened on 16th July, 1913. In 1915 the Waikato Co-operative Cheese Co. was formed. This was operated as an independent concern, but in conjunction with the Waikato Co-operative Dairy Co. To cope with the output of butter offering from the Lower Waikato, a factory was built at Tuakau, and was opened in November, 1917. This replaced a factory

which had formerly been operated at Mercer. The amalgamation with the New Zealand Dairy Association was finally effected in 1919.

In addition to the manufacture of butter and cheese, the New Zealand Co-operative Dairy Co. carries on extensive operations in the principal by-products of milk, as well as conducting certain important subsidiary enterprises relating to the servicing of their business, such as boxmaking, laboratory work, engineering, and the provision of fuel through the medium of coal-mines. The company is also a shareholder in large fertilizer-works, and is thus able to supply the company's shareholders with fertilizer at moderate prices.

The following figures give a good general idea of the growth and extent of the company's operations :—

OUTPUTS OF COMMODITIES MANUFACTURED BY THE NEW ZEALAND CO-OPERATIVE DAIRY CO., LTD.

Season.	Butter.	Cheese.	Casein.	Milk-powder.	Condensed Milk.
	Tons.	Tons.	Tons.	Tons.	Tons.
1919-20 ..	8,717	2,549	386	..	..
1920-21 ..	12,688	5,498	468	..	..
1921-22 ..	18,218	4,691	497	1,873	..
1922-23 ..	22,020	3,482	826	3,456	..
1923-24 ..	20,662	4,278	638	3,611	..
1924-25 ..	22,512	4,626	657	3,981	..
1925-26 ..	22,266	4,767	922	2,260	..
1926-27 ..	25,772	5,019	767	4,114	..
1927-28 ..	26,072	4,250	723	4,110	183
1928-29 ..	27,195	5,949	714	4,341	934
1929-30 ..	32,451	6,563	1,200	4,383	..
1930-31 ..	32,289	8,389	1,043	5,017	16
1931-32 ..	33,419	7,582	723	5,402	347
1932-33 ..	39,252	10,979	726	4,460	1,009
1933-34 ..	43,637	11,421	810	4,777	633
1934-35 ..	42,089	9,019	931	5,345	1,860
1935-36 ..	47,500	7,625	1,239	6,032	1,953

SUMMARY.

The important factors relating to the years 1914 to 1919 have already been referred to in the text. It was a period in which the dairy industry, in fact, the whole life of New Zealand, industrial and otherwise, was dominated by the influence of the Great War. The immediate effect on the dairy industry was, on the one hand, to create difficulties with regard to labour and transport, and, on the other, to stimulate production, particularly of cheese, and to increase prices as well as costs. Marketing was

simplified by an unlimited demand for all that could be produced and by the Imperial Government's commandeering of supplies. In addition, a new industry was virtually created—namely, the manufacture of dried milk, principally in the form of what is well known as Glaxo.

A few figures will illustrate the position. For the year ending 31st March, 1913—the year preceding the outbreak of war—New Zealand exported 369,008 cwt. of butter, valued for Customs purposes at £2,058,683, as compared with 429,627 cwt., valued at £3,543,724, for the year ending 31st March, 1919. For cheese the 1913 figures were 634,170 cwt., valued at £1,859,179, while the 1919 totals were 990,687 cwt. and £4,666,944. A year later the cheese exports rose to 1,540,949 cwt., valued at £7,720,366. Statistics relating to dried milk are difficult to obtain, as in most cases Customs figures do not distinguish between the different varieties of the preserved product, but some idea of the development may be visualized from the fact that for 1914 the total value of preserved, condensed, evaporated, and dried milk or cream exported was £791, whereas in 1919 the value of dried milk alone was more than £500,000 sterling, reaching a peak in 1921 at over £960,000. Large quantities of the preserved commodity were used for the soldiers overseas, where the fresh product was not available, and in England where there was a shortage of supply. Glaxo was used extensively in hospitals connected with the War. Obviously the dried-milk trade did much to develop the dairy industry.

Another important side-line to the industry was the establishment of the factory at Eltham for the manufacture of rennet, which not only safeguarded the position and tided us over the difficulties of the war period, but has served to make the industry independent of foreign sources of supply.

From the purely manufacturing aspect the outstanding features were the introduction of cream-grading and the spread of pasteurization. Quality, on the whole, was well maintained, despite the tremendously increased output and the growing shortage of skilled workers.

Broadly summed up, there were no radical changes or reforms as applied to production methods, the whole industry now being more or less stabilized and settling down to a routine of accepted standard procedure.

“ It may be rightly claimed that the dairy industry ‘ saved the situation ’ for the Dominion in the past year. With a high-water-mark price of 28os. per hundredweight from the Imperial Government for the bulk of the season’s output of butter, the industry responded in remarkable fashion, almost doubling in production as compared with the preceding season, and setting up a record for annual output. Cheese-manufacturers were also favoured with higher ruling prices than anything heretofore recorded, and, notwithstanding an extensive turnover to butter, the output of cheese was well maintained at near the previous season’s big volume of production. These results were obtained in a season in which weather conditions were by no means uniformly favourable for dairying. For the year ended 30th June, 1921, the shipments of butter and cheese were valued at £16,823,963 out of total exports of £50,831,881, or over 33 per cent. of the latter. To this may be added, in round figures, another million for condensed milk, sugar of milk, and casein.”

The point in the foregoing statement which immediately focuses the attention is the phenomenally high price quoted for butter—namely, 28os. per hundredweight. There was, during the season, a heavy increase in the production of butter, a number of factors operating toward this result. It was considered in the previous spring by those in authority in England that there would be a shortage of butter on the Home markets. To encourage production the price paid for our butter by the Imperial Government for the season under review was increased by some 99s. per hundredweight over that of the preceding season. The effect was as planned, and from the 1st August, 1920, to the 31st March, 1921, the quantity graded showed an increase of some 88 per cent. Russia, which in pre-war days supplied some 35,000 tons of butter to Britain annually, was still off the market. The quantity of butter imported by Britain during 1920 was only about 41½ per cent. of the pre-war figures. The rate of exchange between the United States of America and other countries induced a considerable export of butter to the United States from Denmark and the Netherlands, as well as from Argentine

and Canada. Altogether, relevant factors tended to inspire confidence in the future of New Zealand's butter trade and to favour the manufacture of this product in preference to cheese. The net result of the whole situation was the most extensive change from the manufacture of one product to another that the New Zealand dairy industry had yet experienced. The greatest change took place in Taranaki, where the majority of large dairy companies changed their manufacture to butter either in whole or in part, though the movement was also in force to a greater or lesser extent in the other dairying districts.

DISTRIBUTION OF BUTTER FOR LOCAL CONSUMPTION.

During the months of June to September, 1920, inclusive, the quantity of butter held by dairy companies and others, outside the Imperial Government Supplies Department, was insufficient to meet requirements for local consumption. Arrangements were made by the New Zealand Government for the purchase from the Imperial Government of the quantities necessary to supplement the available "free" butter for New Zealand's winter requirements. An Order in Council of 17th June fixed maximum sale prices for butter made up to the end of July at 1s. 5½d. ex store, and 1s. 9d. retail. In order that the Government butter might be placed on the market as necessary, the Dairy Division was called upon to effect sales to the usual distributors as stocks were required. These transactions represented over sixty-nine thousand boxes of butter, and enabled consumers to get what quantities were needed until the spring make had sufficiently developed to ensure ample supplies. With the advent of the current season's make on the local market new prices were fixed. By Order in Council dated 18th October, 1920, local prices for the season's make were fixed at 2s. 3d. per pound for cash over the counter and 2s. 5d. booked and delivered. These prices were in force until the end of the financial year, when the contract between the Imperial Government and the dairy factories was completed. While the Dairy Division was made responsible for sales and allocation, the financial side was in the hands of the Imperial Government Supplies Department, an organization made necessary by war conditions, but later dispensed with on the return to normal peace-time routine.

The contract for the disposal to the Imperial Government at 28s. per hundredweight or 2s. 6d. per pound, f.o.b., of our surplus butter to the end of March, 1921, made necessary an adjustment of the local retail price. It was the opinion of many urban consumers that the cost of production did not warrant the local consumers paying a price on a parity with the value for export. A Select Committee of the House of Representatives, known as the Butter Prices Inquiry Committee, was set up to take evidence and report on the matter. The Committee in due course announced that it was "of the opinion that the dairy-farmers are entitled to the full benefit of the price for butter." Finally, the butter prices equalization payments were arranged, so that the dairy-farmer could get the market price for such butter as went into local consumption. To effect this and at the same time fix a retail price of 2s. 3d. cash over the counter, the consumer was assisted to the extent of 6d. per pound from an equalization fund established by the Government.

The whole matter is interesting as indicating a novel situation so far as this country is concerned.

CHEESE-QUALITY.

For some few years the quality of our cheese had given cause for a certain amount of adverse criticism, but during the season under review showed a definite improvement. This improvement was attributed principally to three factors—(1) the increasing adoption of the practice of pasteurization of milk for cheese-making; (2) the longer maturing of the cheese, both on the curing-room shelves and in the cool-store while awaiting shipment; (3) the cumulative effect of differential prices for quality. By Order in Council dated 21st October, 1920, it was required that all cheese be held at least fourteen days in the curing room prior to despatch for shipment.

GRADING-FEES.

From the 1st January, 1921, a grading-fee was charged, the rate being 1d. per box for butter and 1½d. per crate of cheese.

MILK-POWDER.

In addition to the factories for the drying of whole milk operated by Messrs. Joseph Nathan and Co. at Bunnythorpe, Matangi, Matamata, and Te Aroha West, there was running during the season a factory at Waharoa, owned by the Zealandia Milk Products Co., and operated for the purpose of drying skim-milk. The Cambridge Dairy Co. also erected, at Hautapu, a new factory for making skim-milk powder, which was to commence operations the following spring.

FARM DAIRY INSTRUCTION.

Nineteen Farm Dairy Instructors were at work during the season. The annual report states that on commencing duty they found 75 per cent. to 90 per cent. of the milking-machines in their respective districts in an insanitary condition. The farm separator was usually found in better condition than the milking-machine, the suggestion being that dairy-farmers recognized that their supply of butterfat was likely to be reduced if the separators were not kept in proper order.

GRADING CONFERENCES.

Throughout the season nine grading conferences were held under the auspices of the New Zealand Factory Managers' Association. Five of these meetings were held at grading ports where the actual work of grading was viewed by the factory representatives. Other of these conferences were held at dairy factories in the Dannevirke, Kairanga, and Pahiatua districts. Officers of the Dairy Division played a prominent part. Much good results from these conferences, which are highly instructive, tending to broaden the factory-manager's knowledge of the business by educating him as to the essentials of a good article as well as enabling a comparison between his own work and that of other makers.

1921-22.

The prospects of an unlimited demand for butter at a luxury price, which appeared so certain the previous season, were not fulfilled during the period under consideration. It was a good season climatically, but the markets for butter and cheese,

especially the former, were marked by extreme fluctuations, due largely to post-war and British decontrol factors. A serious crisis in the British market for butter which occurred towards the middle of the 1921-22 dairying season entailed low advances for milk and cream supplies, with consequent embarrassment for many dairy-farmers. At other periods, however, the market rose to a high level, and the aggregate return for the season averaged out at a reasonably satisfactory figure. Fairly good values ruled for dried milk, with special reference to skim-milk powder, the manufacture of which was largely increased. Satisfactory returns were also received for casein. Grading figures showed an increase of about 31 per cent. for butter and a decrease of approximately 2 per cent. for cheese. The slight decrease on cheese was due merely to market fluctuations, and the consequent changing-over in a number of districts from the manufacture of cheese to butter.

The average seasonal pay-out per pound of butterfat for all cheese, butter, and dual-plant factories, which had been rising steadily during the War years, and had jumped abruptly from about 1s. 8½d. in 1919-20 to slightly more than 2s. 4d. in 1920-21 fell dramatically to, roughly, 1s. 2½d. in 1921-22, which, together with low ruling prices for other export primary products, necessitated rather severe measures being taken to balance the national budget—cuts in wages, increase in taxes, mortgage moratorium, &c. While dairy-produce prices rose somewhat the following season, butterfat pay-out up to and including 1928-29 varied between approximately 1s. 2½d. and 1s. 6¼d.

Although the mortgage moratorium gave some measure of relief to farmers, the burden of highly enhanced land-values consequent upon the period of sharply rising prices from 1914 to 1921 had to be met mainly through more efficient farming practice. Actually the period from 1921-22 to 1928-29 saw phenomenal efficiency increases in dairy-farming. The rapid development of herd-testing and the use of cheap superphosphate made in New Zealand from imported phosphatic rock quarried in Nauru, Ocean, and Ellice Islands were the main effective factors. Viewed broadly, the War period capitalized high produce prices into the land and when prices fell efficiency was increased to vindicate the land-values created formerly.

PART SKIM-MILK CHEESE.

The Hawera Dairy Co. commenced the manufacture of "part skim-milk" cheese on a small scale toward the end of the year. This was the beginning of what afterwards developed into the partial diversion to "standardized" cheese, a somewhat unfortunate experiment in our dairy industry, which will be dealt with in due course.

DIRECTOR OF DAIRY DIVISION.

In 1921 Mr. W. M. Singleton was appointed Director of the Dairy Division on the retirement owing to ill health, of Mr. D. Cuddie. Prior to this, Mr. Singleton had been acting as Director as necessitated by Mr. Cuddie's absence from New Zealand or headquarters.

Mr. Singleton, one of the best-trained experts that New Zealand has been fortunate enough to acquire, was born in 1878 on a dairy-farm in Leeds County, Ontario, Canada. He had the benefit of boyhood training in milking and attending to dairy cattle, together with the delivery of milk to cheese factories. At an early age he entered a dairy factory, became manager, and afterwards superintendent of a number of factories. During the winter season he attended dairy schools, and finally qualified for diplomas at Kingston (Ontario), Guelph (Ontario), and Madison (Wisconsin, U.S.A.), three of the foremost dairy schools in North America. Before leaving the Madison School he was employed on the staff for a period as Instructor. Well-known names among the college Professors under whom Mr. Singleton received tuition were Dr. S. M. Babcock, E. H. Farrington, Professor King, Professor H. H. Dean, and G. G. Publow, to whom Mr. Singleton was assistant.

As previously stated, Mr. Singleton came to New Zealand in 1901 as dairy instructor, was appointed Assistant Director of the Dairy Division in 1909, and Director in 1921. Since his appointment to administrative office the New Zealand dairy industry has gone through some difficult periods, necessitating many minor reforms and much important legislation. The present high standard of efficiency and organization is due in no small measure to Mr. Singleton's thorough knowledge of the business, sound judgment, and well-balanced attitude toward the many problems which confront one in his position.

1922-23.

The Minister of Agriculture, the Hon. W. Nosworthy, summed up this season in the following words: "The agricultural year of 1922-23 may be fairly described as a good all-round period for primary producers in New Zealand. Production of our main staples has been heavy, average market prices satisfactory in general, and financial conditions distinctly easier compared with the preceding season. Climatically the main season in most parts of the Dominion has been marked by an exceptionally high average rainfall. Generally speaking, this proved of great benefit to the grasslands, and to those leading branches of farming mainly based on pasturage . . . The chief feature of the year has been the phenomenal expansion of the dairy industry, as evidenced by another big advance in production and all-round development. With a surplus output this season of some 66,000 tons of butter and 60,000 tons of cheese, New Zealand may claim to have become the largest exporter of dairy-produce in the world. As a supplier of the British market we have now actually taken the lead in cheese, and are running close up to Denmark for first place in butter-supply. The manufacture and export of dried milk has now reached a volume which warrants its regular inclusion statistically, while preserved milk, casein, and sugar of milk must also be reckoned with."

LEGISLATION.

During the year a Dairy Industry Amendment Act was passed. The principal provisions of this Act were: (1) It became the duty of the owner of a dairy factory—co-operative or proprietary—to advise suppliers of the yield of cheese or butter obtained per pound of butterfat received during the financial year; (2) the Dairy Division was given authority for the check-testing of milk and cream samples for butterfat at dairy factories.

ADVERTISING NEW ZEALAND BUTTER.

A campaign to advertise New Zealand butter in Great Britain was started early in the season. A fund amounting to £500 was subscribed by the importers, the fund being supplemented by our Government, through the High Commissioner's Office, to the extent of £250. Good results were reported.

GROUP HERD-TESTING.

The establishment in 1922, of the Waikato Farmers' Herd-testing Association, Hamilton, marked the introduction of the group system, and was the starting-point of considerable development in the herd-testing branch of dairying work. The Waikato organization was the forerunner of the New Zealand Co-operative Herd-testing Association, and the foundation of a movement which subsequently led to the establishment, in 1926, of the Dominion Group Herd-testing Federation, and, in 1929, of the New Zealand Herd-testing Central Executive.

DAIRY INSTRUCTOR VISITS FIJI.

In 1922, by request, Mr. G. M. Valentine, one of the Division's Instructors, visited Fiji for the purpose of providing information and giving advice concerning the formation of co-operative dairy companies. While there he found the dairy cows were of a very low standard, and was able to give help regarding herd-building and the feeding and treatment of dairy cows. Mr. Valentine's assistance while at Fiji covered a very wide field, embodying the whole of the dairying activity on the Tailevu Soldiers' Dairying Settlement, including suitability of land, selection of dairy stock, and planning and equipment of dairy factories.

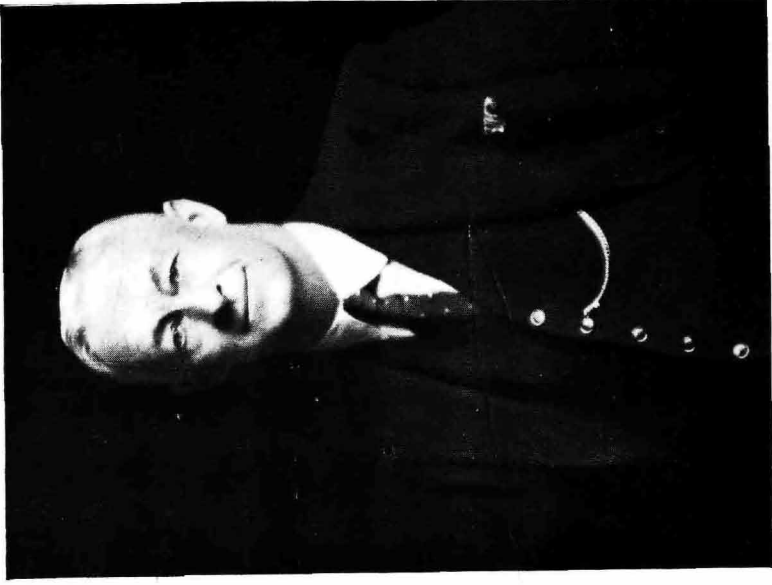
ASSISTANT DIRECTOR OF THE DAIRY DIVISION.

It was also in 1922 that Mr. W. E. Gwillim was appointed Assistant Director of the Dairy Division. Mr. Gwillim was born in London in 1868. With John T. Warrington, Tooley Street 1881-92. Came to New Zealand 1892. Assistant at Edendale Dairy Factory 1892-94. Manager, Tauranga, 1894-95. Dairy-factory manager and proprietor Victoria, Australia, 1895-99. Manager, Eltham, 1900-7. Dairy Instructor and Grader 1907-22. Assistant Director, 1922-34. Mr. Gwillim's long and varied association with the industry gave him an outstanding knowledge of all branches of the business. He was honourably known to a wide circle of cheese and buttermakers, and rendered good service by teaching and example.

ASSISTANT DIRECTORS OF THE DAIRY DIVISION.



W. E. Gwillim (1922-1934).



G. M. Valentine (since 1934).

1 To face page 17b.

1923-24.

This was a poor season climatically. The principal feature of the period was the swing back of the pendulum from butter to cheese manufacture. The quantity of cheese graded increased 21 per cent., while butter decreased 9 per cent. The output of dairy-produce was still progressing at a rapid pace, the export value of milk products for the season having reached the high figure of £18,500,000 sterling.

In 1923 the Division inaugurated the system of examining for moisture one box of butter from each churning. The object was not only to more strictly enforce the regulations pertaining to moisture content in excess of the legal limit of 16 per cent., but also to draw attention to butter which contained too little moisture, and thereby bring about greater uniformity in the moisture percentage of butter.

NEW ZEALAND DAIRY BOARD.

In August, 1923, the Dairy-produce Export Control Act was passed, and shortly afterwards the New Zealand Dairy-produce Control Board was formed for the purpose of handling, distributing, and marketing New Zealand dairy-produce. The history of this organization is included in the second section of this volume.

1924-25.

During this season butter-manufacture took the lead in comparative output, cheese registering a moderate decrease. The cheese market, as it turned out, gave the better return to producers.

INCREASED STANDARD OF GRADE POINTS.

One measure taken during the season, with the full co-operation and assistance of the Dairy-produce Board, the National Dairy Association, and factory directors and managers, was the establishment of a higher standard of minimum points for first-grade butter and cheese, the requirement being raised from 88 points to 90 as from the 1st January, 1925. This change was brought into operation with very little difficulty or friction, and an improvement in the quality of both butter and cheese was soon noticeable as a result.

STORAGE OF CHEESE AND BUTTER.

Not until this season could it be stated that New Zealand cheese was precooled by mechanical refrigeration at all grading-ports. The general position was now such that all export cheese was in cool storage from the time of grading until shipment. For some years prior to this cooling by mechanical refrigeration was in vogue at all grading centres except Bluff, where storage in insulated chambers obtained, sufficiently low temperatures being procurable except during some weeks in the summer.

Generally speaking, all butter was in cool storage at suitable temperatures prior to shipment. Attention to temperatures at time of shipment was not only being given by the graders in charge but the shipping companies were more insistent on butter and cheese being at proper temperatures when going on board. Great assistance was rendered by the Shipping Supervisor of the newly formed Dairy-produce Board towards ensuring conditions more suitable for the carriage of the Dominion's dairy-produce on the Home steamers.

CREAM-GRADING.

The grading of cream and the payment of a differential price for different classes was not yet compulsory, but had extended on a voluntary basis during the year. While the extension was considerable, the general position was unsatisfactory in many districts. There was a definite increase of cream-grading in the Wellington Province and Gisborne district, while a genuine attempt to inaugurate a general system in Otago, Southland, and Canterbury was made during the preceding winter and spring. Much improvement in butter-quality was reported, but, unfortunately, the grading of cream was discontinued by many dairy companies owing to too much competition for quantity irrespective of quality.

1925-26.

This was a very unfavourable season climatically and was described as the worst for many years. Milk-production was severely affected by the inclement spring weather, and although the shortage was steadily reduced as the season progressed it was

never quite overtaken. Grading returns indicated a decrease of between 5 per cent. and 6 per cent. in butterfat represented by export butter and cheese.

INTERNATIONAL BUTTER TRADE AFFECTED BY IMPORT DUTIES.

In the year under review the international butter trade was subjected to some changes, brought about by the imposition of new or increased duties in Germany and the United States of America. During our preceding financial year Germany imported a quantity of butter, which relieved the markets of the United Kingdom to a considerable extent. Much of this butter was forwarded to Germany from Denmark, thus decreasing Denmark's export to Great Britain. London re-exported to Germany butters received from the Southern Hemisphere. The imposition of a duty of about 11s. per hundredweight in October, 1925, combined with the low spending-power of the German people, caused a great decrease in the imports into Germany of high-class butters. Cheaper butters from Siberia and the Baltic States were accepted in their stead, though in lessened quantity.

The United States of America had an import duty on imported butter, which at 8 cents a pound was considered by some of that country's trade journals to afford sufficient protection to their dairy industry. Late in 1925, however, the duty was increased by 50 per cent. to 12 cents a pound, with obvious effect on importation.

The reciprocal tariff with Canada came into effect during the year, and assisted in renewing some trade in butter with that Dominion. Since, however, Canada was at that time experiencing a renaissance in her export butter trade, it was unnecessary for her to draw on New Zealand for any important quantities. Altogether, then, the New Zealand butter trade was detrimentally affected by foreign influences, as borne out by the export figures appearing in the statistical survey at the end of this volume.

SHIPPING CONDITIONS.

A strike of British seamen on steamers carrying dairy-produce as part cargo between New Zealand or Australia and the United Kingdom interfered materially with the timely delivery of our

spring-made butter and cheese to Britain during the season under review. Not only did this factor tend to upset continuity of supplies from this Dominion to overseas customers, but it increased costs at this end by way of storage, and caused an increase in prices of dairy-produce to the British public—the advantage of which went largely to countries other than New Zealand and Australia and to such as were exporting butter to the United Kingdom at that time. The fact that the causes which influenced the seamen to strike did not pertain in any manner to New Zealand or Australia did not make the dislocation of trade any more acceptable to the losers in this Dominion.

DAIRY LABORATORY.

During the year the Federation of Dairy Factories in Taranaki, with financial assistance from the Government, established a dairy research laboratory at Hawera, and Mr. P. O. Veale, B.A., M.Sc., was appointed to take charge for the Federation.

WORLD'S BUTTER COMPETITION.

In August, 1925, for the first and only time in its history, New Zealand held, at Auckland, under the auspices of the Auckland Winter Exhibition, a world's butter competition. There were 82 exhibits in the class, of which 41 were New Zealand manufacture, 27 Australian, 9 Irish, 1 Canadian, 1 American, 1 Danish, and 2 Fijian. The first prize was awarded to "Rangiwahia" (New Zealand) with a total score of 96½ points, and the second prize to "Oakley" (Queensland) with a total of 96 points.

The exhibits were judged by three of the Division's Dairy Instructors—namely, Messrs. Dempster, O'Dea, and Clayton. Mr. P. J. Carroll, Commonwealth Supervisor of Dairy Exports, was present at the competition as official representative of the Australian exhibitors. In a very full report he makes the following comment:—

"There can be no question as to the absolute fairness of the whole procedure and the keen desire on the part of both the show officials and the departmental officers to ensure that there was no room for suspicion in regard to the conduct of the judging. I am perfectly satisfied that it

would be impossible to provide greater safeguards for the equitable carrying-out of the work than there were provided by the society's officials."

A feature of the competition was that every exhibit was subjected to chemical analysis. This is the only occasion on which such procedure has been adopted in New Zealand, though the practice is not uncommon in other countries.

THE DAIRY PRODUCE "EXPORTER."

This monthly dairy journal, established in 1925, came into being at a time when the Dairy Board (1923) was still in its infancy and breaking new ground, and when matters pertaining to marketing and control of New Zealand dairy-produce were still fresh in the minds of dairymen. Certain of the original members of the Board stressed the opinion that the Board should adopt some medium for educating producers in the important changes which were likely to take place as the result of the Board's operations, and suggested an official organ in the form of a dairying journal as the best means towards this end.

The Dairy Board, however, did not favour the idea of establishing a journal, and finally a separate company was formed, though the Board's guarantee, amounting to approximately £3,000 per annum, was probably the deciding factor in getting the *Exporter* established. The *Exporter* became the Board's official organ, and in return for the grant undertook to give the Board a stipulated amount of free space in each issue and to publish the Board's annual report in full.

The first managing editor of the *Exporter* was Mr. A. J. Heighway, a prominent officer of the New Zealand Co-operative Dairy Co., who went over to journalism. The present holder of the position is Mr. C. Burnard.

The *Exporter* company serves co-operative interests only, and its original idea was to provide a free copy to every supplier to a co-operative dairy company—about sixty thousand when the paper started. A large number of copies are sent abroad and serve a very useful purpose at the marketing end by providing information regarding dairying developments in New Zealand.

In 1931 the Dairy Board reduced its subsidy, and since then has confined its financial assistance to the paying for a free copy for the factory-manager, secretary, and directors of every co-operative dairy company, which, plus the purchase of a certain amount of space, represents about £1,200 per annum. Since 1931, therefore, the *Exporter* has operated principally on a subscription basis.

The big New Zealand Co-operative Dairy Co. and an increasing number of others are now providing free copies for suppliers, the cost being defrayed from the company's expenses.

Recently the *Exporter* company donated the sum of one hundred guineas per year for five years for a scholarship at Massey College, sons of dairy-farmers or dairy-farm employees being eligible to compete. The donation pays the full cost, including board and lodging, of the two years' dairying course.

1926-27.

The dairy industry season of 1926-27 was an important one historically, being notable for the consolidation and extension of the regulations under the Dairy Industry Act and the introduction of several far-reaching measures.

"FINEST" GRADE.

Since the inception of the grading of dairy-produce in New Zealand three grades were in use—namely, "First," "Second," and "Third." During the year under review it was decided in the interests of the industry to create an additional grade for high-class quality, and as from the 1st September, 1926, "Finest" grade, to include all creamery butter and factory cheese scoring 93 points and over, came into operation. As an incentive to factory-managers to produce "Finest" quality, the Dairy-produce Board advanced a premium of $\frac{1}{2}$ d. per pound for butter and $\frac{1}{4}$ d. per pound for cheese graded "Finest" over and above the advance for first-grade quality. The beneficial result of this inducement is evidenced by the fact that 68.94 per cent. of the butter graded during 1926-27 scored 93 points and over, against 45.87 per cent. for the previous year, and 50.16 per cent. of cheese as against 21.06 per cent. Furthermore, the percentage of second grades dropped from 5.46 per cent. in 1925-26 to 3.95 per cent. in 1926-27

NATIONAL BRAND.

Soon after the Dairy-produce Board functioned consideration was given to the establishment of a national brand for butter and cheese intended for export, and after collaboration with the Dairy Division it was finally decided that the time was opportune to institute a brand of this description for all "Finest" and "First" grade creamery butter and factory cheese, as from August, 1926. Competitive designs were invited and a prize offered to the successful designer. The brand finally decided on took the form of a fern-leaf with the words "New Zealand" through the centre of the leaf, and replaced the factory brand through the centre of the usual circular impress die. The make of the produce was readily identified by the registered number of the factory within the circle and the owner's registered brand word above the circular impression.

CREAM-GRADING.

Although the grading of cream and the payment of a differential price for different classes had extended still further on a voluntary basis during the year, the general position was still unsatisfactory. For some time the consensus of opinion amongst the majority of suppliers and those in control of dairy factories was that the grading should be made compulsory, and during the year the Department was requested to prepare the necessary legislation to give effect to this proposal. Regulations along this line were gazetted on the 25th November, 1926, and became operative from that date. Two months' time was allowed dairy companies to appoint the necessary cream-graders. The Dairy Division fixed the standards for the three grades of cream—"Finest," "First," and "Second"—carried out the examination of all applicants, and issued certificates to successful candidates. By the end of the first season nearly five hundred certificates had been issued.

GENERAL REGULATIONS UNDER THE DAIRY INDUSTRY ACT, 1908.

The regulations gazetted in November, 1926, superseded regulations gazetted as far back as 1899. Many of those old regulations were no longer applicable. Many new phases of endeavour in connection with the industry had been undertaken, and

any administration in connection with these from the Department's standpoint had come directly under the general provisions of the Dairy Industry Act in a general way rather than under the regulations. A few regulations had been made subsequent to 1899, and the 1926 regulations not only amended the original regulations by deletions and consolidated those retained, but were so extended as to be quite up to date so far as the requirements then existing necessitated.

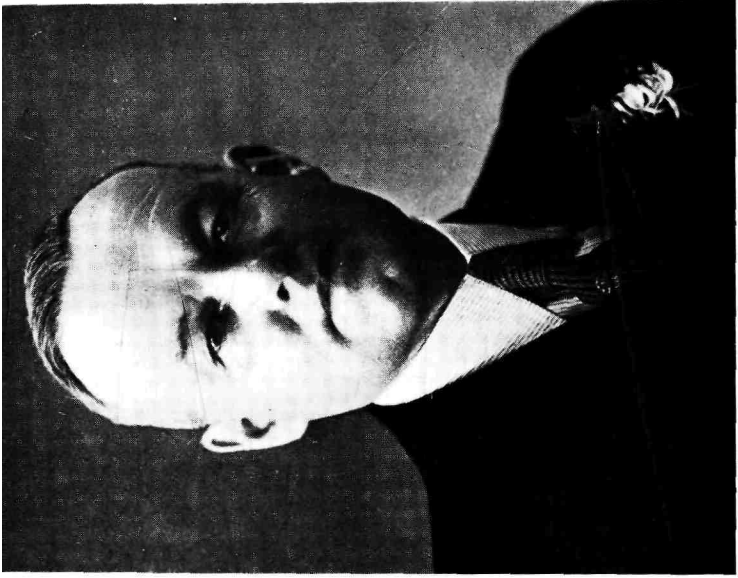
Mr. F. S. Pope, Assistant Director-General of Agriculture, rendered considerable service in the arduous and responsible task of revising the regulations and drafting them in a form suitable for gazetting as law.

MARKETING.

Market conditions during the year under review were comparatively unsatisfactory from the point of view of the New Zealand dairy-farmer. During the latter end of the 1925-26 season many dairy companies, instead of meeting the market, preferred to hold their butter for higher prices, which they considered would obtain during the August-September period. The holding was overdone, and whereas prices ruled from 170s. to 178s. per hundredweight from April to July, 1926, inclusive, they receded during the August-November period until "price-naming" (price-control—that is, fixation of prices) was commenced by the Dairy-produce Board about the middle of the latter month. At that time prices for butter had reached the comparatively low level of 144s. The coal strike in England, which was followed by a more general strike, commenced in May and lasted some six or seven months. This produced very unfavourable conditions for trade in the United Kingdom, and was doubtless a direct and important influence toward the reduction of prices for our dairy-produce. This would refer to the stored butter of the 1925-26 season. Price-naming came in with reference to the new season's butter about the middle of November, and during the December-February period prices ranged from 170s. to 176s. ; but between the latter end of February and the middle of March, when the Board discontinued price-naming, prices had receded to 160s. Price-naming was then discontinued by the Board, and immediately prices fell to around 146s. When discontinuing price-naming, however, the Board



W. M. TAPP, SECRETARY N.Z. JERSEY CATTLE BREEDERS' ASSOCIATION (1914-1936).



T. C. BRASH, SECRETARY N.Z. DAIRY BOARD FROM ITS INCEPTION IN 1923.

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stipulated that only 90,000 boxes of butter and 45,000 crates of cheese were to be sold per week. Prices shortly afterwards gradually recovered, and were soon above those named by the Board immediately prior to its recession from price-naming. A special feature in connection with the season's experience was that a larger proportion of butter than usual went to markets other than the United Kingdom. Owing to the unfavourable climatic conditions in Australia, the make of the Commonwealth was curtailed, and a considerable quantity of New Zealand butter was exported to Australia. Large quantities also found their way to Canada, United States, South Sea Islands, and the East. Other quantities were re-exported from the United Kingdom to North America.

Cheese prices evidenced a trend in very close sympathy with butter. They were influenced in the same direction and about the same time. It was also considered that the comparatively low prices for meat had a "bearing" influence on cheese prices.

1927-28.

There is not a great deal to record concerning the 1927-28 season. Although an exceptionally dry summer was experienced, approaching almost drought conditions in some districts, the year as a whole was favourable to the production of dairy-produce. A mild winter followed by a good spring in most districts enabled dairy cows to commence the new season in good condition. The year registered a further advance in the industry's main lines of production, an appreciable increase in butter more than counterbalancing a slight decrease in cheese. Our exportable amount of butter and cheese had now reached the impressive figure of 75,000 tons for each of these products. The more general use of fertilizers as a top-dressing agent, thus giving pastures an increased resistance to drought conditions, and an improvement in the producing-capacity of dairy herds, were contributing factors towards this high record of production. Dried milk and casein also showed increased production during the year. Moreover, following the preceding lean year, the financial returns to the industry were on a considerably higher level, and market prices continued to rise steadily until the close of the season.

PASTEURIZATION : WAX-COATING OF CHEESE.

The pasteurization of milk for cheesemaking was now almost general, the output of this class of cheese for the year under review being approximately 92 per cent., as against 86 per cent. for the previous year.

A number of factories had installed plant for the paraffin-waxing of cheese, more especially in the Auckland Province, where approximately 50 per cent. of the output was wax-coated. Mention should be made of experiments in the wax-coating of cheese carried out by the Division in 1924 in co-operation with the Kiritaki Dairy Co. The findings of the experiment were so promising that the subsequent result was the quick uptake of waxing, particularly by the big New Zealand Co-operative Dairy Co. The chief warrant for waxing was its safeguard to quality of well-made cheese, and the fact that it minimized mould growth and reduced shrinkage.

PRESERVATIVES IN BUTTER.

The prohibition of the use of preservatives in butter consumed in the United Kingdom came into force on the 1st January, 1928. Tests of the various butters exported subsequent to this date were made at intervals for preservatives, and these showed that New Zealand dairy companies, without exception, honoured the regulation of the United Kingdom. So much so was this expected by the Division that no attempt was made to get a regulation gazetted making the export of preservative butter illegal. As a matter of fact experiments demonstrated that preservatives were of no value to New Zealand butter.

CHECK-TESTING AT DAIRY FACTORIES.

The issue of the Dairy-produce General Regulations enabled the Dairy Division to give better consideration to the check-testing of milk and cream samples at dairy factories for butterfat. Dairy companies were now giving the Division an indication of their figures representing the yield of cheese or butter as per pound of butterfat for the season. Some of these were regarded as being

rather high, and as from the 1st January, 1928, an officer was on duty as check-testing officer. He was directly and solely under the control of the Director of the Dairy Division, but it was deemed advisable to keep this service segregated from the butter and cheese instruction work so as not to interfere with the good feeling existing between factory-managers and Dairy Instructors. The check-testing officer has been able to correct many irregularities, and the service provided has, from both an instruction and an inspection point of view, been an important factor in improving and standardizing this particular branch of dairy-factory operations.

OFFICIAL HERD-TESTING.

At the commencement of this season the Department of Agriculture inaugurated what is now known as the Government Official Herd-testing. This scheme is open to all certificate-of-record-testing breeders, and permits the testing of all purebreds in the herd other than those on Certificate-of-Record test. The method is similar to the Certificate-of-Record except that the owner takes no milk-weights, the yield being based on milk-weights and samples taken by the Testing Officer at the time of his usual Certificate-of-Record visit. The fee for the service is 5s. per cow per season. Statistics relating to the Government official herd-test are given later.

GOVERNMENT SUBSIDY TO HERD-TESTING.

The first Government subsidy to herd-testing was granted in 1928. The amount originally set aside for the purpose was £8,000, though this was later increased to £9,500 to permit of testing dairy-herd owners receiving 6d. per cow for cows tested under the group system and 3d. per cow for cows tested under the association own-sample system. This matter, too, is dealt with more fully further on.

MASSEY AGRICULTURAL COLLEGE.

This institution was opened in 1928. Mr. G. M. Valentine, Dairy Instructor, was appointed Superintendent of the dairy factory attached to the College, and took over his new duties in the month of May,

1928-29.

From the dairying standpoint this was an exceptionally favourable season climatically. Production increased and dairy-produce forwarded for grading represented an increase of about $7\frac{1}{2}$ per cent. in butter and $12\frac{1}{2}$ per cent. in cheese.

STANDARDIZED CHEESE.

The most important feature of the year was the introduction of standardized cheese. The introduction followed a series of resolutions passed at a fully representative meeting of cheese-producers held in Wellington on the 7th December, 1928, to discuss what action might be taken to meet the position brought about by the large and constantly increasing employment of high-testing milk. It was considered by many dairymen that owners of Jersey cows received an advantage, owing to the ratio of casein to butterfat in the milk being lower than in the milk of cows generally used for the manufacture of Cheddar cheese.

A large proportion of dairy cows in New Zealand are of the Jersey strain, and a fairly high percentage of our cheese is made in dual-plant factories, most of which are in districts where the Jersey strain predominates. It was considered that the addition of casein per medium of skim-milk was a practical way to meet the position, but as cheese made from other than whole milk could not be branded "Full Cream," a new class became necessary. Regulations were gazetted on the 21st December, 1928, making it legal as from that date to manufacture a standardized cheese containing a minimum of 50 per cent. fat in the dry matter, to be branded "New Zealand Produce: Factory Cheese—Fat 50 per cent. or over," and to include the national brand for "Finest" and "First" grades similar to full-cream cheese.

These amendments to the general regulations under the Dairy Industry Act, in addition to providing for the manufacture of standardized milk cheese, also provided additional safeguards for the manufacture of full-cream cheese. Standardized cheese could only be made in factories registered for the purpose, and by certificated standardized cheese-factory managers. Full-cream cheese could be made from whole milk only, including starter milk, if any, and be made in registered whole-milk factories.

It was considered that standardized cheese would compare favourably with other cheese on the markets in Britain. The standard of fat it contained had to be controlled at a minimum which was higher than that required for whole-milk Cheddar cheese produced in Britain or in such cheese-producing countries as Canada and Holland. The cheese was to contain no fats other than milk-fats, and from March to July inclusive—the high testing-period for dairy cows—the minimum fat content in the dry matter was set as high as 52 per cent.

That, briefly, describes the salient points regarding the introduction of standardized cheese. Although the prospects looked promising enough at the time, the popularity which the advocates of this class of produce forecasted never materialized, and it was only a matter of about three years before legislation prohibiting the export of anything but full-cream cheese was passed.

Continuing the account of standardized cheese, the legal manufacture of this class of cheese commenced early in January, 1929, and continued up to the 31st December, 1930. Complaints from Britain were numerous concerning the quality of much of this cheese, and, as a result of the apparent prejudice created against this standardized article, the Government agreed to increase the minimum content of fat in the dry matter in order to distinguish it from the article previously branded "Fat 50 per cent. or over," and branded the resultant cheese as Cheddar. Amended regulations were gazetted on the 22nd December, 1930, and came into force as from the 1st January, 1931, providing for the manufacture of cheese with a minimum milk-fat content in the dry matter of 50 per cent. from the 1st August to 31st December, 52 per cent. from 1st January to 15th March, and 54 per cent. from 16th March to 31st July. Cheese which contained less than these minimum standards, but not less than 50 per cent. fat in the dry matter, were classed as "Modified milk cheese."

The changes in branding and composition, however, failed to increase the popularity of the article, and a regulation was gazetted prohibiting the manufacture of other than full-cream cheese as from the 1st August, 1931. There are many persons who hold the opinion that the experiment with standardized cheese was fully warranted; that the standardized article was quite as good from a food point of view as the full-cream cheese from other countries; that standardized cheese meant a higher return to the producer;

and that its success was damned entirely on account of prejudice. Whatever the truth may be, one fact remains, and that is that standardized cheese did not prove acceptable to the trade in Britain. From one standpoint standardization was viewed as probably lessening considerably the difficulties attendant on cheese-manufacture from high-butterfat-testing milk, with resulting improvement in quality.

The following table indicates the quantities of standardized and modified milk cheese exported :—

CHEESE-GRADINGS, STANDARDIZATION PERIOD.
(All figures in crates of cheese, year ending 31st July.)

Class of Cheese.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33
Full cream ..	1,052,422	1,100,874	514,513	799,925	1,219,111	1,396,000
Standardized ..	..	93,385	686,363	290,687	..	..
Cheddar* ..	..	..	..	143,613	1,741	..
Modified milk ..	..	2,396	4,597	2,022	..	..
Totals ..	1,052,422	1,196,655	1,205,473	1,236,247	1,220,852	1,396,000

* *I.e.*, standardized cheese branded Cheddar to distinguish it from full-cream cheese.

CHECK TESTING.

From the 1st August, 1928, a second officer was engaged on the work of check-testing of milk and cream-samples for butterfat at dairy factories. At many factories various irregularities were noted, due mostly to lack of experience or poor equipment. By the end of the season check-testing had been carried out at the majority of the factories, and the general position greatly improved as the result of this new service.

THE DIRECTOR GOES ABROAD.

During the 1928-29 season the Director of the Dairy Division Mr. W. M. Singleton, paid a visit to the United States, Canada, Great Britain, and the Continent of Europe in order to gain first-hand information relating to our export trade and to manufacturing methods in other dairying countries.

DAIRY BACTERIOLOGIST.

In May, 1928, Mr. G. F. V. Morgan, N.D.A., N.D.D., was appointed to the staff of the Division as Dairy Bacteriologist.

1929-30.

During this season pasturage was more plentiful than usual, due to a well-distributed rainfall throughout the year, and to the cumulative effect of top-dressing with artificial manures. The plentiful supply of grass, together with an increase in the number of dairy cows, resulted in a milk-production not previously excelled for volume in the Dominion. Butterfat production for the season, covering all products and uses, for the first time exceeded the 300,000,000 lb. mark. Reverting to other years, it is interesting to note that the 50,000,000 lb. mark was reached in 1902-3, the 100,000,000 in 1912-13, the 200,000,000 in 1922-23, and all but 400,000,000 lb. in 1932-33, which dates, by the way, are at ten-yearly intervals.

Owing to general unfavourable economic conditions, however, and larger supplies of butter from a number of countries, lower prices ruled during the season under review, and only a larger output prevented a decreased income to dairy-farmers. This season, 1929-30, really saw the commencement, as far as the dairy industry is concerned, of what is commonly called the "great depression." Average pay-out in 1929-30 fell to little more than 1s. 4d., while in 1930-31 it went down to about 11½d. This was the dawn of a period of adjustment to depression prices, mainly by way of increased production, lowering of unit costs of production, Government subsidies, and assistance by various means.

A survey of the 1929-30 season indicates that apart from economic factors nothing occurred which need be mentioned here. The industry's principal problems related to standardized cheese and to cheese quality generally.

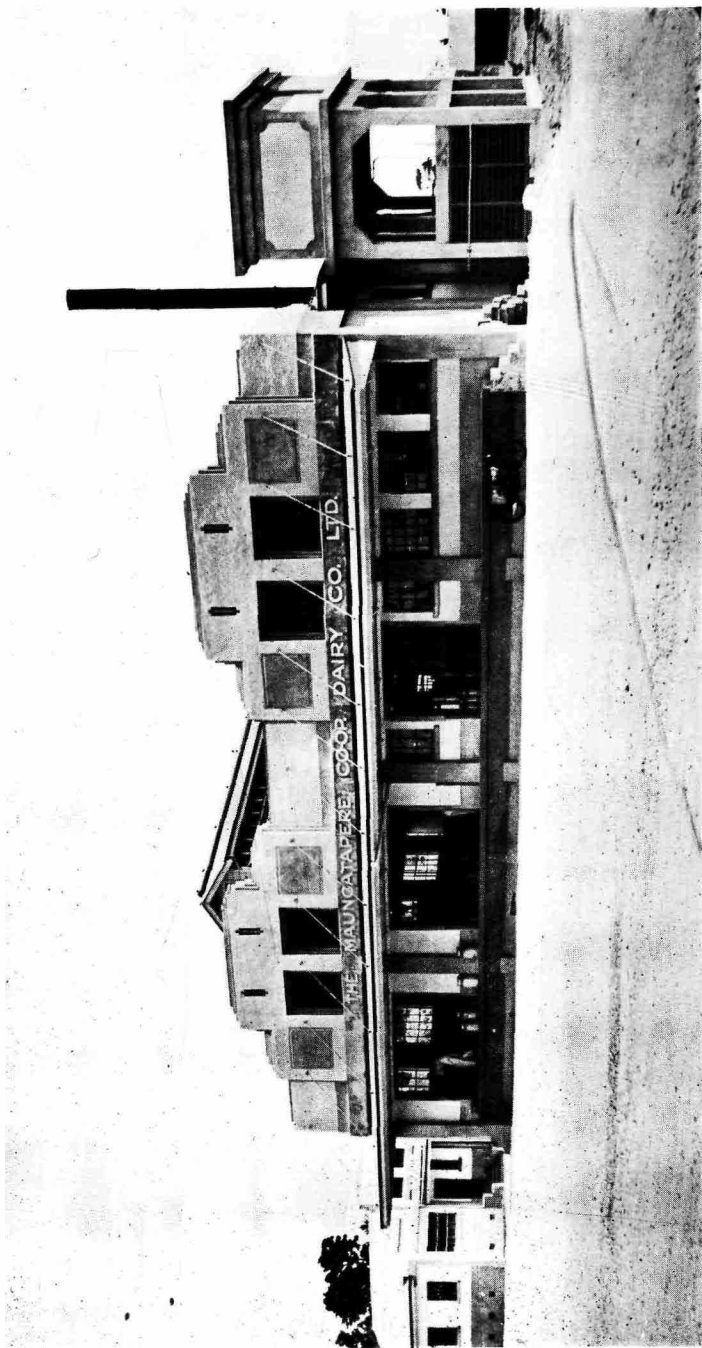
SUMMARY.

In the opening pages of this history the years 1920 to 1929 were referred to as representing a period of rapid expansion which preceded a time of marketing difficulties. The great expansion took place on the butter side of the industry, the exports of this commodity having increased from 310,000 cwt. in 1920 to 1,600,000 cwt. in 1929. Cheese exports rose from 1,540,000 cwt. to 1,709,000 cwt. in the same period, while export values of the two commodities

combined practically doubled, being £10,500,000 in 1920 and over £20,000,000 sterling in 1929, the highest figure which New Zealand has yet attained. A survey of the annual production statistics year by year throughout the period indicates a fairly even trend, fluctuations being principally of climatic origin. The figures relating to export values also ran comparatively smoothly, suggesting a steady market, but in this respect are misleading, inasmuch as in its broader aspect the marketing position was far from stable. While, however, the British market was subject to extreme fluctuations—due to prevailing conditions in world markets—periods of low prices fortunately were counterbalanced by occasions when prices soared, the detailed position not being apparent in the annual totals. Moreover, the fact that total income was maintained was due to increased production, average prices showing a decline. Needless to say, the whole position was influenced by post-war instability due to economic causes, the international butter trade, particularly, being affected by import barriers imposed by foreign countries. Actually Britain experienced two transient booms and a minor depression during the decade 1920 to 1930, all of which had an influence on New Zealand's dairy industry.

Within the Dominion marketing problems led to the establishment of the Dairy-produce Board, and in addition increased attention was being devoted to the quality of our butter and cheese and its suitability for the Home market. The various reforms have already been dealt with in the main text, the more important relating to farm dairy instruction, cream-grading, cool storage and longer maturing of cheese, the raising of the grade points, the introduction of a "Finest" class, and the adoption of a national brand.

A special feature was the entry of modern science into the realms of dairying as what might be termed a distinct branch, the period under review having witnessed the establishment of the Scientific and Industrial Research Department, the Dairy Research Institute, Massey Agricultural College, the appointment of a Dairy Bacteriologist by the Dairy Division, and of Dairy Chemists by two dairy-factory organizations—namely, the New Zealand Co-operative Dairy Co. and the Federation of South Taranaki Dairy Factories.



A MODERN NORTH AUCKLAND BUTTER FACTORY.

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Group herd-testing was introduced in 1922, and this phase of dairying enterprise evidenced rapid development, being considerably assisted by annual Government grants of money, commenced in 1928.

Taken as a whole, 1920 to 1929 were years of great activity in the industry, and of great prosperity for our dairy-farmers, though the resultant advance in land-values was to create a serious problem in later years. Moreover, despite the fact that 1929 was a peak year for *total value of dairy products exported*, signs of the period of low prices and marketing problems which was to follow, were already apparent.

CHAPTER VII (1930-35).

PERIOD OF MARKETING DIFFICULTIES.

Decline in prices—Production peak—Return to full-cream cheese—Dairy Chemist appointed—Milk-grading—Amending regulations—Rukuhia investigation—Registration of factory-managers—Dairy Industry Commission—Dynes Fulton—Summary.

1930-31.

THE downward trend of prices for dairy-produce which had been in evidence for several years was again responsible for a further substantial decline in the income of dairy-farmers. The quantity of butter and cheese exported for the twelve months ended 31st March, 1931, was considerably greater than that of the preceding year, but the declared values showed a decline of no less than £1,724,270. The lower prices realized for all classes of produce were due principally to the adverse economic conditions operating in Great Britain. From a quality point of view our butter was meeting the market requirements very satisfactorily. Cheese, however, was experiencing considerable adverse criticism, due not only to the introduction of standardization, but to a remarkable increase in such faults as openness and muddy and other discoloration. It is also unfortunate that standardization came in on a falling market. The criticism concentrated on cheese-quality, however, was not without its brighter side, and there is no doubt that the subsequent return to high-quality produce was largely due to the concentration on better methods forced upon us by low prices and strong criticism of the article which we were placing on the British market.

SALT IN BUTTER.

A regulation was gazetted and came into force as from the 7th August, 1930, limiting the quantity of salt in export butter from not less than $1\frac{1}{2}$ per cent. to not more than 2 per cent., with a proviso that official permission was obtainable for export orders for butter with a salt content outside these limits. This resulted in a more even salt content and consequently an article more acceptable to the trade on the Home market.

1931-32.

Notwithstanding the fact that climatic conditions during the year were not altogether favourable to a high production of dairy-produce, and that economic conditions were definitely unfavourable, the quantity of butter received for grading in any one year exceeded the 100,000 ton mark for the first time in the history of the dairy industry in New Zealand. During the year ended 31st March, 1932, 102,087 tons of butter and 85,258 tons of cheese were sent forward for grading. Considering this position was reached in less than fifty years after the introduction of refrigeration and the factory system of manufacture, the achievement was little short of marvellous.

CHEESE-QUALITY.

As stated previously, the manufacture of standardized cheese was prohibited as from the 1st August, 1931—the commencement of the 1931-32 dairying season. Evidence of closer attention to quality was given by the passing of a regulation providing that cheese manufactured in August and September should be held on curing-room shelves for not less than twenty-one days before being packed or coated with wax, and that the curing-room temperature be raised to not less than 55° F. This holding at a higher temperature resulted in the cheese being marketed in a more mature condition. Reports from Britain at the end of the season indicated that the general quality of our cheese had been more acceptable to the trade. During the year approximately 87 per cent. of the cheese graded was made from pasteurized milk and approximately 83 per cent. was wax-coated.

MILK-GRADING.

During the year under review there was considerable discussion at conferences of dairy-producers on the subject of milk-grading. The South Island Dairy Association and the National Dairy Association at their annual conferences carried resolutions in favour of grading. A proposal to bring in milk-grading as a "try-out" and without compulsory differentials in price for the different grades in the meantime was supported by the Dairy-produce Board. On the 10th March, 1931, regulations were gazetted giving effect to this proposal. It took a little time to get all companies in line with the requirements, but by the end of the 1931-32 season the system was working satisfactorily. In addition, from the beginning of the season a dozen cheese-producing companies were voluntarily grading their milk for cheesemaking and paying differential prices.

DAIRY LABORATORY.

During the season Mr. Morgan, Dairy Bacteriologist, resigned from the Division, having decided to return to England. During his engagement here he did excellent work which was of material assistance to the industry. Some of his more important work related to the assessing of the merits of the various tests for grading milk for cheese-manufacture. His practical experience in the manufacture of cheese enabled him to appreciate the factors required of such a test. Mr. Morgan also rendered valuable assistance in connection with the problem of discoloration in cheese.

Dr. Moir, Ph.D., M.Sc., A.I.C., F.C.S., Dairy Chemist, joined the staff during the year, his appointment dating from the 1st September, 1931. After Mr. Morgan left Dr. Moir took charge of the Division's work at the Wallaceville Laboratory, and since taking up duty has added considerably to our knowledge of dairy starters and dairy-factory water-supply. New and increasing interest has been evidenced concerning many analytical, chemical, and bacteriological aspects pertaining to the production of milk-products, and improved methods and conditions have been brought about through his work and comprehensive knowledge.

1932-33.

A great increase in the production of dairy-produce took place during this year. Owing to the adverse economic conditions, many suppliers of milk and cream to dairy factories increased the number of cows in their herds, and many woolgrowers established dairy herds as a side-line, these, together with a favourable season, being contributing factors to the increased output. During the year 123,112 tons of butter and 97,660 tons of cheese were sent forward for grading. This season witnessed the lowest ebb in prices since the setting-in of an economic depression, which was apparent on all sides. Heavy production helped to a certain extent to keep the dairy-farmer's income at a higher level. Owing to supplies of milk increasing to such extent a night shift at a number of factories was required to handle supplies offering, which was not conducive to as good a cheese being made as would have been possible had the position been normal. Despite the general position, however, cheese which this Dominion exported during the season was more favourably reported upon in Britain. Temperatures at which the previous year's cheese was held in cool store awaiting shipment ranged from 50° to 55° F. Experience proved that for summer- and autumn-made cheese, which is usually held longer in store than that made in spring, lower temperatures are more satisfactory. Arrangements were therefore made to hold cheese for the 1933-34 season at from 50° to 54° F. from 1st August to 1st December; 47° to 49° to end February, and from 42° to 44° March to end July.

DISCOLORATION.

The various changes in temperature introduced about this period had a bearing on the appearance of a serious defect known as discoloration. The prevalence of this fault in our cheese was first reported in 1930, a number of factories having experienced trouble with muddy discoloration in cheese made during the 1929-30 season. Later pink discoloration was reported, while bleached or mottled discoloration also made its appearance in several brands. Carrying temperatures of shipments had been

raised with a view to getting more maturity into the cheese, but as a result of the higher temperatures discoloration developed. In order to check this discoloration difficulty the temperatures were again dropped, the reversion to lower temperatures having the desired effect.

MILK-GRADING.

The improvement in butter-quality consequent on the general adoption of cream-grading, with compulsory differential prices for the various grades, made the grading of milk appear to be a wise move in the direction of improvement in cheese-quality.

The general consensus of opinion among cheese-producers was such that milk-grading was given a trial, without compulsory differential payments, commencing during March, 1932, and continuing until July, 1933. The necessary amending regulations were gazetted on the 18th May, 1933, and came into force on 1st August.

REGULATIONS.

In May, 1933, the general regulations under the **Dairy Industry Act, 1908**, were amended and consolidated.

CERTIFICATE-OF-RECORD TESTING.

An outstanding feature of the year's testing was the performance of the four-year-old Jersey cow, "Woodlands Felicie," whose production of 1,220·89 lb. butterfat from 17,332·6 lb. milk was a world's record for the Jersey breed. This cow was bred by Mr. H. C. Sampson, of Hillsborough, Taranaki, and was owned and tested by Mr. P. J. Petersen, of Waitara. Up to the close of 1932 nine New Zealand cows had gained first-class certificates of record on production of 1,000 lb. butterfat or over.

1933-34.

In the season ended 31st July, 1934, the cheese graded reached the 100,000 tons figure for the first time in the history of New Zealand dairying, the butter having done so in 1932. Prices for dairy-produce during the year evidenced a very low range, values

for cheese having fluctuated between 38s. and 55s. per hundred-weight and for butter between 65s. and 110s. In total value the dairy-produce exports were worth approximately £600,000 more than for the previous year, owing, of course, to the increased exports being sufficient to more than counterbalance the falling off in prices.

GRADING OF MILK.

The grading of milk with differential payments according to grade, which was introduced during the previous season, so improved the quality of the milk-supply to cheese-factories that it was deemed advisable to frame regulations making compulsory payments for two grades, first and second, giving companies the option of recognizing a higher grade with a higher payment. It was further decided to apply the grading to milk supplied to butter-factories, that the grades be three as in the case of cream grades—viz., finest, first, and second—and that the grading of milk for cheesemaking be based on the curd-test in conjunction with either the reductase test (methylene blue) or the microscopic count test, and of milk for buttermaking on either one of these tests or the curd-test together with the reductase or microscopic test.

The curd-test and reductase test found most favour, the tests being operated on the factory premises by certified milk-graders. By means of the curd-test it can be demonstrated to suppliers of poorer-quality milk that the quality is as indicated by the grade, and steps taken to effect the desired improvement. The consensus of opinion is that through the medium of milk-grading the quality of the milk generally has been raised to a higher standard. This has been reflected in the improved quality of the cheese output since the introduction of the milk-grading system and the payment of differential prices according to grade.

While New Zealand was, so far as is known, the first country in the world to introduce compulsory milk-grading with differential payments according to grade, Denmark had a Milk Grading Association in 1902, though without differentials. Milk-grading and payment according to quality was introduced in 1922. While the system is still voluntary in that country those institutions adopting milk-grading are bound by Government regulations.

To-day all Danish dairies producing selected (Lur-branded) butter have established milk-grading and quality payment. The methylene-blue reductase test is used for the purpose.

TRANSFER OF SUPPLY.

It was recognized at the outset that if the grading-system was to be successful it would be necessary to prevent suppliers from transferring their supply from one company to another during the season owing to dissatisfaction with the grade allotted to their milk. A regulation covering the matter was accordingly gazetted and brought into force simultaneously with the milk-grading provisions.

SPECIAL INVESTIGATION : CHEESE-MANUFACTURE.

In October, 1933, the Dairy Division took over charge of the Rukuhia Cheese Factory of the New Zealand Co-operative Dairy Co. This was done at the request of the Dairy-produce Board, which, in conjunction with the New Zealand Co-operative Dairy Co., agreed to provide a portion of the costs. Special arrangements were made to provide for a milk-supply which, from a sanitary point of view, would leave little to be desired as milk for cheese-manufacture. Each farm dairy had a sufficient water-supply for cleansing and cooling purposes, and was provided with sterilizing facilities for treating milking-machines and milk utensils.

The Live-stock Division co-operated in the conduct of the experiment by examining many samples of milk from cows of the various herds, with particular reference to manmitis. The Scientific and Industrial Research Department also kindly supplied a report on a soil-survey of the farms of the suppliers to Rukuhia, together with a map showing the different soil-types on the farms concerned.

The object of the experiment was to determine whether a clean and cooled milk from healthy cows would, if manufactured under good conditions, produce a resultant cheese which would evidence all the desirable qualities of a Cheddar cheese, including closeness of texture.

The work commenced on the 11th October, 1933, and was continued throughout the remainder of the financial year. The supplier's milks were graded each day by the curd and methylene-

blue reductase tests at the factory, and periodically examined by Mr. Udy, scientist to the New Zealand Co-operative Dairy Co., as for microscopic count. The manufacture was in charge of Mr. H. A. Foy, of the Dairy Division, and the company's manager of the factory, Mr. A. Laurent.

In due course a very full report on the work was issued, and this indicated that although ideal cheese did not eventuate the experiment was well worth while and that much valuable data was collected.

DAIRY-FACTORY MANAGERS REGULATIONS, 1934.

At the request of the New Zealand Dairy Factory Managers' Association, and with the support of the Dairy Board, regulations were framed making it obligatory on all dairy-factory managers to register as such, and these were gazetted on the 22nd February, 1934, and came into force as from the 1st April of that year. Provision was made therein that on application and payment of the prescribed fee of 10s. every person who was employed as a manager of a creamery or cheese factory, or both, on the coming into force of the regulations was entitled to an appropriate certificate of registration, provided he was of good character and reputation. Provision was also made for the registration of persons not employed as managers who, by virtue of their qualifications and experience, were deemed competent to perform the duties of a manager. A Board of eight members, known as the Dairy Factory Managers' Registration Board, was set up, the function of the Board being to administer the regulations. Mr. J. S. Fleming, Divisional Clerk of the Dairy Division, was appointed Registrar.

ASSISTANT DIRECTOR OF DAIRY DIVISION.

In 1934 Mr. G. M. Valentine, previously Dairy-factory Superintendent at Massey College, was appointed Assistant Director of the Dairy Division, filling the vacancy occasioned by the retirement on superannuation of Mr. W. E. Gwillim. Before taking up his new duties Mr. Valentine spent a term in England as Assistant Inspector of New Zealand dairy-produce. His position at Massey College was filled by Mr. J. W. Smith, one of the Division's Dairy Instructors.

Mr. Valentine was born at Waikouaiti in 1875. Started dairy work in Taieri and Peninsula Milk-supply Factory 1890-92. With New Zealand Dairy Supply Co. 1892-94. Manager of Dairy Union Factories 1894-98, Oaonui 1898-1902, Marlborough 1902-12; Dairy Instructor 1912-28; Dairy Factory Superintendent, Massey College, 1928-33.

THE DAIRY INDUSTRY COMMISSION.

In years to come 1934 will be remembered for the setting-up of a Commission "to inquire into and report upon the condition of the dairy industry in New Zealand and upon all such matters incidental or relevant thereto as the Commission may think proper, with a view to the enactment by the General Assembly of New Zealand of such further legislation in relation to the said industry as will best promote the interests of the persons engaged therein and the general economic welfare of New Zealand." The Commission comprised His Honour F. V. Frazer (afterwards Sir Francis Frazer), Judge of the Arbitration Court, Wellington, as Chairman, and Messrs. G. A. Duncan, J. Gilkison, W. A. Iorns, and D. O. Williams, while Professor W. Riddet, and Messrs. E. J. Fawcett and H. L. Wise were attached to the Commission as an expert secretariat. Mr. J. A. Gilmour was general secretary to the Commission, and Mr. R. D. Steel his assistant.

Sittings for the taking of evidence were held at Wellington, Stratford, New Plymouth, Hamilton, and Auckland. The Commission was engaged almost continuously in hearing evidence from the 9th May, 1934, to the 14th August, 1934, during which time it examined 193 witnesses and received written statements from 262 persons. The report of the Dairy Industry Commission finally appeared in October, 1934.

The conclusions and recommendations of the Commission were too voluminous to permit of inclusion here, but the full report published by the Government Printer is available to any one specially interested in the subject. The report pointed to a very thorough and intelligent investigation, and reflects great credit on those responsible for its production. Roughly summed up, the three principal reforms arising out of the Commission's conclusions and recommendations were:—

- (1) The setting-up by the Government of an Executive Commission of Agriculture, which consisted of the Minister of Agriculture, as Chairman ; Mr. Justice Frazer (now Sir Francis Frazer) as *deputy Chairman* ; Mr. David Jones ; and Mr. G. A. Duncan. The Dairy Industry Commission's recommendation related to an Executive Council of dairying, but the Government decided to set up a Council to deal with all agriculture.
- (2) The reconstitution, with wider powers, of the New Zealand Dairy-produce Board. Among the wider powers given to the new Board was power to control local marketing and, if considered necessary, to introduce a levy on butter and cheese consumed within New Zealand. Mr. A. J. Murdoch was appointed Chairman of the new Board and Mr. C. P. Agar, Deputy Chairman.
- (3) The setting-up of a Mortgage Corporation to provide long-term loans and mortgage-relief for farmers.

The necessary authority for the foregoing was provided by the passing of the Agriculture (Emergency Powers) Act, 1934.

With regard to the historical aspect of the question, the setting-up of the Dairy Industry Commission was in reality one of the many repercussions of the depression. The movement started with requests by dairy-farmers for relief owing to financial difficulties brought about by low prices for dairy-produce. All over the country branches of the Farmers' Union as well as dairy companies stated their opinion that something would have to be done. The setting-up of the Dairy Industry Commission was also precipitated by suggestions of a quota on Dominion dairy-produce, and particularly by the visit of Mr. Thomas Baxter in 1933. Mr. Baxter, representing the British dairy-farmers, was invited out by the New Zealand Government to meet the dairy-producers in this Dominion, it being the hope of New Zealand dairymen that the visit would result in the abandonment of a quota policy.

On the 15th February, 1934, the New Zealand Farmers' Union brought a deputation to the Prime Minister requesting the setting-up of a Royal Commission to investigate the dairy-farming industry. Following upon this deputation, the Government called a Dairy Industry Conference, which opened on the 13th March, 1934, and

continued with various interviews with Cabinet Ministers throughout the month. Finally, at the end of April the Government stated its intention to assume active responsibility in the matter, and in due course the Dairy Industry Commission was set up. Later, however, the Government recognized that if any assistance were given it should apply not merely to dairy-farmers but to all farmers, and consequently a Mortgage Corporation and the Executive Commission were created to deal with all agriculture.

MR. DYNES FULTON.

By the death of Mr. Dynes Fulton on the 16th December, 1934, the dairy industry lost one of its prominent personalities. Mr. Fulton, a dairy-farmer by occupation, was born at Pukekohe in 1875. Following is a brief biographical sketch of his career: Chairman of Directors, New Zealand Co-operative Co., Ltd., from 1925; director, Waikato Co-operative Dairy Co., 1915; after amalgamation of New Zealand Dairy Association and Waikato and Thames Valley Dairy Companies in 1919, elected a director; director, Empire Dairies; member, New Zealand Dairy-produce Control Board; President, Dominion Group Herd-testing Federation; Chairman, New Zealand Co-operative Herd-testing Association; Chairman, New Zealand Herd-testing Central Executive; director, N.Z. Rennet Co., Eltham; member, National Dairy Association; director, Challenge Phosphates; director of *Dairy Exporter*, &c. For ten years prior to his death probably the most outstanding figure in the dairy industry. Played a prominent part in many conferences during the depression years commencing in 1930-31.

1934-35.

Prices for butter and cheese showed considerable fluctuation during the season ended 31st July, 1935, the average being slightly lower than for the preceding season. Moreover, climatically the season was most unfavourable, a cold dry spring being followed by almost drought conditions until well on towards autumn. Consequently, despite an increase in the number of dairy cows, there was a decrease of 4.8 per cent. in butterfat-production as compared with the twelve months ended 31st July, 1934. In

TWO WAIKATO LEADERS.



DYNES FULTON.



WILLIAM GOODFELLOW.

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New Zealand currency there was a decrease of over £1,400,000 in the value of butter and cheese exported during the year ended 31st July, 1935. Commencing with June, 1935, however, prices, particularly of butter, began to show a rising tendency, and there were grounds for expecting a more satisfactory average return for the 1935-36 season.

GROUP HERD-TESTING.

Towards the end of 1935 plans were laid for the re-organization of herd-testing along a modification of lines recommended by the Dairy Industry Commission. Finally the original idea of a permanent herd-testing council with statutory powers to govern all branches of dairy-cow testing was abandoned, and a scheme approved by the Government, the Dominion Group Herd-testing Federation, the Herd-testing Central Executive, and the Dairy Board whereby the Dairy Board assume the future control of the group herd-testing work, the Government to provide financial assistance for a period of six years. An Order in Council to confer the necessary powers upon the Dairy Board has been drafted and approved by the Board, and is expected to go before Cabinet early in 1936.

CLOSE OF THE HISTORY.

Nothing further of importance from the point of view of this history occurred in 1935, and so we come to the end of the volume. Unfortunately it is not the end of the period, and consequently this book remains as a work untrimmed, and deprived of that rounding off which would have bestowed upon it a more satisfying semblance of completeness.

In surveying the period under review it becomes clear, when all aspects of the dairying position are considered, that the dairying community deserves congratulation and commendation for the way its difficulties have been dealt with. Despite a long period of stress, production and quality have been well maintained; by important developments in respect of pig-keeping a source of additional income has been exploited; and by attention to such matters as pasture-improvement, certificate-of-record testing and group herd-testing a good deal of building for the future has taken place. Further progress towards the fullest possible efficiency promises to be largely by way of decreased costs of production

and improved quality of products. Relative to these a good deal is in the hands of the industry itself, and in this connection it seems noteworthy that, despite the generally recognized advisability of Dominion-wide farm-dairy instruction, only 84 of a total of 368 dairy companies operating in the Dominion are at present (1935) co-operating with the Department in the employment of Farm Dairy Instructors. Some other important matters bearing on quality and costs call for specialized effort beyond what can be undertaken by practising farmers. These matters include many of the more serious ailments to which dairy stock are prone, new difficulties which seem ever to present themselves in regard to the manufacture of dairy-produce, as well as several old problems still unsolved. The Department of Agriculture has scope for unremitting attention in these directions.

From the external aspect the position relating to the world's dairy markets appears more favourable from New Zealand's point of view than for several years past, and while this Dominion is not yet clear of the marketing difficulties which for approximately five years have clouded the outlook there is justification for confidence in the future.

FINAL SUMMARY.

The years 1930 to 1935, which constitute the closing period of this history, are usually referred to as years of depression, but for the dairying industry in New Zealand it was more a time of marketing difficulties and consequent low prices, production of dairy-produce being comparatively lightly affected except in the latter part of the period. Tariff barriers raised by certain countries previously importing dairy-produce from a source that relieved the British market, together with heavier supplies from the British overseas dominions and Denmark, resulted in tremendously increased imports of butter and cheese into Great Britain, New Zealand's principal market. In a lesser degree the position was further aggravated by Britain's development of her own dairying industry. The lower prices for butter induced consumers to increase their purchases and enabled the butter market to make a decided invasion into the field of margarine consumers. The *per capita* consumption of butter in the United Kingdom thus registered a definite increase. Despite the fact that more attention had to

be devoted to the marketing end of the business and lower prices ruled, the gratifying position remained that our butter and cheese was disposed of almost without a hitch, and thus producers were assured of regular even though considerably curtailed incomes.

The slight decline in New Zealand's production of butter and cheese during the last few years is accounted for partly by climatically unfavourable dairying seasons and partly by the inability of many dairy-farmers, owing to decreased incomes, to maintain the productive capacity of their land through the medium of artificial fertilizers and specialized cropping.

These difficult years, however, are teaching us many lessons. Lower prices have forced attention on costs of production, while the more critical buying which invariably accompanies lower purchasing power and abundance of supply has necessitated efforts to improve quality.

Reforms in the interests of economy of production of butter and cheese which have been introduced or are in the course of introduction, relate to overlapping in cream-collection, overlapping in supply, and the elimination of factories which are considered unnecessary or unsuitably located. In recent years there is a tendency toward a larger manufacturing unit, better roads, and cheaper and more rapid transit enabling one large factory to take the place of several smaller ones, and thereby lower unit manufacturing-costs.

From the point of view of quality there has been a general tightening up throughout the industry. Dairy-produce Graders have been a trifle harder on such matters as "finish" of cheese and the packing of butter. The registration of dairy-factory managers and the systems of grading milk and cream with differential payments according to grade have also been introduced during recent years and played an important part in the interests of quality. Marketing, advertising, and distribution in Great Britain have received close attention by the Dairy Board and are likely to be the subject of further action in the near future. It is also anticipated that a scheme of guaranteed prices at present receiving the consideration of the new Government will have an important influence on the welfare of the industry. The only other reform which appears to warrant immediate attention is the extension

of the farm-dairy-instruction service to cover all dairy factories in the Dominion. Otherwise it would appear that any future extension is likely to be connected with dairy science, the strictly practical side of the industry having, in the meantime at least, reached its limit of development.

As for production, only the future can tell. The first factory mentioned in this volume was built just sixty-five years ago, and during its first year of operation manufactured $4\frac{1}{2}$ tons of cheese. To-day there are over five hundred creameries and cheese factories in New Zealand with an exportable capacity of over 140,000 tons of butter and 100,000 tons of cheese. Even so we have not nearly reached the limit of our productive ability, though what further expansion takes place depends upon market prospects. Moreover, New Zealand is now the principal source of imported butter and cheese into the United Kingdom, the world's largest dairy-produce market. We have a dairying history to be proud of, and it is good to know that New Zealand's dairy industry is probably better organized than it has ever been, and better fitted to meet future development, or future adversity.

SUPPLEMENTARY.

GUARANTEED PRICES.

The closing words of this history were written on the eve of the 1935 parliamentary elections. As a result of those elections New Zealand found its first Labour Government in power, with Mr. M. J. Savage as Prime Minister, and in due course Mr. W. Lee Martin was appointed first Minister of Agriculture in the new regime.

One of the important planks in the platform of the Labour Party at the 1935 elections was a scheme of State-guaranteed prices to producers of primary products, particularly to dairy-farmers in respect of butter and cheese. It would appear that the question was first discussed at the 1933 conference of the Labour Party, and in 1935 was referred to in the Party's policy statement, "The Case for Labour," by Mr. M. J. Savage, M.P., then Leader of the Opposition. Later in the same year the scheme was made the

subject of special attention by Mr. W. Nash, now (1936) Minister of Finance whose pamphlet "Guaranteed Prices—Why and How," was the first comprehensive publication on the scheme.

On assuming office the new Government quickly gave attention to putting into effect its proposals with regard to guaranteed prices, and early in May, 1936, the Primary Products Marketing Act was passed. This Act provided for the appointment of a Minister of Marketing—the Hon. W. Nash being chosen for the post—and the establishment of a new Department of State called the Primary Products Marketing Department, with a Director of Marketing and one or more Assistant Directors.

While it is intended ultimately to embrace all primary products the Act applies only to butter and cheese in the meantime, and comes into force on the 1st August, 1936. Briefly summed up, the Act provides for the purchase by the Government of all butter and cheese intended for export, and for the marketing of the produce by the Government, the producer receiving a fixed f.o.b. price per pound of butter or cheese for the whole season's output. Future prices are to be determined from season to season. With the idea of stimulating interest in quality differential prices according to grade are also provided for, high quality produce receiving a premium over the guaranteed price and lower quality suffering a penalty.

All such matters as shipping, freight, and insurance now come under the jurisdiction of the new Marketing Department, so that the Dairy Board has been relieved of these functions. The functions of the Executive Commission of Agriculture are transferred to the Marketing Department. The Minister of Marketing also has power over dairy-produce intended for local consumption and may either purchase this for sale by the Government or fix the prices at which it is to be sold.

The Primary Products Marketing Act, 1936, is surveyed in Section II of this volume, page 255.

CHRONOLOGICAL LIST OF PRINCIPAL EVENTS.

1814. Rev. Samuel Marsden arrived at Bay of Islands **with first** domestic cattle.
1833. John Bell, the first settler, arrived at Mana Island.
1839. Cattle sent to Kapiti Island by Cooper and Holt of Sydney. William Barnard Rhodes landed at Akaroa with 50 head of cattle.
1848. First Ayrshires imported.
Howick Pensioners' Co-operative Cow Co. established.
1862. First Jerseys imported.
1870. Canterbury Herd Book established.
1871. Otago Peninsula cheese factory established.
1878. Captain Runciman started private cheese factory at Hautapu.
1880. Gilpin and Pardon started private cheese factory at Featherston.
1881. Government offered bonus of £500 for first 25 tons butter or 50 tons cheese exported.
Trial shipments of Akaroa cheese sent to England.
1882. Factories established at Edendale, Flemington, and Te Awamutu.
Refrigeration introduced.
Trial lot of frozen butter exported.
1883. Cheese factories established at Greytown, Taratahi, Pukekohe, Hamilton, Kati Kati, Clevedon, Lepperton, Temuka, and Waiareka.
Second lot of refrigerated butter sent to England.
William Bowron engaged by Government to report on general dairying situation.
Wesley Spragg entered the butter business.

1884. New Zealand's first butter factory established at Karere.
Cheese factories established at Okoia, Maungakaramea,
Geraldine, Paterangi, Rukuhia, and Morrinsville.
Taieri and Peninsula Milk Supply Co. founded.
Ayrshire cattle sent to Australia for sale.
A. B. Fitchett, Wellington, installed separator.
John Grigg imported first Friesians.
1885. Waikato Dairy Factories Association formed.
Taranaki Butter Company (New Plymouth) *commenced*
first manufacture of tinned butter.
Waitara Co. first to buy farmer's butter for cash.
Cheese factories established at Opunake, Gisborne, Tau-
whare, Wyndham, Milton (Bruce), Woodlands, and
Waihou.
Butter factories established at Whatawhata and Inglewood
(Moa).
1886. Cheese factories established at Stirling, Otakeho, Manaia,
Belvedere, and Gisborne (Ormond).
Opunake Creamery built.
Henry Reynolds built butter factory in Waikato.
1887. Butter factories established at Mangere, Waitara Road,
Tikorangi, and Eltham.
Cheese factories established at Dalefield, Omimi, and
Mataura.
1888. Butter factories established at Sefton and Mosgiel (J. and
R. Cuddie's).
Cheese factory established at Waikouaiti.
Crown Dairy Co. commenced operations.
First condensed-milk factory started at Roseville.
Butter-packing factories started at Cardiff and Dunedin.
R. M. McCallum temporarily appointed by Government to
lecture on dairy-factory system.
Parchment paper for wrapping butter first used in New
Zealand.
1889. Tai Tapu butter factory established.
John Sawers, first Dairy Instructor, appointed.
1890. Middle Island Dairy Association formed.
Condensed-milk factory started at Wallacetown.
Babcock test invented.

1891. Cardiff Co-operative Dairy Co. established.
New Zealand Dairy Supply Co., Dunedin, established.
C. W. Sorensen, Second Dairy Instructor, appointed.
Combined churn and butter worker introduced.
1892. Department of Agriculture formed.
First Dairy Industry Act passed.
Riwaka, Canterbury Central, Ashhurst, and **Maharahara**
factories established.
First Babcock tester reached New Zealand.
First Dairy Factory Managers' Conference held at **Dunedin**.
Gerber test invented.
1893. C. R. Valentine appointed Chief Dairy Expert.
Factories established: Canterbury Central, Dairy Union,
Sandymount, Cheltenham, Dannevirke, Heretaunga,
Hurleyville, Le Bon's Bay.
Withell's Brookside milker patented.
Ambury, English, and Co. (Auckland), founded.
1894. Second Dairy Industry Act passed.
Grading system for butter and cheese introduced.
Factories established at Tauranga, German Bay, and Wainui.
National Dairy Association established.
1895. Government dairy schools held at Edendale and Stratford.
Factories established at Okain's Bay and Le Bon's Bay.
Margarine Act passed.
North Otago Dairy Co. founded.
1896. Inspection of farm dairies commenced.
Dairyman newspaper established.
Government dairy schools held at Edendale and Waverley.
Waverley Dairy Factory pasteurizing milk.
1897. Home-separation system first tried.
Experiments in pasteurization of cream carried out at
Waverley.
1898. J. A. Ruddick appointed Dairy Commissioner.
Dairy Division first classified as separate branch of Depart-
ment of Agriculture.
Third Dairy Industry Act passed.
1899. J. A. Ruddick resigned.

1900. J. A. Kinsella appointed Dairy Commissioner.
Invercargill Dairy Supply Co. founded.
Dairy schools held at Wyndham and Inglewood.
D. Cuddie appointed Dairy Instructor.
1901. W. M. Singleton appointed Dairy Instructor.
Nathan's commenced manufacture of dried milk at **Makino**.
First tests made for moisture content of butter.
Government offered bonus for condensed milk.
Dairy schools held at Stirling and Stratford.
1902. New Zealand Jersey Cattle Breeders' Association formed.
1903. J. A. Kinsella resigned, and D. J. McGowan temporarily filled position of Dairy Commissioner.
Dairy Industry Extension Act passed.
1904. J. A. Kinsella reappointed Dairy Commissioner.
D. Cuddie appointed Assistant Dairy Commissioner.
1905. Instruction in farm buttermaking inaugurated.
1906. J. A. Kinsella resigned and D. Cuddie appointed **Dairy** Commissioner.
1907. Butter Export Bill passed.
1908. Dairy Industry legislation consolidated and amended in Dairy Industry Act, 1908.
1909. W. M. Singleton appointed Assistant Dairy Commissioner.
Dairy Division inaugurated herd-testing.
Ayrshire Cattle Breeders' Association formed.
1910. Oruru-Fairburn Dairy Co. adopted cream-grading with differential payments.
Holstein-Friesian Association formed.
1911. Inspection of New Zealand dairy-produce in London commenced.
1912. First casein factory, Rapanui, commenced operations.
Miss G. N. Davies appointed Instructress in soft and fancy cheesemaking.
Certificate-of-record testing inaugurated by Dairy Division.
Farm dairy instruction commenced.
1913. Milking Shorthorn Association formed.
1914. First sugar-of-milk factory erected at Edendale.
Cream-grading and prohibition of transfer of supply during season introduced by group of North Auckland dairy factories.

1915. Imperial commandeering of dairy factory outputs commenced.
1916. New Zealand Co-operative Rennet Co. established at Eltham.
1917. New Zealand Dairy-produce Exporters' Association established.
1918. Oblong butter-box made compulsory.
1919. New Zealand Co-operative Dairy Co. established.
Imperial commandeering of dairy factory outputs ceased.
1920. Manufacture of skim-milk powder commenced at Waharoa and Hautapu.
1921. W. M. Singleton appointed Director of the Dairy Division.
1922. Dairy Industry Amendment Act passed.
W. E. Gwillim appointed Assistant Director of the Dairy Division.
Group herd-testing introduced.
1923. Dairy-produce Export Control Act passed.
1925. Dairy Research Laboratory established at Hawera.
Exporter dairy newspaper established.
1926. National brand adopted.
Dairy-produce General Regulations gazetted.
Compulsory cream-grading introduced.
1927. Official herd-testing inaugurated by Dairy Division.
1928. Standardized cheese introduced.
Dairy Bacteriologist appointed to staff of Dairy Division.
Massey Agricultural College established.
1931. Dairy Chemist appointed to staff of Dairy Division.
1932. Milk-grading (without differential payments) introduced.
1933. Dairy-produce regulations amended and consolidated.
Rukuhia cheesemaking experiment carried out.
Milk-grading (with differential payments) made compulsory.
1934. Dairy Factory Managers' Regulations passed.
G. M. Valentine appointed Assistant Director of Dairy Division.
Dairy Industry Commission investigated and reported on industry.
1935. Executive Commission of Agriculture set up.
1936. Control of group herd-testing placed under Dairy Board.
Dr. Reakes, Director-General of Agriculture, retired, and Mr. A. H. Cockayne appointed as his successor.
Primary Products Marketing Act passed. •

TWO EARLY CROWN DAIRY COMPANY FACTORIES IN
TARANAKI.



ORATO.



SECTION II.

A Series of Historical Surveys of the more Important Phases of the New Zealand Dairy Industry.

CHAPTER I.

THE EVOLUTION OF NEW ZEALAND DAIRY-FARMING.

ALTHOUGH in the introductory remarks to this work it was clearly stated that no attempt had been made to cover the husbandry side of dairying, it may be appropriate, before embarking upon a series of more detailed surveys of special branches of the industry, briefly to outline the trend which has taken place in the broader aspects of New Zealand dairy-farming. The various summaries with which the first section of this volume has been interspersed present a fairly complete, though necessarily broken, picture from the dairy-factory aspect, and while the present chapter may repeat something of what has been said already, recapitulation is considered justified for the purpose of enabling the reader to form a connected idea of the general development from the point of view of the man on the land. At first consideration it may be claimed that colonial pioneering in agriculture is much the same the world over, but this is only true as a broad generalization, and the student soon discovers that for many reasons New Zealand had distinctive problems which required to be met in an original way.

It has already been shown that in the short space of slightly under one hundred years New Zealand dairy-farming has evolved and developed from nothing—the Maoris having no cows—to a point to-day when New Zealand ranks as the world's largest

exporter of dairy-produce, and as one of the foremost countries in the practice of efficient production. New Zealand exports more cheese than any other country, and ranks second to Denmark in the case of butter. Moreover, while the historian may regard colonization as his starting-point, the great expansion of our dairy industry has taken place in the present century. During this period of thirty-five years there has been, roughly, a fivefold increase in the number of dairy cows, butterfat-production per cow has almost doubled, and in consequence total butterfat-production per season has increased approximately tenfold. Although no direct data are available, it is probable that in the same thirty-five years butterfat-production per acre has doubled.

These statements may appear astounding to overseas readers, especially when one adds that New Zealand's export trade in butter and cheese did not really commence until the advent of refrigerated transport, which in our case dates from 1882.

The phenomenal achievement evidenced has resulted from the combined effect of many factors. Mr. A. H. Cockayne* reminds us that when the colonists arrived in 1840 New Zealand consisted mainly of four great types of country—(1) Forest of varied and often of a very dense nature belonging to types essentially different from those originally clothing great parts of Great Britain (from whence our pioneers came); (2) scrub and heath lands partly of a stable nature, but mainly representing one of the successional stages back to forest again; (3) large areas of swamp land, the vegetation cover varying from fern vegetation to forest; (4) open grassland, known as tussock grasslands, which had developed entirely in the absence of any grazing animals and which were essentially climatic in origin.

In the first place the early pioneers found that the easiest utilisable land was in those low-lying coastal areas comparatively free from forest. These parts mainly constituted our first dairying areas, and while the movement began in the South Island, New Zealand dairying was eventually to have the major portion of its huge expansion take place in the North Island. Here most of the land was forest-clad almost to the water's edge, with the exception of a few scattered areas and such comparatively small spaces as the Natives had cleared before the arrival of European settlers.

* Paper read at Empire Farmers' Conference, 1930.

It was found that by felling and firing the bush the resultant ash permitted surface sowing of English grasses, which quickly gave an abundance of luxuriant growth among the stumps and logs. Hence in the North Island in particular the march of progress in dairy-farming (as well as in sheep-farming) was mainly through the medium of the fire-brand. The early discovery that a good seed-bed for the establishment of pastures of European grasses could be produced by felling and burning the forest was an outstanding factor in the agricultural development of this Dominion. Following upon the felling and burning of the bush came the slow and arduous work of stumping and clearing the land of logs. In the beginning there were no mechanical appliances for the process. However, little by little the farms were cleared, and gradually the bush was driven back and the farms crept farther inland.

Dairying was first practised in and around the first settlement points such as Bay of Islands, Otago Peninsula, Banks Peninsula, Auckland, Wellington, Nelson, and New Plymouth. The discovery of alluvial gold in Otago spread farming inland in Otago and what is now Southland, and along with it dairying, this being the first penetration into the interior. The next extension took place around Auckland, due to Auckland's importance in the early days as the capital city. The South Island saw the first considerable expansion in railways, hence dairying spread more rapidly there, aided by the fact that there were fewer and less extensive forest areas to impede progress. But farming in the South was mainly general rather than specialized dairying.

The huge forest mass of the North Island, on the other hand, impeded progress on lines similar to the South, and although small areas were opened up at various early points of settlement, a great deal of preparatory work had to be done without the facilities of transport so vitally necessary to progress, before the country was ready for the trunk railways, such as the Manawatu line and its later extension through Taranaki to New Plymouth, and greatest of all the Main Trunk, which in 1908 linked Wellington with Auckland. Although the Wellington Province has shown steady and consistent increase as a dairy province since early times, and the Waitemata, Franklin, and Manakau counties around Auckland also developed well, it was in Taranaki perhaps that the foundation

of our present practice was largely developed during what might well be termed the middle period of our dairying history.

As a dairying country New Zealand owes more to her climate than to her soil, mild and equable temperatures being an important factor. New Zealand soil as a whole is not particularly good, but this has been amply offset by a plentiful, consistent, and well-distributed rainfall in most parts of the country, with the exception of Canterbury and Marlborough, which are not important dairying districts. This point is more evident in Taranaki than elsewhere. Here the soil is mainly a light volcanic loam, and were rainfall not so bountiful dairying could not have figured so prominently in the history of this province. In Taranaki, too, some of the earliest indications were in evidence of the necessity for bettering bush-clearing pastures. The ploughing and resowing which followed stumping and logging gave an impetus, the ash from the burning of stumps and logs providing an added stimulus. The grass again showed signs of going off, and bone-dust and blood and bone were resorted to, other fertilizers not being readily available in those days. Later basic slag was utilized and became very popular for use on the heavily leaching Taranaki soils. It was probably the early adoption of top-dressing practice and the grading-up of dairy stock which gave Taranaki such dairying prominence between 1900 and 1915. This province was also noted about this time for its fine Jerseys. It may be said, therefore, that Taranaki was the first province in New Zealand to become predominantly dairying.

With the opening to traffic of the North Island Main Trunk line in 1908 the Waikato evidenced rapid expansion, and in a very few years displaced Taranaki for pride of place as a dairying district. Next followed Hauraki Plains and the Bay of Plenty. These three later-developed dairying districts constituted areas of richer land largely of a swampy or semi-swampy nature, with considerable areas of peat land as well. Here the grass-production was coarse and heavy and the soil fertility not so readily exhaustible as on the much lighter Taranaki soils. Hence the necessity for top-dressing did not intrude itself so early or so prominently as in other less fortunate districts. Owing to the class of land and feed heavier dairy stock were favoured in the beginning, and not until certain areas were properly drained did the Jersey receive much popularity.

The North Auckland Main Trunk Railway was largely responsible for latter-day dairying development in the northern peninsula, the latest big dairying area in New Zealand. In recent years, however, much trial and development work has been done on the extremely light pumice areas in the lower Matamata, Rotorua, and Taupo counties, and mainly through heavy top-dressing yet another expanding dairying district is being built up.

Dairying progress in the King-country, Wanganui, Rangitikei, Manawatu, Wairarapa, Hawke's Bay, and Gisborne districts of the North Island has not been so spectacular as in the other districts already mentioned, and, moreover, these areas are not so intensive from a dairying point of view, sheep-farming being equally if not more important in certain instances.

In the South Island there is only one main dairying area at present—namely, Southland—although Westland promises considerable expansion. Dairying in other parts of the South Island, with the exception of more or less confined areas in such districts as Nelson, Marlborough, Banks Peninsula, and the coastal portions of Canterbury and Otago, is combined with other forms of farming.

The key-points of progress in the practice of dairy-farming are therefore confined principally to the predominantly dairying districts of the North Island.

Briefly summed up, the principal steps in the evolution of New Zealand dairy-farming on a grassland basis occurred in the following sequence: (1) Virgin forest; (2) felling and burning of the bush; (3) the first sowing with coarse, cheap, and often weedy English and Australian grasses; (4) bush-clearing pastures; (5) stumping and logging; (6) first subdivision; (7) ploughing and regrassing on the land cleared of logs and stumps; (8) cropping with green and root and cover crops; (9) early manuring and top-dressing, first with crushed bones and later with bonedust; (10) draining of the swamp areas; (11) the tendency towards better dairy stock; (12) better grasses; (13) better top-dressing with blood and bone mixture and later with basic slag and superphosphate; (14) supplementary crops more or less declining in importance; (15) more subdivision; (16) heavier top-dressing, with introduction of ammonia and ammoniated superphosphate;

{17} further stock improvement ; {18} the use of ensilage as well as hay ; {19} final and intensive subdivision ; and {20} the practice of rotational grazing. Finally, it may be said that the adoption of up-to-date pasture-management methods combined with systematic breeding of dairy animals has been one of the most important factors in placing the dairy industry in its present position.

While the foregoing cannot be claimed to present a summary of the strict sequence of events in all areas, it may be accepted as a fairly true outline of the position as applying to the typical North Island dairy-farm. The South Island adhered more closely, in the early days, to the English rotational practice. The grasses were regarded as temporary and a good deal of regrassing was done, usually every three years. The early grass mixtures were usually poor. Liming was also popular, particularly in the South where lime was more readily available.

DAIRY STOCK.

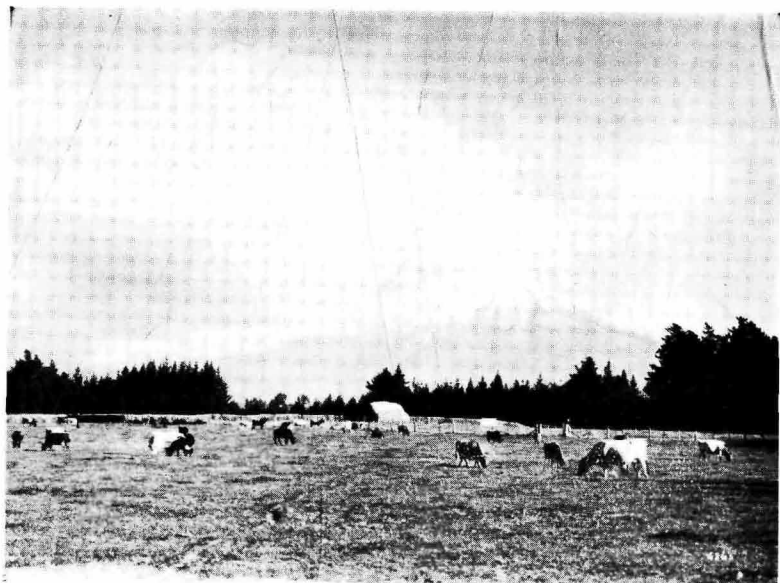
As an indication of the high productivity and efficiency reached in dairy-farming in New Zealand, it may be mentioned that, inclusive of all cows milked on other than true dairy-farms, butterfat-production averages around 80 lb. to 90 lb. per acre per season. Good dairy-farms produce somewhere between 100 lb. and 150 lb. of butterfat per acre, and in exceptional cases butterfat per acre is as phenomenally high as 300 lb. In such cases even large herds average as much as 300 lb. of butterfat per cow per season, with only one acre per producing cow.

Butterfat-production per labour-unit engaged runs, in good dairy-farming, around 6,000 lb. and more per season.

Little need be said regarding our dairy stock. The great development in this respect was built on a Shorthorn base. It is true that Ayrshires were imported at an early date (1848), but this breed, despite its recognized merits as a cheese cow, failed to spread much beyond the confines of its first adopted home, Otago and Southland. The Jerseys came in 1862 and the first few Friesians in 1884, but until well into the present century the Shorthorn dominated our dairy herds, for while in odd instances the herds were kept pure it was the Shorthorn, crossed with the



AYRSHIRES AT PASTURE.



IN THE SHADOW OF MOUNT EGMONT, TARANAKI.

[To face page 214.]

Jersey or the Friesian or the Ayrshire, which met with most favour in the early days of the dairy business in New Zealand. The introduction of systematic herd-testing in 1909 and of certificate-of-record testing in 1912 focused attention on herd-building through breeding and selection and developed a leaning toward the special purpose dairy cow. The tendency is now rapidly towards the grade cow, with the Jersey markedly predominant, and we are heading toward grades so high that a dairy-cow population of almost purebreds is discernible. The educational influence of the various branches of herd-testing has been a great factor in this respect. While the Jersey came first to the Wellington Province the majority of the early breeders of Jerseys were located around Auckland. It was, however, Taranaki which subsequently brought about the great expansion of the breed, first as a cross with the Shorthorn and subsequently in the high grade and pure form, though later still, when the Waikato developed, the Auckland Province again took first place as the stronghold of the Jersey cow. The Jersey has now spread to every part of the North Island where dairying is carried out, and to the northern end of the South Island. Friesian herds are scattered throughout both Islands, and, with the Ayrshire, this breed predominates in the far South. The present-day milking Shorthorn has diverged from the original heavy dual-purpose type, and many of our highest-producing herds are comprised of members of this breed, which is to be found in most parts of both Islands. The work of the breeders' associations has been an important factor in the swing-back to the high-grade special-purpose dairy cow.

GOVERNMENT ASSISTANCE THROUGH LEGISLATION.

The Dairy Industry Acts and regulations have been referred to in various parts of the first section of this volume and are more fully dealt with in Chapter V of this Section. This legislation, however, dealt specifically with the manufacture and export side, and there has been other legislation which, though not directly concerning the production of dairy-produce, nevertheless has been of paramount importance with regard to the expansion of the industry.

First, mention should be made of Sir Julius Vogel's public-works scheme inaugurated in 1870, which caused a rush to the land and resulted in the land boom of 1874-76. The movement, however, was before its time, and high land-values combined with a restricted market for farm-produce, and a period of low prices, subsequently brought about the collapse of 1878-80. This, it must be remembered, was before the days of refrigerated sea transport. Depression and low prices in dairy-produce, as in all farm produce, prevailed until the early 'nineties." A revived public-works policy commencing about 1885 was later to bear fruit in the final decade of last century when the influence of railways, roads, and bridges, coupled with the benefits of refrigerated transport, was beginning to give an impetus to dairy-farming. This impetus was further assisted by the land-for-settlement policy (1892) of the Seddon and Ballance Government, which provided facilities for the taking-up of land by persons of limited capital.

The great starting-point of modern progress, however, was the State Advances to Settlers Act introduced by Sir Joseph Ward in 1894, which has been described as the greatest single event from a monetary point of view that has taken place in the politics of this country. This Act was instrumental in providing finance to farmers on generous terms of interest, with comparatively low security, and led to an extensive and rapid development of the land. In effect it favourably influenced finance in practically all avenues throughout the Dominion. Before its introduction rates of interest were high, probably averaging little short of 10 per cent. The Advances to Settlers Act provided for interest at 5 per cent., and thereby established a lead which before long all other money-lending institutions were compelled to follow. Since the passing of this Act there has been something like £70,000,000 recorded as advances by the State Advances Department. It can truly be said that 1894 marked an important milestone in the progress of New Zealand's dairy industry from the expansion aspect.

LABOUR RELEASE.

The labour phase of the subject has already been sufficiently stressed to need no repetition here, so that it is necessary for the sake of a reasonably complete picture to do no more than record the main features. It has been shown how the growing industry

progressed from the making of butter and cheese on the farm by individuals to community manufacture in the factories, at first proprietary and later co-operative. It has also been shown how the industry grew at such a pace that a new problem arose with regard to the milking of the cows, and how this problem was met by the adoption of milking-machines. In New Zealand there is a higher percentage of machine-milked herds than in any other country in the world. The walk-through shed was also an important factor in this respect. Later came the separation of the cream on the farm, and combined action with regard to the collection of milk and cream in place of the original method whereby each supplier delivered his own raw material to the factory. Reticulation of the country with electric power has further improved the position and tended to simplify the dairy-farmer's work and to make it more congenial. An interesting account of the progress in power for farm and factory machinery could be written, following the trend from hand, horse, and water power to the steam-engine, the internal-combustion engine, and so on down to the electric motor. From the dairy pasture point of view machinery has been specially developed for the distribution of fertilizers, the saving of hay and ensilage, while the grass harrows are worthy of mention.

EDUCATIONAL.

In concluding this brief sketch of the dairy-farming side of the industry, reference should be made to the factor of education. The Government of New Zealand has, from earliest times, laid stress upon the educational side of agriculture, and by means of instruction services has done a great deal toward promoting improved methods through increased knowledge.

The work of the Dairy Division has been dealt with elsewhere, and it has been pointed out that the Division's work relates principally to production, manufacture, and grading of dairy-produce. Regular dairy instruction dated from 1889, though a certain amount of lecturing and instruction work was done as far back as 1883. Dairy-produce Graders were first appointed in 1894 and the first Farm Dairy Instructor in 1912. Dairy schools were conducted by the Division for several years commencing in 1895, and revived at intervals until the first decade of the present century. Systematic

herd-testing was introduced in 1909, and in the upshot has probably rendered as great a benefit indirectly through its educational service as directly through culling, selection, and herd-building. From the broader aspect, however, other institutions and other branches of the Department of Agriculture played important parts in the building of the industry. Taking the Department first, the Live-stock Division, through its veterinary service, has kept our dairy herds comparatively free from serious disease and made the position safe for the breeder of dairy cattle. The Quarantine Regulations pertaining to importation of stock have helped to avoid the introduction of contagious diseases, while the Department's staff of skilled Veterinarians working in conjunction with the stock-inspection service copes with any outbreaks which may occur. Through lectures, demonstrations, and literature, farmers are educated in the detection and treatment of stock ailments. The inspection of dairies for local milk-supply is also under the supervision of the Live-stock Division.

Before the establishment of dairy laboratories the Chemistry Section rendered important service to the dairy industry and co-operated with the Dairy Division, more particularly under the headings of dairy glassware and appliances, testing of butter for moisture, and analysis of milk.

The Fields Division has been one of the most important of all, its work covering a wide field. The demonstration farms, particularly at Weraroa, Moumahaki, and Ruakura, in addition to the breeding for sale of purebred dairy cattle of the lesser established breeds, provided skilled example in all branches of dairy-farming practice. Through these demonstration areas and others established in various parts of both Islands, dairy-farmers were guided in such matters as grassland farming, rotational grazing, methodical subdivision, skilful cropping, and all that goes to the making of the scientific farmer and greater and more economic production of butterfat. At a later date, 1928, when several of these farms had been disposed of, the Plant Research Station at Palmerston North carried on the fields side of the work in a more specialized manner.

The Farm Economics branch, founded in 1925, marked the commencement of a farm economic service to the farming community. Since its establishment economic studies have been made

of cost of production and of most other branches of agriculture occurring in New Zealand, dairying receiving special attention.

A service of special importance because it provides a foundation on which the dairy-farmer of the future is built is that rendered by the Education Department through the teaching of dairying subjects at primary and secondary schools in rural districts.

Next there are the two agricultural colleges, one at Palmerston North in the North Island and the other at Lincoln, Canterbury, in the South Island. In addition to most other agricultural subjects, Massey College, founded in 1928, provides comprehensive courses, both theoretical and practical, in all branches of dairying, including herd-testing, and possesses a model dairy factory as well as a dairy laboratory. The Canterbury College of Agriculture, usually referred to as Lincoln College, is the pioneer institution of its kind in New Zealand, being established as far back as 1881. This college has been of major importance in the scientific training of our farmers, and, while more particularly concerned with general farming rather than specialized dairying, was for many years the only institution where dairy science and dairy husbandry were taught.

Much could be written regarding the work of farmers' bodies through breed societies, calf clubs, conferences, field-days, demonstrations, &c., though this would be beyond the scope of this work.

Mention should be made, however, of what, from the dairy industry point of view, is a most important educational medium—namely, co-operation. The educational value of the co-operative principle as applied to the conduct of dairy factories, &c., can scarcely be overestimated. It compels an active interest in the operations of the dairy factory, in the production and handling of the raw material, and in the marketing of the finished product. Out of the co-operative system comes improved dairying.

CONCLUSION.

This chapter has attempted to portray, in broad outlines, a picture of the gradual progress of the dairy industry in New Zealand from the dairy-farming side, touching also upon legislation, education, and the introduction of science. The Government has

naturally played a conspicuous part for the obvious reason that State assistance is essential to the development of a new and sparsely populated country hampered by lack of necessary finance. The trend of development, too, has been a normal one, the only spectacular feature being its rapidity. At first the work progressed in stages along more or less independent lines—the breaking-in and utilization of the land, the breeding of dairy cows, the manufacture of dairy-produce, &c., being treated as related but nevertheless separate problems. Time, however, has proved the necessity for a linking up, and each year is bringing us nearer to a true co-ordination between the various organizations and institutions concerned with the welfare of the industry. Until recent years the dairy-farmer has, in normal seasons, found little difficulty in obtaining a satisfactory monetary return for his labour and capital invested, but increasing competition and a long period of low prices has focused attention on economy of production. It appears that in future it will be necessary to endeavour to increase the average return per unit of stock, which will necessitate more scientific practice. Improvement will probably come about not only through more skilled farming methods, but also by closer attention to the feeding of dairy cows, a matter which has received comparatively little attention in this Dominion in the past. Fortunately, practical and common-sense legislation, an expert Government instruction service for all branches of dairying work, dairy laboratories, and a Research Institute place New Zealand in possession of the necessary facilities for future advancement.

CHAPTER II.

ORGANIZATION AND FUNCTIONS OF THE DAIRY DIVISION.

WHEN planning this book it was intended to devote a special chapter to the Dairy Division, but it was soon discovered that Government assistance and supervision was so interwoven with the development of the industry that the two were inseparable. It is considered desirable, however, to include a brief survey of the organization and functions of the Division, in order that readers may understand, if only in a general way, not only the important part which the Government plays, but, more particularly, how an attempt has been made to co-ordinate every branch of the industry under one main control having two main objectives—namely, (1) to produce, as economically and scientifically as possible, high-quality butter and cheese, (2) to place on overseas markets, particularly the British market, in good order and condition, dairy-produce entirely suitable to the requirements of that market. It should be understood that the Dairy Division's duties pertain to the manufacturing side of the industry and are not associated with the production of milk or cream for local consumption. These matters come under the Live-stock Division of the Department of Agriculture.

ORGANIZATION.

The Dairy Division comprises (1935):—

- (1) A Director :
- (2) An Assistant Director :
- (3) A Head Office clerical staff of 10. About half of this staff is engaged on clerical and statistical work connected with cow testing :

(4) Dairy Instructors and Dairy-produce Graders. These number 40, of whom 2 are resident in London as Inspectors of New Zealand dairy-products and 38 are within the Dominion. Of the latter, 14 are engaged almost exclusively as travelling Dairy Instructors, each within a specified territory. Seven of them have specialized chiefly in buttermaking and 7 chiefly in cheesemaking. The remaining 24 are located amongst the eleven grading-ports or centres and employed mostly at the work of grading butter and cheese. At ports where casein is graded the work is done by these officers. Each port has its clerical staff and its officers engaged in the testing for moisture and salt in butter, 22 testers being so engaged at present (1935). Six clerical officers are permanently employed at the grading-ports, while an additional 9 are engaged during the busy period of the year :

(5) Farm Dairy Instructors, 36 :

(6) Special Inspectors, 2 :

(7) C.O.R. and Government O.H.T. Testing Officers, 16.

FUNCTIONS.

The functions of the Dairy Division fall under some sixteen principal headings, which may be tabulated and briefly commented upon as follows :—

(1) *Administration of the Dairy Industry Act and the regulations thereunder.*

From the administrative side the Dairy Industry Act and the Dairy-produce General Regulations cover a wide field, embracing, as they do, every phase of the industry. This fact will be obvious from the section relating to "legislation dealing with the industry." The correspondence side also is of considerable magnitude and embodies requests for information on an infinite variety of dairying subjects. The Division has been fortunate in that it has always received the sympathetic support of the great majority of workers in the industry, and without such support efficient administration would have been a well-nigh impossible task.*

(2) *Advice on the formation of co-operative dairy companies.*

The Division now receives very little call for assistance along this line, but played a conspicuous part in the earlier days of the industry.

(3) *Selecting sites for dairy factories and advising re building plans and dairy plant.*

Right from the commencement of the Division's instruction service in 1889 Dairy Instructors have made a special study of factory design and equipment, and a large number of New Zealand's factories have been built to plans or modifications of plans prepared by the Division. As far back as the early "nineties" comprehensive pamphlets dealing with every phase of the subject were circulated by the Government. Site, structure, and equipment of all new dairy factories must meet with the approval of the Director of the Dairy Division, and the plans must also be approved by the Minister of Agriculture.

(4) *Inspection and registration of manufacturing dairies.*

Every factory requires to be registered, and registrations are subject to the approval of a Dairy Instructor to the general effect that the building, plant, and surroundings comply with the statutory requirements governing the matter.

(5) *Instruction at dairy factories in manufacture of butter, cheese, and casein.*

This, coupled with the work of the Grader, is probably the most important work of the Division. It is the Instructor who keeps the wheels running smoothly and true. There are few days on which the Division's Instructors are not in some dairy factory or another assisting to solve difficulties and generally contributing to the smooth running of the manufacturing side of the industry. Not only do they assist toward keeping quality at a high standard, but at a uniform standard. They are required to know all branches of the business from the production of the raw material to the packing of the finished article.

(6) *The grading and testing prior to export of butter, cheese, and casein.*

The Dairy-produce Graders and Instructors are chosen from men who have been successful dairy-factory managers. The Dairy-produce Grader grades the produce, allotting points under the various headings laid down by the regulations. A copy of the grade certificate, or grade "note" as it is commonly termed, goes to the dairy company, and in the case of faults which the factory-manager cannot rectify the Dairy Instructor is called in, so that he provides a link between the dairy factory and the Dairy-produce Grader. The Grader is, needless to say, in an ideal position to exercise oversight in the matter of uniformity of the character of the output of the various factories operating in the district covered by his grading-port. It is also the Grader's duty to have checks carried out from the point of view of seeing that there is no contravention of the regulations governing the salt and moisture content of butter. Further, his supervision extends to the container in which the produce is packed.

(7) *Maintenance of uniformity of milk and cream grading.*

This important work is under the supervision of the Dairy Instructors. It is difficult work to control, requiring wide experience and considerable tact and judgment.

(8) *Examining and certificating of milk and cream graders.*

Applicants for these certificates are required to pass a strict test before being recommended for a certificate entitling them to carry out the work. The certificate is issued by the Director of the Division.

(9) *Instruction at dairy-farms on the care of milk and cream.*

This service is rendered by Farm Dairy Instructors, who are under the direct supervision of the Butter and Cheese Instructors. The service is one of the most important rendered by the Division inasmuch as it deals with the raw material at its source. A thorough knowledge of milking-machines and farm separators is essential, while it is also necessary that Farm Dairy Instructors should have had a certain amount of dairy-factory experience.

Without this experience they cannot tell to the best advantage that the raw product—milk or cream—is of the quality most desired for the manufacture of best-quality butter or cheese.

(10) *Inspection of milking-machines.*

It is required by the regulations that all milking-machine installations be notified to the Director of the Division. Dairy Instructors are required to see that both the machine and the installation of the machine comply with the regulations.

(11) *Testing of glassware used in testing milk and cream to determine the pounds of butterfat for which each supplier should be paid.*

This work was originally carried out by the Chief Chemist of the Department of Agriculture. For some years, however, the testing has been done by the Dairy-produce Graders. A small fee is charged for the service. Correct glassware is marked accordingly and incorrect glassware destroyed. It is the duty of the special Inspectors to see that the glassware in use for testing work at dairy factories is marked as correct.

(12) *Check-testing at dairy factories to ensure that the testing is being done accurately.*

Factory-managers are required to hold samples four clear days after the factory testing-day. The Dairy Instructors pay surprise visits and check-test the samples to see that the results agree with those credited to the suppliers.

(13) *Dairy chemistry and bacteriology.*

Chemical and bacteriological work is carried out at the Wallaceville Laboratory, and is conducted along lines which enable it to be linked up with the grading and instruction service. The principal subjects of investigation relate to testing for salt and moisture content of butter and cheese, the preparation, use, and care of dairy starters, and to dairy factory water-supply.

(14) *The judging of competitive exhibits of butter and cheese at shows.*

Judging at all the important shows is carried out by officers of the Division, and for many years this work has been considered a regular part of the Division's duties. Instructors and Graders co-operate in carrying out the judging.

(15) *The inspection of dairy-produce in England.*

The two officers of the Dairy Division stationed in London report to New Zealand on the condition of New Zealand dairy products on arrival in the United Kingdom and investigate any special complaints respecting quality, packing, &c., reporting any matters of urgency by cable to permit of early investigation at the manufacturing dairy in New Zealand.

(16) *The certificate-of-record testing and Government official herd-testing of purebred dairy cows.*

This work is a more or less independent unit of the Division's activities. The Testing Officers work under the direct supervision of the Director of the Dairy Division, although their work is inspected periodically by a Dairy Instructor or one of the special Inspectors.

The foregoing is, at best, little more than a tabulation of outstanding features. A long series of important items could be collected under the general caption of "State assistance in regard to manufacture," but this would necessitate considerable detail. There is justification for feeling proud of the fact that, except in the early stages, when experienced men were not available within the colony, all the Division's Instructors and Graders have received their training in New Zealand. These officers are chosen from the more successful factory-managers, and, in addition to dairy-factory experience, the majority have had dairy-farming experience. New Zealand initiated and developed the first Government grading of dairy-produce forwarded for export, and the good reputation of the system is world-wide. Our Graders, like our Instructors, are all locally trained, and it says a great deal for the men as well as the system that such efficiency and uniformity is maintained when the grading-ports are so many and scattered.

The salaries and expenses of Dairy Instructors are, and always have been, paid from the Consolidated Fund. In the earlier years all grading and cold-storage charges were paid by the Government. The Government pays half the salary of Farm Dairy Instructors. Since 1928 the Government has contributed annual

sums ranging from £10,500 to £6,000 by way of encouragement and assistance to herd testing. The certificate-of-record testing costs considerably more than the sum represented by fees received, and the system is subsidized to approximately 50 per cent. of the cost. The laboratory service at Wallaceville is rendered without charge to dairy companies.

In conclusion it should be recorded that our dairy companies have always shown a progressive spirit not only in their own behalf, but at the suggestion of the Division, and have never been backward in trying out new appliances or methods which show promise of increasing efficiency

CHAPTER III.

REPRESENTATION OF THE DAIRY DIVISION IN LONDON.

FROM the inception of the export trade in dairy-produce from New Zealand to Great Britain there was a feeling among those in the industry that reports thereon which were received from importers did not give the information to the makers in this country which would enable them to rectify the faults which were complained of, and it was also felt that, in a desire to extend business with the dairy companies, these faults were in some cases minimized.

In 1912 it was decided to send an officer with a practical knowledge of the manufacture and grading of dairy-produce to reside in London and take up this work. Mr. W. Wright, at that time Grader in Charge at Patea, was chosen. He was born in England and came to New Zealand at an early age.

Mr. Wright's training covered every phase of the industry and included dairy-farming, city milk-supply, and butter and cheese making in various parts of New Zealand and Australia, followed by some years of experience as a grader of both butter and cheese at a number of ports. The work done by him in his new position showed that the choice was a good one.

The outbreak of war within two years of Mr. Wright's arrival in London interrupted the work, and he was released for service at Sling Camp, where he undertook the training of the small contingent of New Zealanders who were engaged in Britain in various occupations, and who immediately enrolled for service. Mr. Wright had seen quite a long period of Territorial service in New Zealand and Australia, and at the outbreak of war had just passed the examination for the rank of Captain. He applied for permission to enrol for service at the front, but was retained in London for duties

connected with New Zealand produce until 1918, when it was decided to discontinue the service for a time. He accordingly came back to New Zealand, where he was engaged as a Grader in Auckland until 1922, when he returned to London and again took up his former position, finally retiring on the 31st August, 1934, having reached the age-limit for service.

Prior to 1912 reports of a more or less general nature had been furnished on New Zealand dairy-produce by Messrs. Lowe, Cameron, and Crabb, whose duties covered produce generally and dealt more with shipping conditions and handling at the London end.

The work required by Mr. Wright as an officer of the Dairy Division necessarily entailed a more detailed examination of butter and cheese on lines approximating the methods followed in the grading-stores in New Zealand, and as the produce was at that stage in the hands of importers, much of it having been actually bought by them, it is obvious that their confidence and respect had first to be gained and a reputation as a reliable judge of quality established.

The grade notes furnished to exporters in New Zealand, and the marks on the boxes and crates were not at that time accepted in Britain, as they are to-day, as a reliable indication of quality, and buyers followed the practice of buying "on the iron" on the floors of the importers, where a number of sample boxes and crates of each of the brands represented in a shipment were exhibited for their inspection. This practice gave an opportunity for examinations of individual brands by the representative of the Division, and the practice of furnishing reports to the factories in New Zealand on the quality of their produce was begun.

Advantage was also taken of the opportunities thus presented for making contacts with wholesalers and retailers from the city and provinces and obtaining their views on quality and the class of produce which would suit their requirements. This contact was followed up by visits to the provincial centres of distribution, and in very many instances wholesalers were induced to handle New Zealand dairy-produce as the result of a personal canvass and advice regarding the brands which would best suit their requirements.

In addition to reports on actual quality which are furnished to individual factories, defects in packing and packages are closely watched and are reported on individually and collectively. A simple system of marking which enables the produce to be readily traced to the time of making and date of grading has been evolved, and has proved acceptable to importers as well as to all parties at this end.

The service is freely availed of by importers to bring before the notice of divisional officers any defect which is affecting the reputation of individual brands or the produce as a whole, and an exchange of views is an everyday occurrence.

Questions relating to defects resulting in claims for allowances by buyers are also referred to them, and, when justified, their suggestions regarding the amount to be allowed, if any, are frequently accepted.

Prior to the establishment of the Dairy-produce Board's office in London, a considerable amount of time was spent in the examination of the condition of cargoes landing at the docks and its handling and storage up to the time of delivery to users, duties which have since been taken over by the officers of the Board.

The extension of shipping services to west coast ports and the large increase in the quantities being exported from New Zealand has led to a considerable increase in the work, entailing travelling to each of these ports, and in recent years the number of officers engaged has been increased to two permanent men and one temporary man, each year, who returns to New Zealand when his term of service, usually ten months, has expired. This wider distribution also results in an increasing number of calls from the larger area being served, and officers keep in touch with users of New Zealand produce throughout Great Britain and Ireland.

The practice of buying "on the iron" has decreased very considerably in recent years, and the bulk of the business done to-day is transacted by telephone or mail order, so that there are fewer opportunities to examine lines of butter, as it must necessarily be thawed before this can be done. This position may be regarded as a tribute to the work of the Graders in New Zealand.

As cheese is carried at a higher temperature, it can be examined in store in London or as it is being unloaded from the ship at out ports, and consequently reports on cheese cover practically all brands.

So far as they possibly can, importers have given every facility for the examination of produce to divisional officers, and the good feeling existing is a tribute to the tact and discretion displayed by those who have occupied these positions.

Many inquiries relating to general matters connected with dairying are received at New Zealand House and are dealt with by officers of the Division. Others come from householders who are users of New Zealand butter and cheese, and cover a very wide variety of questions which frequently entail visits to retail grocers and have quite a bearing on the good will shown to our produce.

A considerable amount of time is taken up by examinations of lines of experimental cheese and butter forwarded by dairy companies and also by the Dairy Research Institute and have covered such wide features as the waxing of cheese, class of bandage used, openness in cheese, crating and cheese packages, mould-development, special lines of show cheese. In the case of butter, the influence of starter, spreadability, butter packages and linings, vacuum treatment in the process of manufacture, and in packing, and many other features which have required attention from time to time, and which have helped to build up the reputation which New Zealand dairy-produce now holds.

Close contact is also kept with the produce from other countries which reaches the British market, and development of dairying methods of manufacture in those countries, as seen from the London end, are carefully watched. Officers have also represented the Dominion on various Imperial committees which have been set up from time to time to deal with dairying matters of mutual interest, such as the Committee on the Standardization of Volumetric Glassware and others of a similar nature.

The most important feature of the service, however, is the personal contact which it provides between the industry in New Zealand and the importers, distributors, and consumers in Great Britain, a contact which facilitates an interchange of ideas and without which many misunderstandings would arise with a consequent loss of goodwill.

CHAPTER IV.

GRADING AND BRANDING OF NEW ZEALAND DAIRY - PRODUCE.

THE Dairy Industry Act of 1894, which came into force on the 23rd October of that year, provided for the compulsory grading of all New Zealand butter and cheese intended for export. The grading and grade-stamping of butter in accordance with the provisions of the Act commenced immediately after the passing of the Act, but the grade-stamping of cheese did not come into operation until some six years later, although an official inspection of cheese was made and the manufacturer supplied with a copy of the Grader's report. The first graded produce to leave New Zealand was a shipment of butter by the s.s. "Gothic," which left these shores on the 13th December, 1894. The grading of cheese and the marking of the packages according to grade took effect as from the 1st October, 1900.

Grading has been continued without intermission since its inception. It is difficult to say who first advocated the grading of New Zealand dairy-produce prior to shipment. Records indicate that the subject was the basis of heated controversy and widely differing opinion as far back as 1889. The idea seems to have been taken from Ireland, where the classifying of butter exported from County Cork had been in operation for many years, since 1813 in fact. The Irish system, however, was a classification rather than a grading, and it would appear that our first scale of points under the headings of flavour, body, texture, &c., was modelled on the United States of America, where in both Wisconsin and New York State scoring-points on a similar scale were in vogue for several years prior to the introduction of grading to New Zealand.

Mr. C. R. Valentine, Chief Dairy Expert 1893-94, drew up the first regulations covering the grading and classification of butter and is said to have copied New York State regulations. He took the term "full cream" from them, and possibly the term "creamery" also originated in America. The Irish applied the term "auxiliaries" to their skimming-stations and "centrifugals" to establishments making butter from power-separated cream.

To begin with the proposal had very few advocates, and numerous reasons were advanced against its success by unfavourable critics, who could see nothing to warrant the step being taken. The argument which appears to have carried most weight was the one that it took our produce at least six weeks to reach its destination, and that marked changes were likely to occur between the time of grading in New Zealand and delivery to the consumer, thus rendering the grade-stamp useless as an index of quality. However, the then Secretary of Agriculture, Mr. J. D. Ritchie, foresaw the benefits to be derived from the systematic classification of dairy-produce, and persistently recommended its introduction. In spite of the opposition and adverse criticism, the work was eventually undertaken with the sanction and strong support of Sir John McKenzie, then Minister of Agriculture. To induce the smooth working of the scheme an enactment was introduced providing for free cool storage of butter so as to assist the industry. Gradually those engaged in the manufacture of dairy-produce began to recognize the advantages of the system, and in a few years a noticeable improvement was manifested in the quality and packing of produce forwarded for shipment.

The net weights of produce, which were formerly very irregular, became more uniform and accurate, and many of those who had at first opposed the action of the Department were convinced that grading was proving of great educational value in building up a better name for New Zealand butter and cheese on the markets of Great Britain. Merchants dealing in dairy-produce could see that the grading system might be helpful to them in arranging their business with dairy companies. Negotiations for the purchase of factory outputs, between the directors and merchants, were entered into, and a special clause in the contracts provided for the acceptance of the Government Grader's certificates of quality and weights.

A copy of the Grader's certificate is attached to the bill of lading for the use of the banks. This recognition gave to the certificates the significance of commercial documents, and such they are now held to be. Copies of grade-notes regularly accompany the usual papers forwarded to the purchasers of butter and cheese outside the Dominion. The greatest value of the system, as originally intended, is still in the effect it has in maintaining and improving the standard of quality of the butter and cheese graded, for through the medium of the grade-notes the owners and makers of the produce are promptly made acquainted with any defects which may be detected in it when examined by the Graders before shipment. This enables the makers to look into their methods with a view to locating the cause of the faults referred to, and, if possible, avoiding a continuance of them in future consignments. When it is found that the butter or cheese from any particular factory shows a falling-off in quality on arrival at the grading-stores, one of the Dairy Division's Instructors pays a visit to the factory to assist the manager in remedying the fault, and therein lies the strength and efficiency of the grading. Without this provision the official examination of the produce would lose the greater portion of its educational value, as well as its popularity with those most directly concerned.

Dairy-factory directors and managers, butter and cheese makers, and others connected with the industry are encouraged to visit the grading-stores frequently, where they are given the opportunity of sampling the produce under examination. Many factory-managers take advantage of this privilege and consequently become competent judges of dairy-produce. The confidence of the dairy people in the soundness and reliability of the grading is thereby obtained, and without such confidence the grading system would not have proved the success that can now be claimed for it.

Strict attention has always been paid toward keeping the graders working on a uniform basis at the different centres, so that a given number of points allotted to each consignment of butter or cheese at any of the ports will indicate a certain standard of quality.

The comparatively insignificant number of complaints received goes to indicate that the grading work has been well done, and there is no doubt that the good reputation for high-class and

uniform dairy products which New Zealand holds can be largely credited to the efficiency of the grading system and the skill of the Dairy-produce Graders.

PROVISIONS OF 1894 ACT.

The principal provisions under the 1894 Act in relation to the grading of dairy-produce were as follows :—

- (1) The proclaiming of cool stores at Auckland, Wellington, Lyttelton, and Port Chalmers, and such other places as might from time to time be considered necessary.
- (2) The appointment of Graders.
- (3) The inspection of each lot of butter and cheese intended for export and the grading and marking of each package according to grade.

GRADING-STORES.

The first premises to be declared grading-stores under the 1894 Act were the stores of the Auckland Freezing Co., Ltd. ; the Wellington Meat Export Co., Ltd. ; the Lyttelton Harbour Board ; Messrs. Irvine and Stevenson, Dunedin ; the Taieri and Peninsula Dairy Co., Dunedin ; and J. and R. Cuddie's store, Mosgiel ; these being gazetted as from the 29th November, 1894.

Waitara was declared a shipping-port for dairy-produce as from the 12th December, 1895, the cool store being the buildings occupied by C. Edward Halloran and used as freezing-works.

The cool store of the Taranaki Freezing Works Co., Ltd., New Plymouth, was declared a grading-store as from the 21st September, 1896.

The next to come in was the Southland Frozen Meat and Produce Export Co.'s store at Bluff, which dates from the 17th October, 1898.

Patea dates from the 8th November, 1901, the premises being those of the West Coast Refrigerating Co., Ltd.

A period of ten years elapsed before it was found necessary to arrange for further grading-ports. On the 12th January, 1911, Timaru was added to the list, the premises being those of the South Canterbury Cold Storage and Produce Distributing Co., Ltd. Next came Wangānui, the date being the 14th September, 1911,

the store being at Castlecliff and owned by the Wanganui Meat Freezing Co., Ltd. On the 14th January, 1915, grading was commenced at Gisborne in the store of the Gisborne Sheep-farmers' Frozen Meat Co., Ltd., while last on the list, 11th December, 1924, is Napier, the premises being at Port Ahuriri, and owned by Messrs. J. J. Niven and Co.

Of those mentioned the only port which does not remain is Waitara, New Plymouth having provided for the North Taranaki produce for many years. Mosgiel was never used except for the first season or so. There are at present (1935) eleven grading-ports and sixteen grade-stores in the Dominion, particulars being as follows: Auckland Farmers' Freezing Co., Ltd., at Auckland, Southdown, and Horotiu; Gisborne Sheep-farmers' Frozen Meat Co., Ltd., at Gisborne, held under lease by the Gisborne Refrigerating Co., Ltd.; J. J. Niven and Co., Ltd., at Port Ahuriri; Taranaki Producers' Freezing Co., Ltd., at Moturoa; West Coast Refrigerating Co., Ltd., at Patea; Wanganui Cold Storage Co., Ltd., at Castlecliff; Wellington Harbour Board's No. 27 store at Wellington; Co-operative Dairy-producers' Freezing Co., Ltd., at Wellington; Lyttelton Harbour Board, Lyttelton; New Zealand Farmers' Co-operative Association, Ltd., Christchurch; New Zealand Refrigerating Co., Ltd., at Smithfield; Otago Dairy-producers' Co-operative Cold Storage Co., Ltd., at Dunedin; Taieri and Peninsula Milk Supply Co., Ltd., at Dunedin; and the Southland Cool Stores, Ltd., at Bluff.

STORAGE CHARGES AND GRADING FEES.

As stated previously in this chapter, the whole of the charges relating to grading and cool storage were originally borne by the Government. This position obtained from the introduction of grading in 1894 until 1900. From that date it was decided the producers would bear part of the expense, and the Government contributed an annually decreasing proportion of the cool-storage charges until financial assistance was finally withdrawn after the 1907-8 season. From then on the charges were wholly met by the dairy companies. In most cases, as will be seen from the list supplied, the cool stores are co-operative enterprises owned by the farmers.

The grading was continued free of charge until the 1st January, 1921, from which date exporting dairy companies were charged 1d. per box for butter and 1½d. per crate of cheese. The grading fees have since been slightly altered on one or two occasions, but at present are back to the original cost. These charges are slightly more than cost, and at the end of each season the exact grading-costs are worked out and any excess may be credited to companies against the following season's consignments. Grading fees cover such items as salaries of Graders and clerical staff, office rentals, telephones, stationery, postages, lighting, &c., as well as cost of London inspection service.

FREIGHT RATES.

Before the inauguration of the Dairy Board rates of freight on butter and cheese shipped to Britain were the subject of arrangement between the shipping companies and the National Dairy Association and the South Island Dairy Association. The Dairy Board, however, took over the freight contracts as an important branch of its operations, and as will be seen from the following table, was instrumental in effecting considerable savings.

RATES PRIOR TO THE BOARD'S INCEPTION.

Year.	Butter (per Box).	Cheese (per Pound).
	s. d.	d.
1914	2 6	0½
1921	6 0*	1¼, * plus 10 per cent.
1922	5 0	1⅞, plus 10 per cent.
1923	5 0	1⅞, plus 10 per cent.
1924	4 6	1

* The end of the War commandeer.

RATES UNDER BOARD'S CONTRACTS.

Year.	Butter (per Box).	Cheese (per Pound).
	s. d.	d.
1924-26	4 0	0⅞½.
1926-29	4 0, less 7½ per cent.	0⅞, less 7½ per cent.
1929-30	4 0, less 12½ per cent.	0⅞, less 12½ per cent.
1930-33	4 0, less 15 per cent.	0⅞, less 15 per cent.
1933-36	4 0, less 21 per cent.	0⅞, less 21 per cent.

(Since January, 1933, rates have been subject to a surcharge of 13½ per cent. to compensate shipowners for rise in exchange premium to 25 per cent.)

THE FIRST DAIRY-PRODUCE GRADERS.

Four officers were appointed as Inspectors and Graders under the 1894 Act, the first of whom was Mr. August BÜSCK, whose appointment dated from the 2nd November, 1894. The other three were Messrs. A. A. Thornton, J. T. Lang, and H. R. McWilliam, all of whom were engaged as from the 12th of the same month. Mr. BÜSCK was appointed to Auckland, Mr. Thornton to Wellington, Mr. McWilliam to Lyttelton, and Mr. Lang to Dunedin.

Of these four names, that of Mr. A. A. Thornton will be longest remembered, on account of his long and important connection with the Dairy Division's grading-work. Mr. Thornton came out from London as a young man, and prior to joining the staff of the Division was twelve years with Messrs. E. Steeds and Co., Christchurch, dairy-produce merchants, where he had specialized in the butter business, and at the same time gained a good working knowledge of cheese. Mr. Thornton remained with the Division until his retirement, owing to ill health, in 1928. Originally stationed at Wellington, he was transferred to Lyttelton in 1898 and to Auckland in 1905, where he remained until leaving the Service. During a long career he worked loyally and enthusiastically for the industry, and left a reputation for sound and impartial judgment as well as outstanding personality. It can fairly be said that the success of grading was in no small measure due to the work of Mr. Thornton.

Mr. August BÜSCK was born in Roskilde, Sjælland, Denmark, and obtained his technical training at the Copenhagen Milk Supply Factory of Mr. Gunni BÜSCK, his uncle, a founder of the dairy industry in Denmark. He came to New Zealand, for health reasons, in 1891, and on his arrival took up dairy-factory work, joining the staff of the Division some three years later. He only remained with the Division some two or three years, but during that period rendered valuable service as Dairy-produce Grader, Dairy Instructor, and lecturer and demonstrator in buttermaking at the first dairy schools conducted by the Division. Mr. BÜSCK acted for a while as a supervising Grader, and was also chosen to inaugurate a system of milking-shed and dairy-herd inspection, something similar to our present farm-dairy instruction, though the work was discontinued.

MEMBERS OF THE FIRST STAFF OF DAIRY-PRODUCE GRADERS.



A. BUSCK.

J. T. LANG.

J. B. MACÉWAN.

A. A. THORNTON.

B. WAYTE.

JOHN SAVERS.

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Mr. Lang came from Ireland in 1881, and Mr. McWilliam from Scotland. On account of their brief stay with the Division—less than two seasons—it is not necessary to do more than record their names.

GRADING AND MARKING OF PRODUCE.

The Dairy Industry Act, 1894, provided for a broad arrow as the official grade-stamp, and the grade-marks 1 for first grade, 2 for second grade, and 3 for third grade. The provisions of the Act applied to all butter and cheese forwarded for export, except that which was packed in hermetically sealed tins. The quantity of produce exported in tins was very small, and as it was difficult to know how to handle it from a grading point of view, it was decided to make an exemption. In later years the problem was met by grading the produce at the factory before tinning, this procedure later giving way to a system whereby the packing company was required to send an extra tin to the grading-store with each box. The grader then selected a tin haphazard for examination and replaced it with the additional tin supplied by the company, the opened tin being returned to the manufacturer after grading.

The first grade-stamps were metal dies impressed by means of a hammer blow, but for reasons of convenience of application the metal die soon gave way to the rubber stamp.

For the first two years of operation of the grading system—that is to say, the seasons 1894-95 and 1895-96—butter was classified according to grade under the headings of first, second, and third, no grade-points being allotted. Commencing with the 1896-97 season, a system of grade-points was adopted, the headings and maximum points being as follows :—

	Points.
Flavour	45
Body, moisture, and texture..	25
Colour	10
Salting	10
Finish	10
	—
Total .. .	100

Butter scoring over 86 points was marked first grade ; from 76 to 85 points, second ; 75 and under, third. These pointings applied to factory or creamery butter, dairy and milled butter being graded on somewhat similar lines.

After two years' experience it was decided to raise the standards for grading creamery butter, the reason being that too much of the butter was being classed as first grade, and for the 1898-99 season first-grade butter was required to grade 88 points or over, butter grading under 88 and over 80 was classed as second, while under 80 points was third grade.

Commencing with the 1899-1900 season a new schedule of grade points for butter was used, and a system of grading cheese on similar lines to butter was inaugurated.

From the 1st October, 1899, the following standards were observed :—

For first grade	..	88 points and over.
For second grade	..	Under 88 points and over 80 points.
For third grade	..	80 points and under.

SCALE OF POINTS FOR CREAMERY BUTTER.

	Points.
Flavour	50
Body, moisture, texture	25
Colour	10
Salting	10
Finish	5
	—
Total	100

DAIRY BUTTER.

For first grade : Clean in flavour, free from excessive moisture and buttermilk, uniform colour, even salting of from 2 per cent. to 4 per cent., well packed in clean well-finished packages.

For second grade : Anything showing weedy, feed, or off flavours, excessive moisture or presence of buttermilk, uneven colour, uneven salting, careless packing, and indifferent packages.

For third grade : Anything not included in first and second.

MILLED BUTTER.

For first grade: Anything fairly clean in flavour, free from excessive moisture or presence of buttermilk, uniform in body, texture, colour, salting, and well packed in clean, well-finished packages.

For second grade: Anything unclean in flavour, showing excessive moisture and lack of uniformity in body, texture, colour, salting, and packing.

For third grade: Anything not included in first and second.

SCALE OF POINTS FOR CHEESE.

	Points.
Flavour	45
Body and texture	30
Colour	15
Finish, including packing	10
	—
Total	100

The scale of grade-points laid down in 1899 remained unchanged until 1926, which year marked the introduction of a "Finest" class and the adoption of a national brand for butter or cheese graded as "Finest." This change was brought about at the suggestion of the Dairy Board. Regulations gazetted on the 26th August, 1926, laid down the following grade classes for creamery butter and full-cream cheese:—

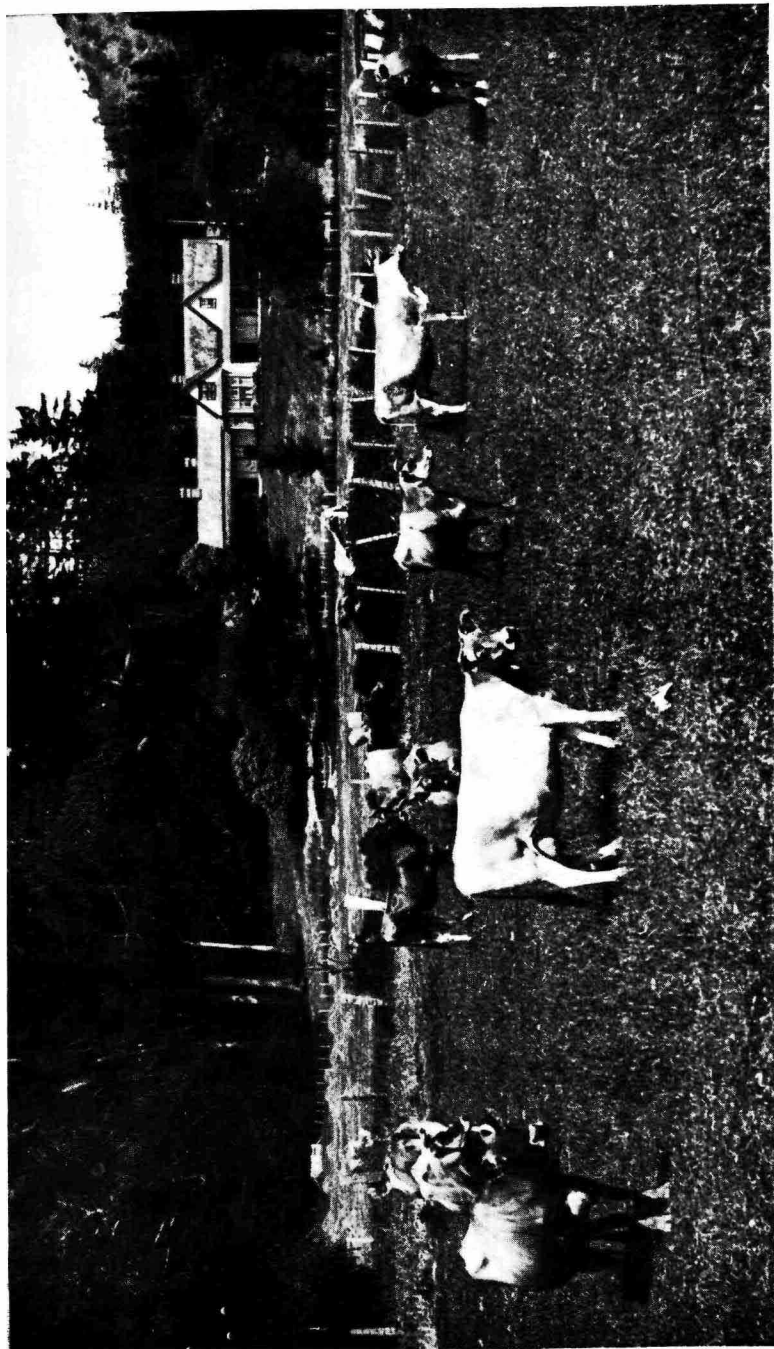
Finest	93 points and over.
First grade	90 points and under 93.
Second grade	80 points and under 90.
Third grade	Under 80 points.

The maximum points for allotment for cheese were provided for as follows: Flavour, 50; body and texture, 30; colour, 15; and finish, 5; total, 100 points.

The maximum points provided for creamery butter were: Flavour, 50; body and texture, 25; colour and salting (if any), 20; and finish, 5; total, 100 points.

The latest change came in 1930 when an amendment to the regulations provided for a re-allotment of the grade-points for cheese for the purpose of drawing attention to closeness. The following maximum points were provided for : Flavour, 45 ; body, 20 ; closeness, 20 ; colour, 10 ; finish, 5 : total, 100 points.

In looking back over the history of the grading-system it is interesting to recall that when the law providing for the grading of dairy-produce intended for export came into operation in the year 1894 it was not anticipated that the grade-certificate would shortly afterwards become a document of commercial importance. The object in view in establishing the grading-system was entirely an educational one, the idea being that defects in butter and cheese should be detected prior to shipment, and a report sent back to the manufacturer to enable any necessary remedial measures to be applied. Commercial men recognized early in the history of grading however, that the grade-certificates issued for dairy-produce would facilitate business between dairy companies and themselves, and they began to purchase factory-outputs on the basis of these Government documents. This practice continues in vogue until the present time, having been long accepted by all concerned.



AN OLD HOMESTEAD.

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CHAPTER V.

LEGISLATION DEALING WITH THE INDUSTRY.

(a) THE DAIRY INDUSTRY ACTS.

THE first Dairy Industry Act was passed in 1892 with the object of regulating the manufacture of butter and cheese for export and to provide for the purity of the milk used in such manufacture. Dairy factories were inspected for certificate entitling them to use certain marks, and these certificates could be suspended on report of an Inspector declaring that any dairy was not kept, or the produce was not manufactured, to the satisfaction of such Inspector.

The second Dairy Industry Act, passed in 1894, was more comprehensive. It repealed the 1892 Act, provided for payment for milk by the gallon or according to the productive character thereof, and also provided for each factory to have a registered number, such number to be included in the brand which should be marked on each end of every container of butter and cheese. This Act appointed certain ports as grading-ports, provided for the appointment of Dairy-produce Graders, and for the grading of dairy-produce prior to export.

The Dairy Industry Act of 1898, the third Act, provided for monetary advances to dairy companies by the Government for the purchase of land for dairy-factory sites, and for the erection of buildings and purchase of suitable plant. This portion of the Act was not popular with dairy companies, who could obtain suitable finance from banks and with fewer restrictions, and the Government lost money on some of the few occasions when loans were advanced under these provisions.

Other Acts were passed in 1903 and 1907, but all Acts in this connection were consolidated in the 1908 Act, which, with its five Amendments passed in 1915, 1922, 1924, 1926, and 1933, still stands. The Amendments provide for the approval by the Minister of Agriculture of the site, buildings, and equipment of any manufacturing dairy; for notification to the suppliers of a dairy company respecting the output of butter or cheese as per pound of butterfat used in its manufacture; for the allocation of costs of new farm dairy buildings as between landlord and tenant; for restricting the transfer of supply from one company to another during the season, &c.

The 1907 Act was known as the Butter Export Act, and prohibited the export of butter containing more than 16 per cent. of water.

The general aim of the legislation for the dairy industry since the first Act in 1892, appears to have been to ensure the manufacture of dairy products in reasonably good surroundings from pure milk or cream; to provide for efficient packages and honest branding and grading; and to safeguard the buyer and consumer to the extent that when purchasing New Zealand dairy products he will receive foods which are not adulterated, and which comply with the legal requirements of the importing countries and more particularly with those of the United Kingdom.

Before proceeding with a summary of the Dairy Industry Act mention should be made of two other Acts which have a direct bearing on the dairy industry.

The Margarine Act.—An Act to regulate the manufacture and sale of margarine was passed in October, 1895. This Act made it illegal (1) to mix, colour, stain, or powder margarine with any ingredient or material so as to imitate butter; (2) to mix margarine with butter, butterfat, or milk; (3) to manufacture, sell, or offer for sale as butter any margarine or other substance which contains, or with which is mixed any animal-fats, or animal, mineral, or vegetable oils.

It will be noted that the production of margarine has never been encouraged so far as a quality for table use is concerned. All classes of people in New Zealand appreciate and use high quality butter. Even during the war period a suggestion to

introduce table margarine was objected to by the New Zealand workers generally, and the proposal was dropped. The popularity of butter as a food in New Zealand is possibly best evidenced by the figures indicating the annual consumption *per capita* at over 40 lb. (1935), which is probably greater than that of any other country and about twice that of the United States of America, and nearly one-quarter more than Great Britain's annual *per capita* consumption of butter and margarine.

Co-operative Dairy Companies Act.—This Act was passed in 1907 and provided for special privileges to be granted to co-operative dairy companies, particularly in connection with their shares.

SUMMARY OF THE DAIRY INDUSTRY ACT, 1908.

In its preamble the Dairy Industry Act, 1908, is described as an "Act to consolidate certain enactments of the General Assembly relating to the inspection of dairies, the manufacture, sale, and export of dairy-produce, and the making of Government advances to dairy companies."

Under Part I the Governor is authorized to appoint such Inspectors, analysts, experts, and other officers as he deems necessary for the purposes of the Act; and may also prescribe their powers and functions. Inspectors under the Stock Act, 1908, are deemed to be Inspectors also under the Dairy Industry Act, 1908, while all Inspectors and analysts under the Dairy Industry Act, have the power and functions of such officials under the Sale of Foods and Drugs Act, 1908.

The Act provides the Inspector with extensive powers of inspection with regard to dairy stock, dairy premises and equipment, and dairy-produce, and the Inspector may also order defects to be remedied.

Elaborate provisions are made against the sale or export of impure or improperly branded produce, while the Act also provides that a purchaser may take a sample of milk for analysis by an analyst appointed under the Act.

Margarine is defined in the 1908 Act as all substances, whether combined or not, prepared or manufactured from any form of animal-fats (other than butterfat or milk) or any animal, mineral, or vegetable oils, and capable of being used as a substitute for butter.

The Governor may from time to time, by Order in Council gazetted—(a) appoint any specified ports to be the only ports at which dairy-produce, or any specified class or description thereof, may lawfully be exported, either generally or to any specified country or colony ; (b) appoint fit buildings to be stores for the storage, cooling, or freezing of dairy-produce prior to export ; and (c) prescribe the mode in which and the conditions subject to which such stores shall be used.

It is forbidden that dairy-produce shall be shipped from New Zealand unless (1) it is sound and free from disease, (2) the requirements of the Act relating to inspection, grading, and marking of dairy-produce have been complied with, and unless (3) the ship is in fit condition to receive the dairy-produce and is properly equipped for the safe carriage of the produce in good order and condition.

Heavy penalties are provided for breaches of the Act. The export of butter containing more than 16 per cent. of water is specifically forbidden.

The Governor is also empowered to make regulations (1) for registration of dairy-produce manufacturers, dairies, and brands, (2) for the inspection of cows, dairies, and dairy appliances, and (3) for the inspection, grading, packing, marking, stamping, branding, and labelling of dairy-produce.

Part II regulates Government advances to dairy companies, and is of little more than historical importance.

Part III defines a co-operative dairy company as “ a company which is incorporated under the Companies Act, 1908 (whether before or after the coming into operation of the Dairy Industry Act), and the principal object of which is the manufacture of butter or cheese from milk supplied to the company by its shareholders.” It is provided that a co-operative dairy company may, on application to the Registrar of Companies under the Companies Act, 1908, become registered as such under Part III of the Dairy Industry Act, and when so registered shall become subject to the provisions of that Part of this Act accordingly. The Act states that, notwithstanding anything in the Companies Act, 1908, or any rule of law to the contrary, it shall be lawful for any company registered under this Part of this Act as a co-operative dairy

company to require or accept from any of its shareholders, "in accordance with the provisions hereinafter contained," a surrender of any shares held by them in the company, and to pay for the shares so surrendered out of the assets of the company "in the manner hereinafter provided." Any shares so surrendered may be reissued by the company to any person in the same manner as if they had not been previously issued. The number of shares so surrendered, and not reissued, shall not at any time exceed one-fifth of the total number of shares issued by the company. Provision is made for the payment of a consideration for surrendered shares—also for the compulsory surrender by resolution of the shareholders. Such shares compulsorily surrendered may be reissued by the company to any other person. Sections 35, 70, 71, 72, and 73 of the Companies Act, 1908, shall not apply to a co-operative dairy company which is registered under this Part of this Act, or whose articles of association provide for its registration under this Part of this Act.

THE 1915 DAIRY INDUSTRY AMENDMENT ACT.

This Act provides that butter must not be exported or sent to the grading-store with an attempt to export if it contains more than 16 per cent. of water. If any such butter is received at the grading-store the Inspector has power to direct the owner to treat or dispose of the butter in such manner as the Inspector thinks fit.

Section 23 of the principal Act is amended by prescribing conditions subject to which applications for registration of dairy companies may be granted, including a condition that the approval of the Minister of Agriculture must first be obtained regarding the site, buildings, and equipment of the proposed factory.

THE 1922 DAIRY INDUSTRY AMENDMENT ACT.

Section 2 of this amendment defines a dairy factory as meaning a cheese factory, butter factory, condensed-milk factory, or milk-powder factory engaged in the manufacture of dairy-produce, and includes a skimming-station, a buying or receiving station, or any other premises ancillary to a dairy factory.

Section 3 provides that where the payment for milk or cream used for the manufacture of dairy-produce is to be made according to the percentage of butterfat contained therein, such percentage to be obtained by the Babcock, Gerber, or other prescribed test.

Further provisions of this Amendment Act are as follows :—

Not later than two months after the close of each financial year each owner of a butter factory or cheese factory shall forward to each person from whom he has purchased milk or cream during the year a statement, certified as correct by an accountant registered under the New Zealand Society of Accountants Act, 1908, and not in the employ of such owner other than as auditor. The statement shall show :—

- (1) The weight of butter (correct to four places of decimals) made from each pound of butterfat used for the manufacture of butter.
- (2) The percentage which the weight of unsalted butter manufactured bears to the total weight of butter manufactured.
- (3) The weight of cheese (correct to two places of decimals) made from each pound of butterfat used for the manufacture of cheese.

Within six months of receipt of this statement any supplier may apply to the Minister of Agriculture for an independent investigation into the correctness of the statement. The cost of the investigation must be borne by the applicant, but if the investigation discloses an error of more than $\frac{1}{2}$ per cent. in the particulars set out regarding the weight of butter or cheese made from each pound of butterfat, the cost of the investigation shall be borne by the owner of the factory.

Section 9 amended the principal Act, as amended by the 1915 amendment Act, by making provision for the prohibition of sending to any grading-store, for the purpose of being graded, any cheese of which the water-free substance consists of less than 50 per cent. of fats wholly derived from milk, and this section also prohibits the export of such cheese.

THE 1924 DAIRY INDUSTRY AMENDMENT ACT.

Section 2 of this Act provides :—

- (1) Every allotment of additional shares to any shareholder of a co-operative dairy company heretofore made by the directors of the companies shall, if made in conformity with the terms of the articles of association or of any amendment of such articles, and notwithstanding that such articles or amendments may be *ultra vires* the company, be deemed to have been accepted by the shareholder to whom they were respectively allotted. The exception being that should such shareholder who has been allotted shares as above mentioned within six months after receiving notice *re* shares, give notice to the company, in writing, of his objection to receiving such allotment, and within six months cease to be a supplier of the company.
- (2) Every person to whom directors have purported to allot shares in the company, who was not a shareholder prior to such allotment, shall be estopped from denying the validity of the allotment if at the date, being a supplier, he did not within six months give notice and during that six months permanently cease to be a supplier.
- (3) Provision is made for enforcement of any articles a company may have, wherein is provided a penalty for non-compliance of performance with provisions *re* obligations to supply the company. Such articles are valid, and any fines mentioned can be made by the company.

THE 1926 DAIRY INDUSTRY AMENDMENT ACT.

Provision is made for inspectors to demand proper surroundings in the neighbourhood of any dairy or store, so as to avoid the likelihood of contamination of dairy-produce. Further provision is made for the proper cooling of milk and cream.

Section 6 prohibits the export of butter containing less than 80 per cent. of butterfat.

Section 7 gives power to owners of dairy factories to pay different prices for different grades of milk or cream supplied to such factories for the manufacture of butter or cheese.

Section 8 provides that no dairy company, having for its object or one of its objects the manufacture of butter, cheese, dried milk, casein, or other articles from milk or cream, shall be registered under any name including the word "co-operative" unless entitled to be registered as a co-operative dairy company under the principal Act.

THE 1933 DAIRY INDUSTRY AMENDMENT ACT.

The purpose of this Act was to take additional power to regulate the dairy industry, by regulations under the Act, in the following directions :—

- (1) Governing the registration of persons competent to be employed as dairy-factory managers, with power to set up a Registration Board for the purpose, and giving any person aggrieved by any decision of the Board in relation to registration, the right of appeal to a Magistrate and two assessors, one appointed by the appellant and one by the Minister of Agriculture or his nominee.
- (2) Regulating the supply of milk or cream to dairy factories by restricting the transfer of supply from one dairy factory to another during the season.
- (3) Authorizing dairy companies to charge a commission not exceeding $2\frac{1}{2}$ per cent. with a maximum of £1, on all assignments or orders by a supplier on his milk or cream cheques.

(b) THE DAIRY-PRODUCE REGULATIONS.

With the exception of the first dairy-produce regulations, which were gazetted on the 18th September, 1899, under the 1898 Dairy Industry Act, all regulations have been under the 1908 Act. In 1926 all regulations were, with the necessary revision and amendment, consolidated under the title of the Dairy-produce General Regulations, by which name they are now known. Although, however, the first regulations were not issued until 1899,

a number of gazette notices appeared from 1894 onwards. These were, in effect, regulations inasmuch as they drew attention to the provisions of the Act, with necessary explanation, and notified the date from which such provisions were to come into force.

To go fully into the Dairy-produce General Regulations, or to give them their full title, the General Regulations under the Dairy Industry Act, 1908, would almost necessitate quoting the regulations in full, which, in both length and detail, would take us beyond the scope of this book. For the specialized student copies of all Acts, regulations, and *Gazette* notices are readily available. All that is intended here is to give a record of the dates of the principal regulations with a brief explanation for their introduction. The regulations are, after all, merely the working details of the Act. Some idea of their comprehensiveness may be gained from the following list of the principal headings :—

- (1) Definition of the various terms and descriptions used.
- (2) Requirements as to use of manufacturing dairies.
- (3) Registration of manufacturing dairies.
- (4) Licensing of persons carrying on the manufacture of dairy-produce.
- (5) Milking-machines and dairy utensils generally.
- (6) Care of milk and cream.
- (7) Disinfectants on teats and utensils.
- (8) Grading of cream.
- (9) Grading of milk.
- (10) Transfer of supply of milk or cream.
- (11) Contaminated or decomposed milk or cream.
- (12) Manufacture of cheese.
- (13) Protection of whey from contamination.
- (14) Manufacture of whey butter.
- (15) Branding and marking.
- (16) Export butter-boxes.
- (17) Export cheese-crates.
- (18) Wrapping butter for export.
- (19) Ports and grading-stores.
- (20) Grading of butter and cheese.
- (21) Grade-marks and grader's certificates.
- (22) Grading fees.

- (23) Export of salted butter.
- (24) Condemned dairy-produce.
- (25) Weighing, sampling, testing, and recording at manufacturing dairies.
- (26) Check upon weighing, sampling, testing, and recording.
- (27) Investigation of owner's annual statement to suppliers.
- (28) Duties and penalties.
- (29) A schedule giving facsimiles of the various forms, certificates, brands, marks, &c., referred to in the regulations.

It is obvious, from these bare headings, that every phase of the manufacturing side of the industry is provided for. The regulations are the result of forty years' experience, but, complete as they may appear on perusal, there is scarcely a year goes by without some unforeseen occurrence necessitating an alteration or an addition of some kind.

The first regulations were made by Order in Council dated the 18th September, 1899, and dealt with the registration of dairy factories, &c., and with the branding, stamping, and grading of dairy-produce. A list of the various cool stores was also included. It is interesting to note that a distinction was drawn between buildings for the storage of produce for export to the Australian colonies and South Sea Islands as compared with exports to the United Kingdom or any country or colony other than the Australian colonies or South Sea Islands. Dairy-produce intended for export to Australia and the South Seas was not graded at that time. Moreover, the grading of cheese on lines similar to butter was not introduced until the 1899-1900 season. It is also interesting to recall that in the brands provision was made for "milled butter" and "half-skim" cheese as well as "full-cream" cheese.

The next regulations did not come in until 1917, being gazetted on the 19th November of that year. These related to the manufacture and branding of whey butter.

Regulations gazetted on the 18th October, 1920, fixed the maximum price of butter for consumption in New Zealand.

Amending regulations under the Dairy Industry Act, 1908, gazetted on the 19th July, 1923, prescribed fees for the grading of dairy-produce.

On the 26th August, 1926, regulations were gazetted in reference to the grading of, and the use of the national brand on, butter and cheese for export. Grading in this instance referred to the introduction of a "finest" class and prescribed grade-points for this and first, second, and third grades.

Regulations gazetted on the 9th September, 1926, related to a change in grading fees.

In November, 1926, the first consolidation took place. Dates of regulations revoked from then until the end of 1933 are as follows: 15th November, 1926; 21st December, 1928; 5th August, 1930; 22nd December, 1930; 29th July, 1931; 9th March, 1932; 26th September, 1932; and 14th November, 1932.

All these regulations were revoked and consolidated, with certain amendments, in the Dairy-produce General Regulations of the 18th May, 1933. Further amendments were gazetted on the 27th July, 1933, and the 22nd February, 1934.

The principal new point of the consolidated and amended regulations gazetted on the 25th November, 1926, related to the grading of cream and the certificating of cream-graders.

The December, 1928, amendments related principally to the manufacture of standardized cheese.

The August, 1930, regulations related principally to a re-allotment of the grading-points for cheese to draw attention to closeness; to the branding of milking-machine rubberware with the maker's name; and to the salt content of butter.

The December, 1930, regulations changed the name of standardized cheese from "factory" cheese to "Cheddar" cheese, and also included amended provisions regarding the fat content of this article.

The July, 1931, amendments provided for, among other things— (1) the reversion to full-cream cheese only and the prohibition of the manufacture and export of other than whole-milk cheese; (2) the cooling of milk on the farm premises so that its arrival at the factory does not exceed 70° F., (3) all cheese manufactured during the months of August and September to be kept on the shelves for twenty-one days before being packed, the temperature of the curing-room to be maintained at not less than 55° F.; (4) temperature of cheese in grading-stores to be not less than 50° F. or more than 55° F.

The March, 1932, amendments were important for the provisions relating to milk-grading (without differential payments according to grade).

The September, 1932, amendment provided for a change in grading fees.

The November, 1932, amendment provided that no person shall carry on the manufacture of dairy-produce in any manufacturing dairy other than those already in operation except in pursuance of a license to be granted by the Director of the Dairy Division—with certain provisions for appeal.

The May, 1933, amendment brought in compulsory milk-grading with differentials, and prohibited the supplier from changing from one factory to another during the season.

The July, 1933, amendment dealt with the following matters : (1) Milk for butter and cheese making to be graded not less than three times in each testing-period ; (2) provision was made for alternative methods of payment where milk-grading is not carried out daily ; (3) dairy-factory managers to record the temperature and humidity of curing-rooms daily ; (4) waxing of cheese prohibited except by written authority of the Director of the Dairy Division.

Finally, the February, 1934, amendment made some changes in the previous regulation relating to the transfer of supply.

DAIRY FACTORY MANAGERS REGULATIONS, 1934.

At the request of the New Zealand Dairy Factory Managers' Association, regulations were framed making it obligatory on all dairy-factory managers to register as such. The necessary regulations were gazetted on 22nd February, 1934, and came into force as from 1st April, 1934.

Provision is made therein that on application and payment of the prescribed fee of 10s. every person who is employed as a manager of a creamery or cheese factory, or both, shall be entitled to an appropriate certificate of registration provided he is of good character and reputation. Provision is also made for the registration of persons not employed as managers, but who by virtue of their qualifications and experience are deemed competent to perform the duties of a manager, and for the setting-up of a Board to effectively administer these regulations.

The following persons were appointed as **members of the Dairy Factory Managers Registration Board** :—

C. P. Agar	}	New Zealand Dairy Board.
T. A. Winks		
J. Murray	}	New Zealand Dairy Factory Managers' Association.
P. C. H. Petersen		
W. Bagrie : Otago and Southland Cheese Factory Managers' Union.		
W. Riddet : Massey College.		
W. M. Singleton	}	Department of Agriculture.
W. E. Gwillim		
Mr. P. C. H. Petersen was appointed Chairman.		

Pursuant to clause 14 (1), the Public Service Commissioner appointed Mr. J. S. Fleming, an officer of the Dairy Division, to be Registrar of Dairy-factory Managers.

The functions of the Board are : (a) To receive applications for registration under these regulations and to authorize registration in cases where the conditions of registration have been complied with ; (b) to direct the removal of names from the register in accordance with these regulations ; (c) generally, within the scope of its authority, to do whatever in its opinion may be necessary for the effective administration of these regulations.

The first meeting of the Board was held in the board room of the New Zealand Dairy Board, Invicta House, Featherston Street, Wellington, on 15th June, 1934, the principal business being the consideration of applications for registration received to date.

(c) THE PRIMARY PRODUCTS MARKETING ACT, 1936.

Since the preceding portion of this section was written legislation of very great importance to the industry—namely, the Primary Products Marketing Act, 1936—has been passed, coming into force on the 15th May, 1936. This Act has been described as an Act to make better provision for the marketing of dairy-produce and other primary products, so as to ensure for producers an adequate remuneration for the services rendered by them to the

community. The Act is divided into three parts : Part I, Administration ; Part II, Marketing of Dairy-produce ; and Part III, the New Zealand Dairy Board. Briefly summarized, the principal provisions under the various Parts are as follows :—

PART I.—ADMINISTRATION.

By this Part a member of the Executive Council may be appointed as the Minister of Marketing, and a Department of State called the Primary Products Marketing Department is established. The Department, under the control of the Minister, is charged with the administration of the Act.

The principal functions of the Department are to make all necessary arrangements with respect to—

- (a) The acquisition on behalf of the Crown of any primary products in accordance with the Act or any other lawful authority that may be conferred :
- (b) The marketing in New Zealand or overseas of primary products whether acquired by the Crown or not.

After the coming into force of the Act no contract for the carriage by sea of any primary products intended for export shall be made except by the Minister or in conformity with conditions approved by the Minister. The functions of the Executive Commission of Agriculture are transferred to the Department.

For the purposes of the Act an account to be known as the Dairy Industry Account is to be established at the Reserve Bank of New Zealand. The Government has unlimited power to borrow by way of overdraft from the Reserve Bank moneys in aid of the Dairy Industry Act, and the account may be overdrawn accordingly. Subsidiary accounts may also be opened at the Reserve Bank or at any other bank in New Zealand or elsewhere.

With a view to the promotion of reciprocal trade the Minister of Marketing is empowered to arrange the terms of provisional trade agreements with the Governments of other countries, negotiating first with the accredited representatives of the United Kingdom Government, then with those of the Government of any other part of the British Empire, and finally with those of any other country.

PART II.—MARKETING OF DAIRY-PRODUCE.

For the purposes of Part II the term "dairy-produce" is defined to include milk, cream, butter, cheese, and all other products of milk or cream, whether derived by manufacturing processes or otherwise. It also includes any other products of a kind derived from the operations usually carried on in conjunction with dairy-farming operations (such as the rearing of calves and pigs), whether such products are actually produced on dairy-farms or elsewhere. For the present, however, Part II of the Act applies only to butter and cheese that is manufactured from milk or cream delivered to a dairy-factory on or after the 1st August, 1936. So far as these notes are concerned, therefore, the term dairy-produce means butter and cheese so manufactured. The Minister has full authority to make such arrangements as he thinks proper for the handling, pooling, transport, and storage of dairy-produce, the shipment of dairy-produce intended for export on such terms as he thinks fit, the insurance against loss, and generally for all matters necessary in the exercise of any powers expressly conferred upon him by the Act.

All dairy-produce intended for export shall become the property of the Crown as soon as it is placed on board ship, and the price to be fixed in accordance with Part II shall become payable after deducting the amount of the levy (if any) due to the New Zealand Dairy Board. The prices to be fixed for dairy-produce manufactured on or after 1st August, 1936, and exported on or before 31st July, 1937, shall be fixed after taking into consideration the prices received in New Zealand for dairy-produce of the same or approximately the same kind, grade, and quality exported during a period of from eight to ten years prior to 31st July, 1935. The prices to be fixed for dairy-produce exported after 31st July, 1937, shall be such that any efficient producer should, under normal circumstances, be assured of a sufficient net return from his business to enable him to maintain himself and his family in a reasonable state of comfort, and shall be so fixed after taking into consideration the following matters:—

- (a) The prices fixed for dairy-produce exported before 31st July, 1937.
- (b) The necessity in the public interest of maintaining the stability and efficiency of the dairy industry.

- (c) The costs involved in the efficient production of dairy-produce.
- (d) The general standard of living of persons engaged in the dairy industry in comparison with the general standard of living throughout New Zealand.
- (e) The estimated cost to the Department of marketing the dairy-produce concerned.
- (f) The cost of the general administration of the Act.
- (g) Any other matters deemed to be relevant.

With regard to dairy-produce intended for sale for consumption in New Zealand, the Minister may determine that the ownership thereof shall pass to the Crown in accordance with notice published in the *Gazette*. Alternatively, it may be determined that the Marketing Department shall control the marketing of such dairy-produce without ownership passing to the Crown. In either case prices may be fixed by Order in Council. The general purpose with regard to prices shall be to assure to the producer a net return equivalent to what would have been received under export conditions.

PART III.—NEW ZEALAND DAIRY BOARD.

Part III of the Act comes into force on 1st August, 1936, on which date the New Zealand Dairy Board is to be reconstituted. The present Government members shall be deemed to have vacated their offices, and the future Board shall consist of five members—namely, the present four producer members and one member as the representative of the Government. Any one of the members vacating office may be appointed the Government representative on the Board.

The present powers of the Board with respect to the control of dairy-produce intended for export or for sale for consumption in New Zealand are repealed as from 1st August, 1936. Thereafter the Board shall not exercise any of its powers, functions, or discretions except with the approval of the Minister of Marketing. All contracts of the Board subsisting on 1st August, 1936, become contracts of the Crown in so far as they relate to the storage, insurance, or freight of the dairy-produce to which Part II of the

Act applies. The property of the Board in the National Fern Leaf design registered in the United Kingdom is transferred to the Crown with effect from that date.

PERSONNEL OF THE NEW ORGANIZATION.

The Hon. Walter Nash, Minister of Finance, was appointed Minister of Marketing, while Mr. G. A. Duncan, of the Executive Commission of Agriculture, was made Acting-Director of Marketing. Three of the principal officers of the Dairy Board—namely, Messrs. G. M. Pottinger (accountant), T. F. Woodcock (shipping) and F. W. Grainger (refrigeration)—were duly transferred to the Primary Products Marketing Department, Mr. T. C. Brash remaining with the Board as Secretary. Mr. C. A. Marchant was appointed Government representative on the Board.

GUARANTEED PRICES.

The first step toward the finalizing of a system of guaranteed prices was the fixing (14th July, 1936), by the Government, of price-margins for the different grades of butter and cheese purchased by it for export under the guaranteed prices plan. By means of these differentials, which were the margins above and below a guaranteed price yet to be announced, it was hoped to encourage the production of the highest quality of dairy products. It was considered that if, under the guaranteed-price plan, differential payments for quality were based simply on grades, dairy-factory companies would have no incentive to strive to secure the higher pointings within the respective grades. The price margins decided upon were as follows:—

Creamery Butter.

Finest grade—			
94 upward	..	..	Plus 1s. 2d. per hundredweight.
93 to 93½	..	..	Basic guaranteed price.
First grade—			
92 to 92½	..	..	Minus 7d. per hundredweight.
90 to 91½	..	..	Minus 2s. 4d. per hundredweight.
Second grade	..	..	Minus 7s. per hundredweight.

Whey Butter.

First grade	..	..	Minus 9s. 4d. per hundredweight.
Second grade	..	..	Minus 14s. per hundredweight.

Cheese.

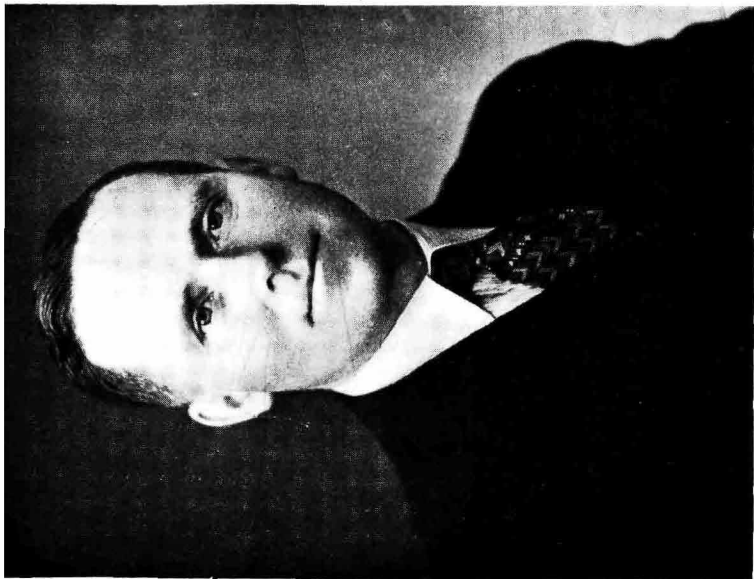
Finest grade—			
94 upward	..	..	Plus 1s. 5½d. per hundredweight.
93 to 93½	..	..	Plus 1s. 2d. per hundredweight.
First grade—			
92 to 92½	..	..	Basic guaranteed price.
91 to 91½	..	..	Minus 7d. per hundredweight.
Second grade	..	..	Minus 2s. 4d. per hundredweight.

It was made clear that what had been decided upon would not alter the existing grading system in any way.

Finally, the basic f.o.b. guaranteed prices for butter and cheese made between 1st August, 1936, and 31st July, 1937, were announced by the Minister of Marketing, Hon. Walter Nash, in the House of Representatives on the evening of the 4th August, 1936. Prices were fixed as follows:—

- (a) Finest-grade creamery butter scoring 93 or 93½ points, 117s. 3d. per hundredweight, or 12½⁹/₁₆d. per pound.
- (b) First-grade whey butter scoring 88 points and over, 107s. 11d. per hundredweight, or 11½⁹/₁₆d. per pound.
- (c) First-grade cheese scoring 92 or 92½ points, 63s. 7d. per hundredweight, or 6½⁹/₁₆d. per pound.

The basic f.o.b. purchase-prices of cheese and whey butter were fixed to yield, under average factory conditions, a margin of 1½d. per pound of butterfat processed into cheese above the average price of butterfat processed into butter. Based on average factory costs, the prices work out at a return to butter-factory suppliers of approximately 13·08d. per pound butterfat, and approximately 14·6d. per pound butterfat to suppliers to cheese factories.



PROFESSOR W. KIDDET, DIRECTOR OF DAIRY RESEARCH
INSTITUTE.



G. A. DUNCAN, ACTING DIRECTOR OF MARKETING.

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CHAPTER VI.

ORGANIZATIONS CONNECTED WITH THE DAIRY INDUSTRY.

SINCE comparatively early days there have been several important organizations connected with the industry. In this chapter it is intended to give a brief outline of their history and to show how dairy-farmers, directly or through the medium of the dairy company, have endeavoured to make use of co-operation in the marketing of their produce as well as in the purchase and manufacture of dairy requisites and supplies.

(a) THE DAIRY ASSOCIATIONS.

There are two dairy associations in New Zealand. The National Dairy Association, with headquarters at Wellington, is composed of practically all the dairy companies in the North Island, together with those dairy companies in the northern portions of the South Island which send their produce to the Port of Wellington for grading prior to export. The South Island Dairy Association, with headquarters in Dunedin, comprises the remaining dairy companies in the South Island. The establishment of both associations was due to the foresight, energy, and ability of Mr. John Sawers, who, for several years, had endeavoured to persuade dairy-producers of the benefits to be derived from co-operative effort through the medium of some such organization.

The older of these, the South Island Association, was formed in 1890 under the title of the Middle Island Dairy Association of New Zealand. In recounting the history of the movement, Mr. Sawers stated that shortly before the close of the New Zealand and South Seas Exhibition (1889-90) he took the initiatory step which subsequently led to the formation of this association.

A meeting was held in the Exhibition Buildings on the 23rd April, 1890, with intent to form a dairy association for the purpose of furthering the interests and development of the industry. This action was deemed imperative on account of the partial closing of the Australian markets against New Zealand dairy-produce by the imposition of heavy and almost prohibitive protective tariffs, and, as a consequence, the necessity which existed for looking towards, and catering for, new and more critical markets. It was also considered essential because of the competition between the factories becoming prejudicial to the interests of the industry as a whole. The meeting was well attended and a resolution was unanimously adopted in favour of the organization of the dairy interests of the South Island. A committee of management was appointed, of which Mr. Thomas Brydone, Superintendent of the New Zealand and Australian Land Co., was chosen chairman, and Mr John Sawers, secretary *pro tempore*. At a subsequent meeting of the committee, held in the Stock Exchange offices, Water Street, Dunedin, a permanent secretary in the person of Mr. J. R. Scott, was appointed, and the rules of the association drawn up. Rule 2, which set out the objects of the association, read :—

“ The objects for which this association is established are—viz., to disseminate practical information with a view to improving the manufacture of dairy-produce so as to produce a uniformly good article, to obtain the best means of transit and disposal of dairy-produce, and generally in forwarding the interests of the dairy industry.”

That the Government looked favourably upon the Middle Island Dairy Association of New Zealand is evident by the fact that after the first season's operations it granted the association a subsidy of £200 towards its working-expenses, and continued to make this grant annually for many years.

The association was successful from the commencement, and four years after its establishment Mr. Sawers succeeded in persuading North Island dairymen to form a similar organization. The preliminary meeting was held in the office of Mr. B. C. Robbins, at that time a member of the firm of Robbins and Pierard, dairy-factory proprietors, Regent Street, Hawera, on the 1st June, 1894. Mr. P. F. Ralfe, chairman of directors of the Cardiff Co-operative

Dairy Co., was appointed chairman, and Mr. B. C. Robbins temporary secretary, the permanent secretaryship later being taken over by Mr. George Finn. In the first instance the organization was known as the North Island Dairymen's Association of New Zealand. The rules of the association were drawn up by Mr. John Sawers, and the objects of the association were set down as follows :—

- (a) To promote and encourage practical dairying in all its branches.
- (b) To introduce and advocate new and improved methods of manufacture, by the use of the latest approved machinery and appliances.
- (c) To arrange for standards in milk whereby payment for same shall be made according to its productive character.
- (d) To establish a training-school or bureau for the educating and supplying of male and female expert labour for the industry generally.
- (e) To benefit the general body of members by the publication of opinions and experiences of individual members, and to establish a reference library for the use of members.
- (f) To improve the breeding and feeding and care of cows for the production of milk for the manufacture of butter, cheese, and condensed milk.
- (g) To arrange for the best means of transit of the produce from the factory to the local as well as the foreign consumer by means of cool railway and steamer accommodation, and delivery transit at lower rates.
- (h) To discover and decide upon the best means of placing and distributing the surplus butter, cheese, ham, bacon, pork, and all other products which can be derived from or made out of cows and pigs, in the markets of Great Britain or elsewhere as the members may from time to time determine.
- (i) To decide upon the best means of uniform packing of dairy produce for the local and export trade.
- (j) To establish branches in every district of the colony ; to secure the dissemination of all the latest information through these branches, among all members of the dairy community, as well as to secure their co-operation for the carrying out of the objects of the association.

- (k) To open up communications for the interchange of ideas and experiences with similar associations in the various dairying centres of the world.
- (l) To hold annual exhibitions of dairy-produce, and to generally endeavour to improve the quality, quantity, and value of the butter, cheese, ham, bacon, pork, and all other dairy productions of the colony.
- (m) To do all other things as are necessary, incidental, or conducive to the attainment of the above objects, or any of them.

On reading this summary one is immediately conscious of the comprehensive aims of the association, and it is readily apparent that Mr. Sawers was endeavouring to bring every phase of the industry within the scope of the organization.

Although the original intention was to call the northern body the *North Island Dairymen's Association*, the name finally adopted was the *National Dairy Association of New Zealand (North Island)*, while the original southern body changed its name to the *National Dairy Association of New Zealand (South Island)*. On the 24th November, 1909, however, it became an incorporated body registered under the Companies Act, 1908, as the *South Island Dairy Association of New Zealand, Limited*. The two organizations are now known as the *National Dairy Association* and the *South Island Dairy Association*, these titles being popularly abbreviated to the *N.D.A.* and the *S.I.D.A.*

As previously stated, the South Island association was formed to promote and protect the interests generally of the dairy-factory companies and persons engaged in the dairying industry in the South Island. In conjunction with the North Island Association, it arranged contracts with the shipping companies for the conveyance of its members' produce overseas, and allotted the bulk space available on the respective steamers between the various factories concerned. This function was attended to until the Dairy Board was instituted in 1924, when the work was undertaken by that Board. Since 1910 the association has acted as a trading concern for the supply of dairy-factory requisites, &c. The association commenced with a membership of 14 dairy-factory companies; in 1910 the members had increased to 80, and

in 1934 numbered 120, consisting of co-operative and proprietary factory companies in the provinces of Canterbury, Westland, Otago, and Southland. As mentioned previously, the Nelson and Marlborough provinces come under the jurisdiction of the National Dairy Association for the reason that the dairy factories in those districts ship their produce through Wellington grading-stores. The association is a company limited by guarantee, and there is no subscribed capital. The company possesses a capital fund of, roughly, £15,000 accrued from surplus revenue from trading and other sources. The members pay an annual subscription on a scale according to output, the minimum being one guinea and the maximum three guineas. From the point of view of management there is a board of nine directors, with secretary and staff. The directors are elected by the members, two retiring each year in rotation, but are eligible for re-election. The secretary and staff are appointed by the directors, and the auditor by the members.

The National Dairy Association also continued under its original articles until the formation of the New Zealand Dairy Board, from which date it has acted principally as a trading concern. In 1929 it was formed into a limited-liability company, which meant that the factories would be shareholders and not merely members. Briefly expressed, the objects of the new organization were :—

- (a) To supply dairy-factory requisites as required for the manufacture of butter and cheese ;
- (b) To erect and equip butter and cheese factories and to supply the necessary machinery and plant ;
- (c) To supply farmers with fertilizers and such other commodities as they might require ; and
- (d) To keep dairy factories and the farming community posted on matters of importance concerning the dairy industry generally.

The new company was registered under the Companies Act in September, 1930. The conditions regarding management, &c., are similar to those already outlined for the South Island Dairy Association.

These associations watch over all matters connected with the industry apart from marketing, and regularly circulate information to the associated dairy companies. They indent all kinds of supplies required by dairy companies in connection with the manufacturing side of dairying. They import parchment paper, salt, cheese-colouring, bandage, rennet, nails, binding-wire, dairy glassware, and many other articles, including some machinery, and contract for the complete equipment of butter and cheese factories. In recent years they have branched out into such general goods as tea, tobacco, clothing, &c. Goods are purchased in very large quantities, and a considerable saving is effected by being able to buy supplies at wholesale rates.

Similar to the S.I.D.A., the N.D.A. was subsidized by the Government to the extent of £200 per annum. No subsidy, however, has been paid since 1910. As the result of the annual contribution by associated companies—the rate being the same for both associations—and a small rate of commission charged upon imported goods, both institutions are now self-supporting.

In 1908 the National Dairy Association sent Mr. Chas. Mackie, formerly secretary of the Eltham Dairy Co., to London to act as the association's representative there, and on his return about two years later Mr. R. Ellison, formerly secretary of the Canterbury Central Dairy Co., was appointed to take his place. Later Mr. Ellison returned with a scheme for marketing produce in association with the Co-operative Wholesale Society, the outcome being the formation of the Marketing Association here and the Colonial Produce Co. in London.

A special feature with these associations is the annual conference. These conferences are very important gatherings, at which most subjects relating to the industry, particularly the manufacture and administration side, are discussed. The conferences also have a considerable educational influence on account of the many and varied papers on dairying matters which are read and discussed. Moreover, the dairy associations are very largely the mouthpiece of the industry on subjects controversial, and at the annual conference the voice of the critic may often be heard, and sometimes in no uncertain manner.

Altogether, these associations have rendered valuable service to dairy factories and dairymen and have contributed in no small measure to the progress of the industry.

J. G. HARKNESS (1851-1930).

One of the most prominent figures in the building of the National Dairy Association was the late Mr. Joseph George Harkness, a man who during a long and active life played a leading part in several important enterprises.

Mr. Harkness was born in Nelson in 1851, and educated at Nelson College. He was elected as Nelson representative to Parliament, in the Atkinson Government, from 1889 to 1893. He took up land at Tariki in Taranaki in 1894, where he became a breeder of Jersey cattle and commenced direct association with the dairy industry. He was one of the prime movers in the formation of the Midhirst Co-operative Dairy Co. in 1896, sitting on the first directorate of the company, and occupying the post of secretary from 1898 to 1903.

In 1903 Mr. Harkness moved to Wellington to take over the secretaryship of the National Dairy Association, of which organization he had been president for some years. The N.D.A. developed rapidly under his supervision and added several new branches to its operations. It was Mr. Harkness who introduced the wholesale buying of dairy supplies, and he also rendered good service to the co-operative dairy companies through the purchase and distribution of salt for dairy-factory use, a commodity which in those days it was difficult and comparatively expensive to buy in satisfactory quality.

In 1911, on behalf of the N.D.A., Mr. Harkness visited England to arrange better marketing facilities for dairy-produce. While with the association better marketing and lower freight and insurance charges for butter and cheese were his special interests, and he did much to improve the position.

In 1914 he paid a visit to Canada and the United States of America to arrange some of the first sales of butter made to these countries by New Zealand dairy factories.

In 1921 he retired from the National Dairy Association to become managing director and secretary of the newly formed Co-operative Dairy Producers' Freezing Co., Limited, Wellington, paying a visit to England and the Continent in connection with the financing and building of the company's works, which were completed in 1929. His position as secretary of the National Dairy Association was filled by Mr. T. C. Brash, who had been assistant secretary for eleven years.

Mention may be made of the fact that Mr. Harkness was a member of the Wellington Harbour Board from 1908, being Chairman from 1919 to 1922. His death occurred at Midhirst, Taranaki, in January, 1930. The New Zealand dairy industry was fortunate in having, over so long a period of years, the services of one so capable and widely experienced.

MR. ARTHUR MORTON.

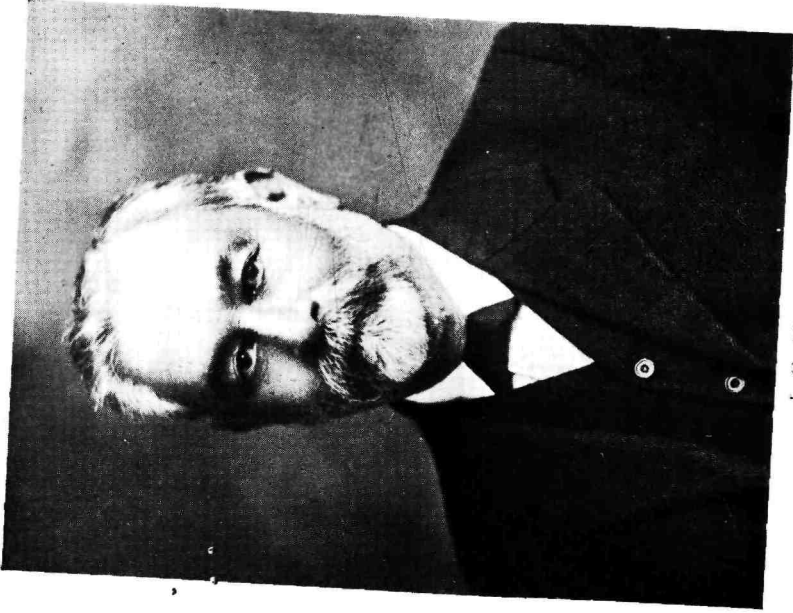
Another name closely linked with the development of the National Dairy Association is that of Mr. Arthur Morton, of Egmont Village, who in several directions has been directly associated with the dairy industry over a long period of years. Mr. Morton has been a director of the National Dairy Association since 1906, and chairman from 1911 to the present time. Briefly summarized, the other main features of Mr. Morton's career are: Chairman of Mangorei Co-operative Dairy Co. from its formation in 1895 until 1923; chairman of Inglewood Co-operative Bacon Co. from its formation in 1899 until 1933; director of Taranaki Producers' Freezing Works Co. from its formation until 1932, and chairman from 1910 to 1925; member of executive of Taranaki Dairy Factories Employers' Union from its formation in 1907 up to the present time; chairman of Advisory Committee to Board of Trade during period of butterfat levy (three years); chairman of Dairy Research Committee, 1935-36; Vice-Chairman of Massey College Council representing dairy industry since 1927.

It will thus be seen that Mr. Morton has had a long and varied connection with the industry. The holding of so many important positions has enabled him to give the industry the benefit of his wide knowledge.

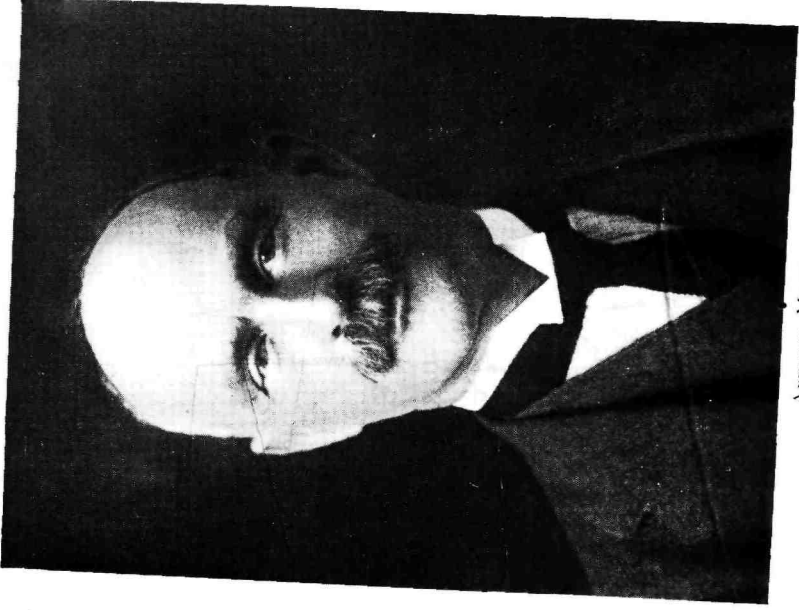
(b) THE NEW ZEALAND DAIRY - PRODUCE BOARD.

In the section of this work which relates to the National Dairy Association and the South Island Dairy Association are to be found references to the need of co-operative action in connection with the marketing of dairy-produce. Both organizations provided for this function in their constitution, but the function was never fulfilled except in the case of the output of a few odd dairy factories, the marketing falling into the hands of private concerns. At

PROMINENT MEMBERS OF THE NATIONAL DAIRY ASSOCIATION.



J. C. HARKNESS.



ARTHUR MORTON.

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the yearly conferences of these organizations representatives of dairy factories from both Islands met together and discussed the problems of the industry. Naturally enough, the problem of effective marketing was also discussed. As the majority of factories handled their products co-operatively up to the steamer's side, it was a natural sequence to consider whether they could not extend the co-operative principle until the products reached the consumer. A serious effort was made in 1914, when a committee was set up at Hawera at a conference called for the purpose, whose deliberations would probably have been instrumental in establishing some organization but for the outbreak of the Great War shortly after its recommendations had been circulated among factories.

While the move toward co-operative marketing may have been the ideal of the few in pre-war days, it became a definite goal of many when the war was over and when the sharp decline in prices realized from 1917 to 1920 and those obtaining from 1921 onwards became evident. High cost of necessary farming-materials, combined with high interest charges on enhanced land values, added to a 50 per cent. drop in returns from the produce of the land speeded up the agitation for co-operative marketing.

In 1920, at the annual conference of the South Island Dairy Association, a co-operative selling-floor in London was proposed, finance to be largely provided by the Co-operative Wholesale Society of Great Britain. The proposal was not carried, but it resulted in the formation, in July, 1920, of the New Zealand Producers' Co-operative Marketing Association, Ltd., described elsewhere in these pages. While this association met the position up to a point it did not succeed in gaining the general support of dairy factories throughout the Dominion.

On the 29th March, 1922, a meeting of the following persons was held at Foster's Hotel, Wanganui: Messrs A. Morton, T. C. Brash, H. D. Forsyth, F. Ranford, J. R. Corrigan, G. A. Duncan, H. Northover, J. Marx, W. C. Motion, and W. Goodfellow. It was agreed to endeavour to form a limited company with a capital of £1,000,000 to organize a compulsory pool. At various meetings held throughout the country — South Taranaki Factories (24th April, 1922), North Taranaki Factories (26th April, 1922), Hamilton (29th April, 1922), Wanganui (1st May, 1922), Palmerston North

(2nd May, 1922), Dannevirke (3rd May, 1922), Carterton (4th May, 1922), Marlborough (8th May, 1922), Richmond (9th May, 1922), Greymouth (10th May, 1922)—the principle was approved, mainly unanimously, except at New Plymouth and in Palmerston North, where there was an opposition minority.

The delegates of these various provincial meetings elected to attend a conference in Wellington on the 18th May of that year, 1922. At this conference it was agreed to form a limited company called New Zealand Dairies, with a capital of £250,000, and to have a London Board with power to control prices and regulate supplies; the ordinary channels of distribution to be used; the Government to be asked to make marketing through the company compulsory, and to give the company power to make levies not exceeding $\frac{1}{4}$ d. per pound on butter and $\frac{1}{2}$ d. per pound on cheese off gross return.

On the 7th June, 1922, the scheme was laid before the South Island Dairy Association, but was not approved by the meeting, a resolution approving of a scheme of monthly auctions being carried.

On the 13th July, 1922, the representative Commission met in Wellington and decided to consider setting up a Board similar to the Meat Board.

On the 14th September, 1922, a general meeting of factories was called in Wellington, when a large majority voted in favour of a Control Board, the opposing minority consisting largely of proprietary interests. Representations were made to the Government, and finally, on the 28th August, 1923, the Dairy-produce Export Control Act was passed by Parliament. Provision was made, however, that the Act should not become operative until it had been submitted by referendum to all dairy producers. The Government forthwith made arrangements for the plebiscite to be taken, the bringing-into operation of the Act being carried by a majority of 13,209 votes. An interesting feature was that, despite the fact that the subject was of such vital importance to the producers of the Dominion, only about 50 per cent. of the persons eligible to do so exercised their privilege to vote.

The Act provided for a Board of twelve members, of whom nine were to be representatives of producers or suppliers (six for the North Island and three for the South), two to be Government

representatives, and one to represent proprietary owners of dairy factories and sellers of produce out of New Zealand. The first Board consisted of :—

Producers' representatives :—

North Island : Messrs. W. Grounds, W. C. Motion, W. A. Iorns, W. Goodfellow, H. D. Forsyth, and K. Dalrymple.

South Island : Messrs. J. R. Thacker, John Fisher, and J. R. Hamilton.

Government representatives :—

Messrs. O. Hawken, M.P., and W. E. Reynolds.

Representing Merchant and Proprietary Interests :—

Mr. J. B. MacEwan.

Mr. W. Grounds was elected Chairman, and, after calling for applications, Mr. T. C. Brash, previously secretary of the National Dairy Association, was appointed Secretary and Chief Executive Officer. The newly appointed Board held its first meeting on the 31st January, 1924.

It was decided that before embarking upon a policy, a complete investigation of the marketing and general dairying position in other countries should be made, with the result that in April, 1924, a delegation comprising Messrs. W. Grounds, J. R. Thacker, and W. C. Motion left New Zealand, their itinerary including investigations in Honolulu, United States of America, Canada, Great Britain, Denmark, and adjoining European countries, and Australia. In due course the delegation submitted a comprehensive report to the Board, the outcome being a decision to adopt a policy of "absolute control" within the meaning of the Act as the only course likely to secure the improvements desired in connection with the marketing of dairy-produce. The delegation also recommended the adoption of a national brand, the fern leaf bearing the words "New Zealand," being now well known to all persons interested in the industry.

The Board's funds were to be raised by an export levy, and power to make contracts for freight on dairy-produce was vested in the Board. In addition, the Act set out that the Board had full authority to make such arrangements as it thought fit for :—

- (a) The handling, pooling, and storage of dairy-produce ;
- (b) The shipment of such dairy-produce on such terms and in such quantities as it thinks fit ;

- (c) The sale and disposal of dairy-produce on such terms as it thinks advisable ;
- (d) The insurance against loss of any such dairy-produce either in New Zealand or in transit from New Zealand and until disposal ; and
- (e) Generally for all matters as are necessary for the due discharge of its functions in handling, distributing, and disposing of New Zealand dairy-produce.

It was at first decided that control should take effect on the 1st August, 1925, but it was later deferred to 1st September, 1926, on which date it actually came into force. Under the scheme laid down the whole of New Zealand butter and cheese was to be pooled and shipped to England, in the first place to those Tooley Street merchants who had been handling New Zealand dairy-produce, and in proportions based on the yearly average of the quantity which had been handled by each in the preceding three years. A plan of price-fixation was also introduced.

The foregoing sets out fairly fully the principal functions of the Board and the various movements which led to its establishment. It is not considered necessary to go into detail concerning the operations of the Board. Suffice it to say that after a year's experience it was decided to abandon the pooling and price-fixation system, and it was agreed to terminate the pooling of creamery butter from the 30th April, 1927, and of cheese and whey butter as from the 31st July of the same year. The Board agreed to care for drafts, documents, &c., for butter shipments until such time as factories could make other arrangements.

In conclusion, it may not be out of place to endeavour to give a brief and impartial summary of the more important alleged causes of the failure of pooling and price-fixation, together with a summary of the principal advantages accruing from the Board's operations. It is desired to emphasize that the statements which follow regarding pooling and price-fixing were gleaned from the press and are not necessarily the opinion of the writer.

The main causes of the Board's failure to continue as a marketing organization with fixed prices were stated to be as follows :—

- (1) The bad condition of British trade at the inception of the pools. England was only just over a severe general strike, and as a result it was estimated that 600,000

boxes of New Zealand butter had been carried over from the 1925-26 season, the accumulated results of lack of demand.

- (2) The fact that the above large carry-over (all outside the selling-control of the Board) enabled wholesalers and multiple shops to stock up, thus obviating their buying in any quantity until the Board's stocks of new season's butter had accumulated to a dangerously heavy figure.
- (3) A boycott on the part of wholesale buyers, who bought as much of their requirements as possible from sources other than the Board's stocks.
- (4) Dissatisfaction by farmers at the low rates of advances received.
- (5) The publication of alarmist cables from London.
- (6) The general dislike of price-fixing as such.
- (7) Propaganda by local agents.

The benefits aimed at under the pools were :—

- (1) The elimination of the large number of New Zealand representatives and their employees, and the consequent saving of marketing expenses.
- (2) More efficient and uniform methods of marketing.
- (3) An endeavour to obtain for the producer the greatest possible return for his produce consistent with a fair price to the consumer.

The principal benefits obtained by the Board were :—

- (1) Finest grade was introduced and established, and thereby the whole quality standard of New Zealand butter and cheese was raised. The Board paid a premium for finest grade and, following this up, the Government introduced regulations requiring cream to be graded and a payment of $\frac{1}{2}$ d. per pound butterfat premium for finest cream.
- (2) The Board converted a big carry-over of butter at the end of the 1925-26 season into stocks, which were below normal at end of pools (1926-27 season). The trade was thus put on a healthy basis and the way paved for the most advantageous prices in 1927-28.

- (3) The Board, by fixing prices, lifted the prices of the stored carry-over of 1925-26 and enabled it to be sold at an advance on what otherwise would have been possible.
- (4) The Board, by refusing to make large payments in advance at the beginning of the season, forced factories to work on current advances. This was a distinct forward step towards putting dairy-company finance on a sounder and more economic basis.
- (5) The Board was enabled to obtain valuable information regarding conditions of storage in London, on shrinkage, and other points.
- (6) The Board was enabled to obtain benefits for dairy companies by way of decreased rates for freight and insurance.
- (7) The Board was enabled to bring about improved shipping conditions from the point of view of temperature control, &c.

Those are the more important features of the activities of the New Zealand Dairy-produce Control Board. As will be seen, however, the word "control" no longer applies, and has in fact been deleted from the Board's title. The history of the Board has been an extremely interesting one, but as the subject of its earlier operations is largely controversial, details are beyond the scope of this work, whose principal aim is to record rather than to discuss and analyse.

(NOTE.—The Primary Products Marketing Act, 1936, relieved the Board of its functions relating to shipping, insurance, and freight.)

(c) THE NEW ZEALAND DAIRY FACTORY MANAGERS' ASSOCIATION.

The original Factory Managers' Association was formed at Inglewood in 1896, the principal influences in its establishment being Mr. J. G. Harkness and Mr. T. Harry Penn. Mr. Harkness, well known in later years as secretary of the National Dairy Association, was then secretary-manager of the Midhirst Dairy Co., while Mr. Penn held a similar position in connection with the Stratford Dairy Co.

This foundation association, however, only existed a year, and in 1897 gave place to the New Zealand Factory Butter and Cheesemakers' Association, with Mr. J. F. Batey, manager of the Stratford Dairy Factory, as first secretary of the new organization. Successive secretaries were Mr. Carl Wrisberg, manager of Normanby; Mr. Walter Wright, afterwards Government Inspector of New Zealand Dairy Products in London; Mr. W. E. Gwillim, afterwards Assistant Director of the Dairy Division; Mr. J. R. Curle, at present Dairy-produce Grader in Charge, Wellington; and Mr. J. W. Smith, at present Dairy Factory Superintendent, Massey Agricultural College. The annual meetings of the association were held under the auspices of the National Dairy Association, and reports of proceedings included in the printed annual reports of the National Dairy Association.

The Butter and Cheesemakers' Association continued until June, 1908, when it was wound up, and the present organization formed—namely, the New Zealand Dairy Factory Managers' Association (Incorporated). Mr. J. Murray was appointed secretary and retained the position until 1916, when Mr. J. B. Wainscott followed on until being relieved by Mr. A. M. Stirling in 1918. Mr. Stirling resigned in 1920 in favour of Mr. J. W. Smith, who held office until May, 1923, when Mr. A. J. Neilson was appointed. Mr. Neilson acted in the same capacity until November, 1929, when Mr. J. Murray was again appointed, and still holds the position. The duties of the secretary have been considerably more onerous since the introduction of the Dairy Factory Managers Regulations, 1934, and the registration of factory-managers. The first president of the present organization was Mr. W. Dempster, now Dairy Instructor at Hamilton.

The principal functions of the Factory Managers' Association are to protect the interests and enhance the efficiency of dairy-factory managers, and it may truthfully be said that the association has rendered good service in these directions as well as definitely assisting toward the production of better-quality butter and cheese.

(d) MASSEY AGRICULTURAL COLLEGE.

In 1923 the late Sir Walter Buchanan donated £10,000 to Victoria University College, Wellington, for the purpose of founding a Chair of Agriculture. Having obtained a Government subsidy

thereon, the Council of the College established a School of Agriculture, and on 1st May, 1924, Professor G. S. Peren was appointed to fill this, the first Chair of Agriculture in New Zealand. The school was given recognition by the University of New Zealand in November of the same year. During the ensuing three years a number of students attended, but the instruction given was much handicapped by the limitations of the urban site.

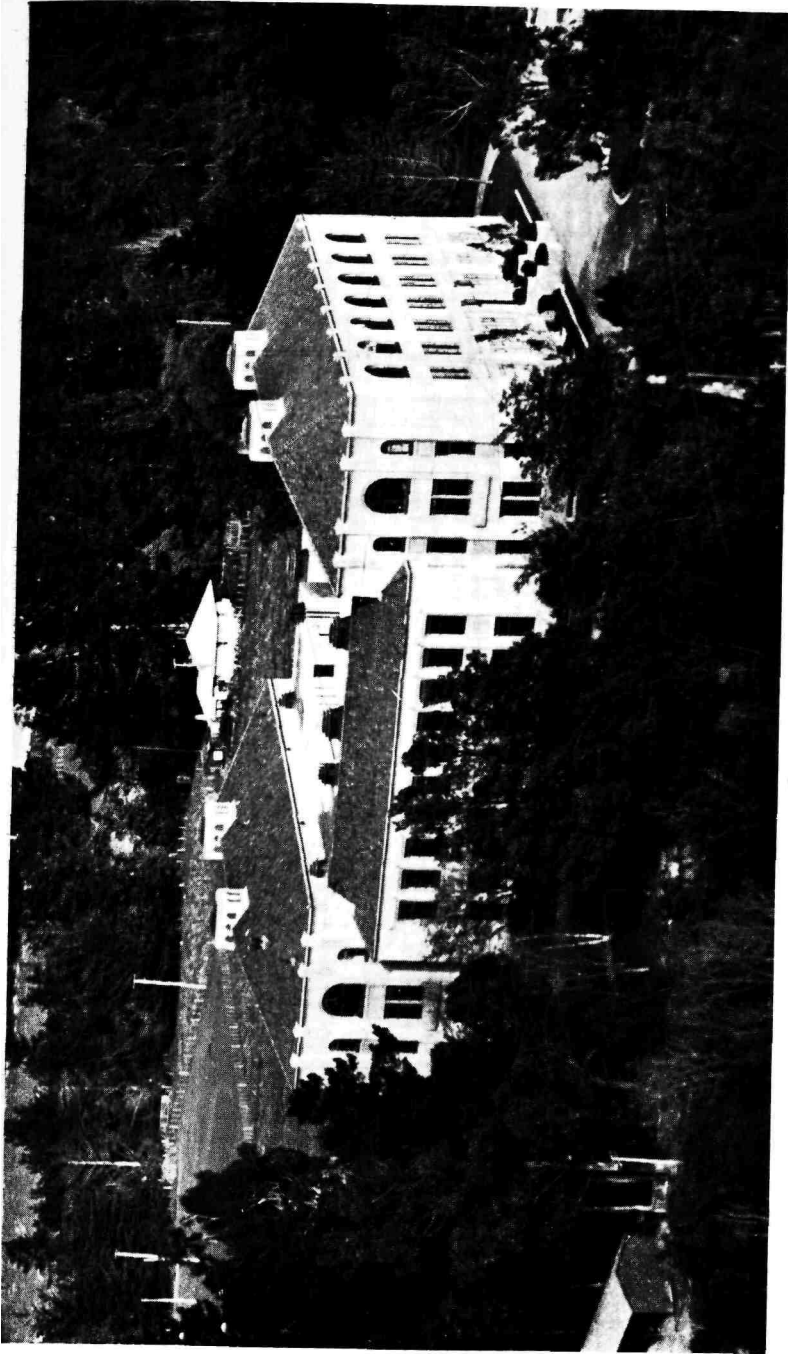
Towards the end of 1924 the Sir John Logan Campbell bequest for the founding of the Logan Campbell Chair of Agriculture was received by the Auckland University College, and a School of Agriculture was established at that college. In June, 1925, Professor W. Riddet was appointed to fill the newly-created Chair. During 1926 and 1927 this school was carried on under the same handicaps as its sister school at Wellington.

In 1926, as the result of a conference between the councils of the two universities, it was decided to combine the two schools, to pool the funds, and to establish one well-equipped institution in the Palmerston North - Marton area. In due course the property of the late J. Batchelar, Esq., at Fitzherbert, Palmerston North, was selected as the most suitable, and purchased by the Government on the 9th December, 1926.

On the 11th September, 1926, the college was established by the passing of the New Zealand Agricultural College Act, and on the 1st February, 1927, the College Council met for the first time. On 29th July, 1927, an amending Act, the Massey Agricultural College Act, was passed, and the college was established under its present title and constitution.

On 1st March, 1928, the Borough of Palmerston North purchased the property of P. A. McHardy, Esq., adjacent to and overlooking the Batchelar estate. Twenty-five acres of this property were presented as a site for the college buildings, the remaining seventeen acres being retained by the borough as a scenic reserve.

The college was formally opened by the Hon. O. J. Hawken, Minister of Agriculture, on 20th March, 1928. The foundation stone of the main building was laid on 4th December, 1929, and the building completed in March, 1931.



MASSEY AGRICULTURAL COLLEGE, PALMERSTON NORTH.

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While all branches of agriculture are taught, the Massey Agricultural College specializes in dairying, with Professor W. Riddet, B.Sc. (Agric.), (Glasgow), N.D.A. (Hons.), N.D.D. (Hons.), and Logan Campbell Professor of Agriculture, at the head of the Dairying Section. A modern dairy factory was erected in 1928. It is a commodious structure, with separate rooms for pasteurizing, buttermaking, cheddar-cheese making, testing dairy products, casein-manufacture, fancy cheesemaking, and the storage of butter and cheese. It is equipped with small units of dairy-factory machinery of the latest design. The factory is used for the instruction of students during the Dairy Manufactures Diploma Course, and for experimental work by the Dairy Research Institute for the remainder of the year. The first Dairy Factory Superintendent was Mr. G. M. Valentine, one of the Dairy Division's Dairy Instructors. On Mr. Valentine's appointment as Assistant Director of the Dairy Division in August, 1934, his place at Massey College was taken by Mr. J. W. Smith, another Instructor of the Dairy Division.

There is also at the college a set of modern dairy-farm buildings, consisting of a milking-shed fitted up with a six-cow releaser milking-plant, separator, and other necessary machinery, calf-pens, sick-animal box, bull-crush, and feed-house. On the college farm, 865 acres in extent, are pastured several breeds of cattle, including the principal dairy breeds. Herd-testing is also dealt with.

In Massey College we have the realization of the dream of forty years ago, when Sawers, Sorensen, and later Kinsella and Cuddie, were stressing the need for a permanent dairy school where all branches of dairying, practical and theoretical, could be taught, and the problems of the industry investigated by qualified dairy scientists.

(e) THE DAIRY RESEARCH INSTITUTE (N.Z.).

This institute, which is situated at the Massey Agricultural College, is the central dairy organization in the Dominion, and was established in 1927. A unit of the Dominion Department of Scientific and Industrial Research, its policy is controlled by a Dairy Research Management Committee of the (parent) Research Council. This Committee consists of three members nominated

by the New Zealand Dairy-produce Board, two by the Department of Scientific and Industrial Research Council, two by the Massey Agricultural College Council, two by the Department of Agriculture, and one by the New Zealand Dairy Factory Managers' Association.

The expenses of running the Institute are borne jointly by the Dairy Board and the Department of Scientific and Industrial Research. The Massey Agricultural College provides the use of its dairy factory, cow-sheds, dairy equipment, and stock for experimental purposes. By agreement between the bodies concerned, the Institute staff do both research and teaching work, so that close contact of research workers and students is maintained.

The Institute is intended to deal with matters affecting (1) the production of milk in relation to feeding, breeding, and management of dairy animals and factors influencing its purity; (2) the manufacture of dairy-produce of all descriptions; (3) the utilization of dairy by-products; (4) the economic aspect of the production, manufacturing, and marketing of dairy-produce; (5) the investigation of the suitability of types and models of dairy machinery, metals suitable for dairy machinery, and other engineering problems affecting the dairy industry. Subject to certain conditions, facilities are afforded for the testing of dairy machines.

(f) THE NEW ZEALAND CO-OPERATIVE RENNET CO., LTD.

This company, which has its headquarters at Eltham, was formed in 1916 as an outcome of the difficulty experienced towards the end of the Great War period in obtaining sufficient rennet from oversea sources. While this world shortage of rennet continued, the company was able to supplement the imported supplies. Although in this way of great value to the industry, it was not possible with the limited number of calves' vells available in New Zealand, to manufacture on a large enough scale to make the business profitable, and, later, oversea raw material was imported so that the output could be increased. There was a rapid increase in the amount of local raw product, commencing in 1926, and by 1929 more calves' vells were available from New Zealand sources than were necessary for the company's output, this increase in raw product being due to the calf-collection schemes conducted in

connection with the export of veal. It is therefore now possible for the company to produce, from New Zealand raw product, the total amount of rennet required for the Dominion's output of cheese.

At the formation of the company about half the cheese-manufacturing dairy companies of the country became shareholders, and many others have since joined. For the past nine or ten years the operations of the company have been successful, and the finances have been greatly strengthened out of profits. The company's rennet is not restricted to shareholders, but is sold to all at the same price. Shareholders, however, have benefited by the strengthening of the company's finances and have also benefited by division of profits. In addition to rennet supplied for the manufacture of cheese, the local market is supplied with rennet for household use under the name of "Renco for Junket." The company also manufactures a number of articles in regular use in dairy factories, such as marking-ink, cleansing-powders, &c.

In 1927 the company made arrangements for the growing of annatto in our Island dependencies, and experiments in the manufacture of cheese-colouring made from annatto-seed received from these sources gave excellent results. The manufacture of annatto cheese-colouring is now carried out on a commercial scale, and large and increasing quantities are being sold annually. Altogether this is a progressive concern rendering an important service to the industry.

(g) EGMONT BOX CO.

This company, originally known as the Egmont *Co-operative* Box Co., was formed in 1902 by a number of co-operative dairy companies in Taranaki to take over the butter-box and cheese-crate factory at Eltham operated by Messrs. T. Runciman and R. S. Allan, Messrs. Chew Chong and J. Penny, jun., also being shareholders. In June, 1905, the records show that there were seventeen shareholders, fourteen of which appear to have been dairy-factory concerns.

In January, 1906, the Egmont Co-operative Box Co., resolved to wind up, and the present company—namely, the Egmont Box Co., Ltd.—was incorporated, primarily with a capital of £10,000, for the purpose of supplying cheese-crates and butter-boxes to its

shareholders, some sixty Taranaki dairy factories. Mr. R. G. Barr was the company's first manager. Following extension of operations and the purchase of bush areas in the King-country capital was increased in various stages until it reached £200,000.

It is at present (1935) operating an up-to-date mill plant in the National Park district, adjacent to its bush area, the company's rights extending over some 22,000 acres of mixed native bush.

A box and crate factory, also operating at National Park, a joinery-factory at Hawera, and a further box and crate factory at Eltham supported by a sawmill using *Pinus insignis* timber completes the centres from which the company carries on production.

Approximately one hundred employees are engaged during the whole year, this number being increased by one hundred and forty to one hundred and fifty during the dairying season.

Since the commencement of its operations the Egmont Box Co. has supplied to its shareholders (to the end of 1935) a total of approximately 6,250,000 butter-boxes and 6,500,000 cheese-crates.

(h) THE NEW ZEALAND CO-OPERATIVE DAIRY CO.'S BOX-FACTORY.

With a view to decreasing overhead costs, the New Zealand Co-operative Dairy Co. in 1921 brought to fruition plans for manufacturing its own boxes and crates by building a box-factory at Frankton Junction. The factory itself covers an area of 24,750 square feet, while the area occupied by the box-factory and timber-yard is approximately 8 acres. The principle of the lay-out is that the undressed timber enters the factory at one end and moves forward in the different stages of manufacture until it emerges at the other end in the form of completed butter-boxes, cheese-crates, and milk-powder cases, these being then loaded direct into the railway trucks for despatch to the various manufacturing dairies of the company. Each machine in the factory is operated direct by electric motor, so that the machines can be operated at will without loss of power.

The factory is capable of handling 750,000 superficial feet of timber per month, and this quantity is handled regularly during the peak months of the season. During the first complete year the output of the factory totalled 853,457, while during the 1933-34 season the total containers manufactured was in the vicinity of 2,000,000.

There are 440 timber-racks in the yard for drying timber, with railway-tracks running past each rack to enable the timber to be handled expeditiously, the length of railway-track being approximately one and a half miles. The storage space of the yard, after allowing ample air-space for the rapid drying of the timber, is sufficient for 2,500,000 superficial feet.

(i) WINTER SHOWS.

No small part of the credit for the advance in the quality of our butter and cheese belongs to those who have conducted competitive exhibitions of such products. Agricultural and pastoral shows, held in the summer, and which included classes for farm-made butter and cheese, date back to the 1850's, and by 1880 were annual events in most rural districts of New Zealand. These early exhibitions, however, would receive entries from too small an area to have much influence on the quality or character of dairy-produce throughout the colony as a whole, but, nevertheless, would bring about an exchange of ideas among the makers and foster an ambition to manufacture a high-class article.

For many years the competitive exhibiting of factory-made butter and cheese has been a feature of the winter shows of the various agricultural and pastoral and other associations. To-day there are three annual winter fixtures which specialize in classes for butter and cheese, two being in the North Island and one in the South. These attract a large number of entries from dairy factories in all parts of the Dominion. Substantial prizes are offered, and the winning of the championship awards is a much-coveted honour. The judging is carried out by officers of the Dairy Division.

The oldest of the three winter shows referred to is the one held at Dunedin under the auspices of the Otago Agricultural and Pastoral Society. This society staged its first annual show in

November, 1877—a summer show—and its first winter show in June, 1894. This first exhibition included two classes for factory cheese, for which there were 32 entries; one class for factory butter, 4 entries; and five classes for farmers' butter, which attracted 50 entries. Mr. Henry Reynolds judged the cheese. The number of entries has shown minor fluctuations from year to year, but, taken as a whole, there has been a steady annual increase, the figures for the 1935 winter show being as follows: Fifteen classes for factory cheese, 131 entries; nine classes for factory butter, 65 entries; 8 entries for special factory cheese class; and twelve classes for farmers' butter, 66 entries.

The Manawatu and West Coast Agricultural and Pastoral Association, Palmerston North, held its first show in 1886 and its first winter show in 1903, at which there were seven classes for butter and cheese and a total of 42 entries. The 1935 exhibit provided for thirty-three classes, for which 565 entries were received. Factories from as far north as Kaitaia and as far south as Invercargill were represented. Mention should be made of the fact, however, that a successful winter show was held at Palmerston North in 1901 under the auspices of the National Dairy Association and the Factory Managers' Association.

The Waikato Winter Show Association, Hamilton, was established in 1907. The first show provided for two classes for creamery butter and one for factory cheese. Two factories exhibited butter, but no cheese entries were received. For the 1935 show the association invited entries for forty-four classes, 751 entries being received in the butter section and 502 in the cheese, making the huge total of 1,253 entries.

Although in the matter of size the three fixtures specially referred to are the most representative in the Dominion, mention should also be made of the Egmont Agricultural and Pastoral Association, which held a winter show at Hawera as far back as 1895. The different classes were reported to have been well filled and the competition keen. Taranaki won most of the butter prizes, while the bulk of the cheese entered came from the South Island, where the principal prizes went. Three officers of the Dairy Division acted as judges.



JUDGING BUTTER AND CHEESE EXHIBITS AT WAIKATO WINTER SHOW, HAMILTON, 1926.

The Waikato Winter Show stages the largest number of entries of factory butter and cheese of the seven dairy shows held in New Zealand each year, the total for 1936 being 1,219. Only one entry, consisting of one box of butter and one of cheese, is accepted in each class from any factory.

The judging at all dairy shows is carried out by officers of the Dairy Division of the Department of Agriculture, and is done on the group system. Two judges award the points at the first examination, and the final awards are made by groups of three by a process of comparison and elimination. In no case is the identity of the exhibitor known to the judges.

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Being held in the closed season for dairy factories, the winter shows attract large numbers of factory-managers and assistants, and advantage is usually taken of the occasion to arrange various meetings where matters pertaining to the industry are discussed. Consequently, both directly and indirectly, the winter shows are of considerable educational value.

GRADING COMPETITIONS AT SHOWS.

At winter dairy shows it is also the usual practice for attending dairy-factory managers and factory assistants to hold grading competitions in connection with some of the butter and cheese exhibits. These events are carried out under the auspices of the Dairy Factory Managers' Association. In some cases the show associations present cash prizes or trophies, and where this is not done the competitors introduce a sweepstake. Officers of the Dairy Division select and grade-point the produce and supervise the competitions. As a rule there are two classes, one for butter and one for cheese. Usually three boxes of butter and three cheese, respectively, constitute each class, and first, second, and third prizes are allocated to each class. Awards are made on the basis of the competitor pointing the produce exactly the same in all scoring sections as scored by the Dairy Division's Grader, in which case a maximum score of one hundred points is obtainable. Failure to score the same points is penalized by the points at variance in each section. Thereby each competitor's aggregate score is ascertained and awards made accordingly.

(j) THE NEW ZEALAND PRODUCERS' CO-OPERATIVE MARKETING ASSOCIATION.

The proposal to form this association came to a head at the National Dairy Association's Conference in Palmerston North in 1918, when a remit by the Riverbank Dairy Co., of Woodville, was brought forward, asking the directors of the National Dairy Association to instruct Mr. R. Ellison, their London manager, to formulate a scheme under which New Zealand dairy factories could market their own produce, such scheme to be brought forward and reported to the conference to be held the following year.

At the subsequent conference Mr. Ellison was in attendance and outlined a proposition for action in conjunction with the

Co-operative Wholesale Society of England. The scheme was that an organization should be set up, comprising the dairy factories of New Zealand, on one hand, and the Co-operative Wholesale Society, on the other. These two organizations were to be jointly concerned in a further company to be formed in London for the purpose of handling the produce when it arrived there. The Co-operative Wholesale Society agreed to find the necessary finance for the proposition, and the resulting profits therefrom were to be divided evenly between the two partners. The directorate of the London concern was to consist of two members from the Co-operative Wholesale Society and two from New Zealand.

The scheme was finally adopted by the National Dairy Association, and the New Zealand Producers' Co-operative Marketing Association formed. The result was that to begin with seventy dairy companies in New Zealand joined and took up shares in the association. Five years later the number had increased to ninety-one shareholding factories and seventeen supplying factories who were non-shareholders. The first year's operations commenced in the season 1920-21. The basis of shareholding in the New Zealand company is for a factory to hold one £1 share for every 1,000 lb. of butterfat which it handled during the preceding year.

In later years the association extended its business to other lines, more especially frozen pork, mutton, and lamb. Mr. G. S. Davidson is secretary to the association.

(k) AMALGAMATED DAIRIES, LTD.

The origin of this organization is bound up with the New Zealand Dairy-produce Control Board and the New Zealand Co-operative Dairy Co., Ltd. Before the control and marketing of dairy-produce was taken over by the Dairy Board the New Zealand Co-operative Dairy Co. had its own marketing organization in London, with a London manager who allocated the company's produce to Tooley Street firms for sale under his supervision. It must be remembered that the company was at the time exporting the huge quantity of nearly 40,000 tons of butter and 11,000 tons of cheese a year. Under the marketing arrangement adopted the company therefore used the existing channels of distribution, but through its London officer exercised a certain amount of control and supervision with regard to the sale of the produce. When,

however, the Dairy Board took over the control and marketing of our dairy-produce the output of the New Zealand Co-operative Dairy Co. was included, and consequently their London marketing organization ceased to function. When, in 1927, the Dairy Board abandoned its marketing policy, Mr. William Goodfellow, managing director of the New Zealand Co-operative Dairy Co., invited the co-operative dairy companies in New Zealand to join the big company in the setting-up of an organization to market their produce on a co-operative basis. In effect this meant attempting to carry out on a voluntary basis a scheme which had failed to succeed under the Dairy Board and under compulsion. The new organization was duly set up toward the end of 1927, and took the name of Amalgamated Dairies, Ltd., the objects of which were to market New Zealand dairy-produce and to co-ordinate the marketing of Empire dairy-produce. As Mr. G. A. Duncan points out in his book, "The New Zealand Dairy Industry," it was hoped to institute a more orderly system of marketing, by reducing competition in selling, and to develop new markets. "The policy was to co-operate with the Tooley Street merchants, and to sell produce under the supervision of the London manager of Amalgamated Dairies, Ltd. It was hoped that the linking-up of the co-operative dairy companies in New Zealand with the scheme would lead to a lifting of the price-level to the highest figure obtainable from the market, but there was to be no attempt to extract an artificial price by the withholding of supplies from the market, or by the rigid fixing of prices."

(l) EMPIRE DAIRIES.

This organization was formed in 1928 by Mr. Goodfellow. Regarding Empire Dairies the following very clear and concise summing up is given by Mr. Duncan on p. 253 of his book referred to above :—

"The desire to co-ordinate the marketing of Empire Dairy produce led to the establishment of Empire Dairies, Limited, the original shareholders of which were Amalgamated Dairies and the Australian Producers' Co-operative Association. It was hoped that Empire Dairies would ultimately be an Empire organization.

"In practice, Amalgamated Dairies acted as an agent in New Zealand for Empire Dairies. Tooley Street firms were employed

to sell produce, and allocations were also made to Empire Dairies, which sold the produce in competition with Tooley Street.

“The establishment by the big New Zealand Co-operative Dairy Company of its marketing organization in London, the undertaking of control of export and marketing of produce by the Dairy Board, and the proposals which have been outlined for co-operative marketing on a voluntary basis, were all expressions of the desire of a considerable section of the producers to carry their co-operation a stage past manufacture, and to improve their returns by better marketing

“After a trial, an announcement was made by Mr. Wm. Goodfellow that the operations of Amalgamated Dairies, Ltd., were suspended, and that the handling by that company of butter and cheese of Co-operative Dairy Companies was to be discontinued. The reasons given by Mr. Goodfellow for this change in policy were that the insistence by the Co-operative Dairy Companies on competitive price returns, had led to a system of market breaking by quick selling, and that, whilst that system continued, Amalgamated Dairies could serve no useful purpose. It was announced that Empire Dairies, Ltd., was to continue as a dairy-produce marketing organization.”

(m) WELLINGTON CITY MILK-SUPPLY.

In 1919 the Wellington City Council's Municipal Milk Department was established, and the first municipalized milk service in the British Empire commenced. The undertaking was the result of the unsatisfactory milk-supply in Wellington during the early war years, due to the shortage of milk created by the high prices offering for dairy products on the Home market.

The milk is purchased from nearby farmers, the producers' supply being co-operative. Milk delivery was originally carried out by vendor companies on the block system, but in 1922 was taken over by the Council, who installed a bottling system and instituted the vending of bottled pasteurized milk. The Council also owns a dairy factory, used as a balancing station, where surplus milk is manufactured into butter and casein.

Much of the success of this enterprise is due to Mr. R. E. Herron, the present General Manager.

CHAPTER VII.

THE INDUSTRY IN GREAT BRITAIN.

(a) THE IMPERIAL ECONOMIC COMMITTEE AND THE EMPIRE MARKETING BOARD.

THE Imperial Economic Committee was appointed in 1925, arising out of the Imperial Economic Conference held in 1923. The Committee consisted of a Chairman appointed by agreement between the Governments of the Empire, and representatives nominated by the various Governments of the Empire on the following scale :—

Four by the Government of the United Kingdom.

Two by the Government of each Dominion.

Two by the Secretary of State for India.

One by the Government of Southern Rhodesia.

Two by the Secretary of State for the Colonies.

The Committee was appointed with the following terms of reference :—

“ To consider the possibility of improving the methods of preparing for market and marketing within the United Kingdom the food products of the overseas parts of the Empire with a view to increasing the consumption of such products in the United Kingdom in preference to imports from foreign countries and to promote the interests both of producers and consumers.”

It was decided that the first products to which they should devote their attention should be meat and fruit, though dairy-produce was dealt with at an early stage in their operations. In various debates it was made clear that the terms of reference were

to be so interpreted that precedence in the Home market should be given to Home produce. The Prime Minister of the United Kingdom stated as follows :—

“ The Dominions have always recognized that our Home producers have, and should always have, the first place in the Home market, but they ask—and we think rightly ask—that they should have a preference over foreign countries as regards that part of the Home market which cannot be supplied by the Home producer.”

The same point was made by the Chancellor of the Exchequer, who stated, “ We wish to encourage Empire products at the expense of the foreign product, but not at the expense of the domestic producer.”

For the purpose of carrying out the proposals outlined the British Government allocated a round £1,000,000 per year, and it was agreed that precedence should be given in the United Kingdom for foodstuffs in the following order : (1) United Kingdom produce ; (2) produce from oversea portions of the Empire ; (3) foreign produce.

Neither the functions nor the position of the Imperial Economic Committee will have been made clear without reference to its relationship to the Empire Marketing Board. In their first or “ general ” report the Committee recommended that the £1,000,000 a year should be administered by an Executive Commission which should carry out those of their recommendations which applied especially to the United Kingdom. The Committee hoped that, though this Commission would owe responsibility to the British Parliament “ means would be devised whereby the views of oversea Governments of the Empire may, from time to time, be brought to bear in an advisory way on the problems involved.”

His Majesty’s Government in the United Kingdom accepted these recommendations in principle, and in May, 1926, established an organization presided over by the Secretary of State for Dominion Affairs, who was responsible to the British Parliament for the expenditure of the annual grant, and appointed an official non-political body, under the title of the Empire Marketing Board, to advise him in the administration of that fund. The membership of the Board was so arranged that though limited for the sake

of efficiency, no part of the Empire was left unrepresented. Thus was secured that association with oversea opinion which the Imperial Economic Committee recommended. All the oversea members on the original Board were members of the Imperial Economic Committee.

The Secretary of State for Dominion Affairs was Chairman of the Empire Marketing Board, which was composed of certain Ministers *ex officio* and of members nominated by the Secretary of State in consultation with the Chairman of the Imperial Economic Committee. The New Zealand member was Mr. R. S. Forsyth, representative of the New Zealand Meat Board in London.

The two bodies thus described—the Imperial Economic Committee and the Empire Marketing Board—were therefore distinct and differed functionally and constitutionally.

The Imperial Economic Committee was an Imperial body in the sense that it owed its authority to resolutions adopted at the Imperial Conference ; that it was constituted of members appointed by the several Governments of the Empire ; and that it reported to the Governments of the Empire on the several subjects referred to it by them.

The Empire Marketing Board, on the other hand, was a body appointed by one of His Majesty's Ministers of the United Kingdom—namely, the Secretary of State for Dominion Affairs—to advise him in the administration of the annual vote of £1,000,000 granted by the Parliament of the United Kingdom.

None the less, the Imperial Economic Committee and the Empire Marketing Board were, in fact, closely related, partly because it happened that certain gentlemen were members of both bodies, and partly because the Empire Marketing Board was charged with the endeavour to give effect within the terms of its vote to many of the recommendations of the Imperial Economic Committee.

Unfortunately, owing to the high cost involved, it was decided to dispense with the Empire Marketing Board, and the organization ceased to function early in 1935. Shortly after its inception it began to pay attention to the marketing, advertising, and distribution of Empire dairy-produce, and New Zealand butter and cheese benefited greatly by its operations. The Board left a number

of bulletins and other publications in which a large amount of valuable statistical and general data is embodied. It will be a pity if arrangements cannot be made to carry forward information on the lines laid down, but more particularly to continue the excellent work which the Board inaugurated regarding the sale and consumption of Empire dairy-produce.

(b) THE OTTAWA AGREEMENT.

What subsequently became known as the "Ottawa agreement" was the outcome of a meeting held at Ottawa in 1932 by the Imperial Economic Conference for the purpose of discussing trade among Great Britain and her dominions. New Zealand was represented at the Ottawa Conference, and the reference to dairy-produce in the agreement signed there between the United Kingdom and New Zealand was in these words:—

"As regards eggs, poultry, butter, cheese, and other milk products, free entry for New Zealand produce will be continued for three years certain. His Majesty's Government in the United Kingdom, however, reserve to themselves the right after the expiration of the three years, if they consider it necessary in the interests of the United Kingdom producer to do so, to review the basis of preference so far as relates to the articles enumerated, and, after notifying His Majesty's Government in New Zealand, either to impose a preferential duty on New Zealand produce, whilst maintaining existing preferential margins, or, in consultation with the New Zealand Government, to bring such produce within any system which may be put into operation for the quantitative regulation of supplies from all sources in the United Kingdom market."

In addition it was provided that a tariff of 15s. per hundred-weight should be imposed on foreign butter, and 15 per cent. on foreign cheese, and in consideration of these concessions New Zealand agreed to review its tariffs, giving additional preferences to British manufactures.

The agreement bears the date 20th August, 1932, and is subject to the embodied proviso that :—

“ In the event of circumstances arising which, in the judgment of His Majesty’s Government in the United Kingdom or of His Majesty’s Government in New Zealand, as the case may be, necessitate a variation in the terms of the agreement, the proposal to vary these terms shall form the subject of consultation between the two Governments.”

The position is, therefore, that until 20th August, 1935, quotas could not be imposed against New Zealand without her consent. Under the proviso to the agreement the British Government may propose quotas and discuss them with New Zealand ; but unless New Zealand accepts the proposals they cannot be applied. But after the 20th August, 1935, the United Kingdom was under no obligation to consult New Zealand, but only to notify us what it had decided to do in the way of putting a duty on our dairy-produce entering the United Kingdom, or of limiting the amount that may enter.

Despite the acute situation in which we in New Zealand have been placed in regard to the sale of our dairy-produce as well as the extremely difficult position of the British producer, the British Government has refrained from formally proposing import quotas as a topic of consultation, with a view to their immediate imposition. What has happened, however, is that the British policy of assisting home agriculture, which was, at the time of the Ottawa Conference, in a more or less indefinite form, has subsequently developed into a scheme of very large proportions and far-reaching effects. Moreover, through the visit of Mr. Thomas Baxter, representative of the British dairy-farmers, and otherwise, New Zealand dairy-farmers and the New Zealand Government have been consulted unofficially as to their attitude to restriction, and for a time English farmers seemed to hope, and New Zealand farmers certainly feared, that the dominions would voluntarily accept quotas before the expiry of the Ottawa agreement. Nothing, however, eventuated, and the setting-up of the Dairy Industry Commission diverted the mind of New Zealand dairy-farmers from quota questions in the meantime. It now remains to be seen what the future will bring.

(c) THE BRITISH MILK-MARKETING SCHEME.

In the meantime England has brought in the milk-marketing scheme, which came into full operation on the 6th October, 1933, after a suspensory period of about two months. This period was to allow time for the milk-producers of England and Wales to become registered with the Milk Marketing Board, and for a poll of registered producers to be taken to decide whether the scheme should come into operation or not. The result of the initial poll was that 96.42 per cent. of the registered producers voting (representing 96.61 per cent. of voters' productive capacity) declared in favour of the scheme. A second poll that closed on the 15th August, 1935, disclosed that out of 98,458 producers, possessing 1,654,064 cows, 81 per cent., representing 86.5 per cent. of the cows, voted for continuance of the scheme.

The scheme provided for the constitution of the Milk Marketing Board, to be elected by the registered producers in England and Wales, and for the establishment of eleven provincial regions (nine in England and two in Wales), each with a regional committee elected by the registered producers in the region, these regional committees to advise the Board as to the working of the scheme in the regions.

The fundamental principle of the scheme was the equalization of the proceeds of all sales of milk wholesale by the registered producers in each region, so that each producer would receive a "pool" price for his milk irrespective of whether it was sold for liquid consumption or for manufacture. By means of an adjustment, termed the inter-regional compensation levy, the regions having a high proportion of sales for liquid consumption contribute towards the pool price in regions that sell milk largely for manufacture.

Summed up the scheme would appear to have the following principal effects:—

- (1) To increase production—
 - (a) Of milk.
 - (b) Of cheese and butter in factories.
- (2) To increase the price of milk.
- (3) To allow the prices of butter and cheese to **remain low**.
- (4) To suggest the consideration of quantities.

Shortly after the introduction of the scheme the British Government found that unless it was prepared indefinitely to pay a heavy subsidy it must endeavour to bring about increased consumption of liquid milk. Consequently, a campaign was launched (a) for securing a purer milk-supply, (b) for publicity towards increasing liquid milk consumption. In each case the British Government gave substantial grants of money toward defraying the costs.

There are some who consider that the British milk-marketing scheme was introduced to accomplish what could not otherwise have been attempted until the expiry of the Ottawa agreement.

(d) TOOLEY STREET.

From the point of view of the marketing of dairy-produce no name is better known to New-Zealanders than that of Tooley Street, London. Used in a colloquial sense the term "Tooley Street" may be said to imply the whole of the merchants, agents, and brokers engaged in the import dairy-produce trade of Britain. The dairy-produce market in Tooley Street, London, is the largest single unit market in Britain. All the leading traders in dairy-produce in all other important centres of distribution in Britain are represented there, as are the traders of all countries dealing in dairy-produce with the Old Country.

Tooley Street runs parallel with the south side of the River Thames, and stretches from the Tower Bridge to London Bridge, a distance of about a mile. It is a street of warehouses (many of them fitted up for cold storage) abutting on the wharves, and there are twenty-seven firms handling butter and cheese direct from this Dominion. Twenty-six of these firms are members of the New Zealand Dairy-produce Importers' Association, which is a body acting for the importers in matters of common interest relating to terms and conditions for handling New Zealand butter and cheese. The remaining firm is Empire Dairies, formed in 1928 by Mr. William Goodfellow, and referred to elsewhere in these pages. In addition, there are several wholesale firms which handle small quantities of butter on consignment direct from New Zealand dairy companies. Tooley Street is the marketing centre for Empire

dairy-produce, and its history dates back to the ninth century, and so far as New Zealand is concerned, to the beginning of our export trade fifty years ago.

Each of the Tooley Street merchants has a representative in New Zealand, whose duty it is to keep in touch with the dairy companies whose business it handles, and to solicit new business. A praiseworthy spirit of understanding and goodwill has always existed between the Tooley Street merchants and the New Zealand dairy factories, and the success of our dairy industry is due to a very large extent to the skill and integrity of the service rendered. Particularly in the early days, Tooley Street rendered inestimable service by way of assistance toward overcoming our transport, storage, and distribution difficulties, and, as already stated, furnished the finance for the establishment of many of the early dairy companies.

Along the waterfront adjacent to Tooley Street are a number of wharves. Most ocean-going steamers carrying Empire dairy-produce discharge their cargo at Royal Albert and other docks, situated some miles below Tooley Street. Hay's Wharf, established in 1770, is the principal wharf on the Tooley Street waterfront, and possesses a fleet of tugs and lighters of no less than 350 craft. Under a contract with the New Zealand Dairy-produce Board, made in 1928, the proprietors of Hay's Wharf are responsible for the unloading, transport, storage, and distribution to the trade of the whole of the New Zealand dairy-produce shipped to London.

During recent years increasing quantities of dairy-produce have been delivered at west coast and other ports. These include Avonmouth, Liverpool, Manchester, and Glasgow, and more recently direct shipments have been made regularly to Cardiff, Southampton, and Hull.



A PIONEER'S HERD.

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CHAPTER VIII.

THE CENTRIFUGAL SEPARATOR AND THE CREAMERY SYSTEM.

(1) THE FIRST SEPARATORS.

It is not within the scope of this work to record the origin and development of dairy appliances apart from their direct reference to New Zealand. The importance of the separator, however, may justify the inclusion of a few of the more important facts regarding its history.

The influence of centrifugal force was investigated by Professor Fuchs, Karlsruhe, Germany, in 1859, and by Albert Fesca, of Berlin, in 1860. Fuchs suggested the whirling of milk in test-tubes, and the reading of the cream-layer formed as a test for its richness. Le Feldt and Lentch offered continuous separators for sale in 1877. L. C. Neilsen, Denmark, invented a continuous separator in 1878, and his patent was bought by Burmeister and Wain, Ltd., a Danish firm of shipbuilders, who commenced the manufacture of cream-separators for sale in 1881. These separators were the most satisfactory up to that date, and found a rapid sale, being spread over the dairying world in a very short space of time. They were in New Zealand in 1883. Dr. de Laval, of Sweden, invented his cream-separator in 1878, and the Alfa Laval Separator Co., which acquired his patent, put its separator on the market in 1879. This was the foundation of perhaps the most widely known separator of the present day. The manufacture of hand-separators was commenced by the Alfa Laval Separator Co., about 1886, all previous separators having been made for power-drive, and very heavy to work. In 1890 the disc-bowls were introduced by Baron Bechtelstein, of Munich, and his patent was purchased by the De Laval Separator Co.

The first creamery using centrifugal separators is said to have been established in Kiel, Germany, in 1877, while the first centrifugal co-operative creamery was established in Hjedding in Jutland, Denmark, in 1882.

So far as New Zealand is concerned, Burmeister and Wain separators were in use in dairy factories in Otago in 1884, in the Waikato in 1885, and in Taranaki in 1886. A De Laval separator was installed at the Edendale Dairy Factory in 1886, and at the Taieri and Peninsula Milk Supply Factory, Dunedin, in 1887. These seem to have been the first dairy-factory separators in New Zealand.

Considerable trouble has been taken to discover the first farm separators in use in this Dominion, but the event could not be traced with certainty. The earliest separator traced was one imported by Mr. A. B. Fitchett and installed at his dairy-farm at Brooklyn, Wellington, in April, 1884. This was a 35-gallon power-driven machine called the "Nakskov," made by the Danish firm of Tuxen and Hammerich. A hand-separator—make not stated—was in use by a Mr. Turner, of Masterton, in 1888, and was claimed to be the first hand cream-separator in that district. "It appeared," so the report reads, "to give every satisfaction, except perhaps that it required a little too much elbow grease"—a common failing of those early machines. The year previous, 1887, a hand-power De Laval cream-separator was demonstrated in Taranaki on the farm of Mr. A. J. Hoskin, Bell Block, and it seems that the farmers were well pleased with the machine, as it was not very long before a number were installed in the neighbouring district. In the meantime separators were being tried out in the Waikato, notably owing to the influence of Mr. Henry Reynolds and Captain Runciman, and by 1890 the farm separator had passed the novelty stage, though its use, needless to say, was for farm buttermaking rather than for the delivery of cream to the factories under what we now term the home-separation system.

(2) HOME SEPARATION.

(a) HISTORY OF THE INTRODUCTION OF HOME SEPARATION.

Although home separation has been a most important factor in the making of the butter side of our dairy industry, and to-day over 95 per cent. of our butter is made from cream separated on the farms, the system did not come into practice without strong opposition, both on the part of the Government and of the factory-managers.

For reasons which are dealt with later the Dairy Division opposed home separation as carried out at that time. At the initiation of the factory system of buttermaking for export the general opinion was that the manufacture of butter on the lines of power separation at the manufacturing dairies was the best system from the standpoint of producing the best quality. This meant the daily delivery of whole milk to the factory and the immediate separation and cooling of the cream to not less than 60° to 65° F., followed by the ripening of the cream when necessary. Ripening was done by the addition of separated skim-milk which had been held in a can at a temperature of 60° to 65° in an insulated wooden box until it developed a mild sourness, which usually took place in about twenty-four to forty-eight hours. This sour culture was the forerunner of the present-day starter culture.

The first deviation from the central-factory system was the introduction of auxiliary whole-milk separating-stations, or creameries, as they were termed. This was in the United States of America, and its adoption in New Zealand soon followed. It extended rapidly, and no very strong case could be made out against it. Concurrently, there were occasional requests from dairy-farmers, particularly farmers so located that they could not deliver whole milk daily to factories or creameries, that they be allowed to separate their milk on the farm and deliver the cream only. These, however, were usually told to make their cream into butter, and they did. At the same period home separation was becoming a very common practice in the United States of America and in Australia, although whole-milk delivery was still considered essential for New Zealand conditions. It meant that the whole milk offered was under the close scrutiny of the receiver, who could accept or refuse it and could advise the owner of its condition.

For many years after the establishment of our export trade in dairy-produce one of the most serious faults in the quality of New Zealand butter was "fishy flavour," and it was generally thought that the departure from the central factory system was to some extent to blame for this, in so far that much of the home-separated cream was older and higher in acid than the central factory cream, owing to infrequent deliveries and to bad handling on the farms. Fresh, sweet cream was the first essential for good

buttermaking, and no further departure from first principles was deemed prudent. At the same time it was generally recognized that the home-separation system had many advantages from an economical point of view, but the fact that the factory had no control over the whole milk separated, nor over the delivery of the cream in a fresh, sweet, and cool condition, was considered a serious handicap with respect to the quality of the resultant butter. When home separation did come in, fishy and tallowy flavoured butter increased in quantity, and, needless to say, the ranks of the opponents of the system swelled noticeably.

By 1905 home separation was spreading rapidly, and its extension on the lines followed deplored. In that year a move was made by two factories (Whenuakura and Mangatoki), in co-operation with officers of the Dairy Division, to pasteurize whole-milk cream as a safeguard against fishy flavour. About 1907 some makers handling home-separated cream used a neutralizing agent to reduce the acidity. This had no definitely useful effect, but was found helpful, and became general when pasteurization of the cream was applied. In other words, home separation was responsible for the system of partial neutralization of acidity in cream. The solving of the problem and the end of the serious fault of fishiness in butter came in 1913, when, at the direction of Mr. D. Cuddie, Mr. J. Pedersen, one of the Dairy Division's instructors, conducted a number of exhaustive experiments at the Konini Dairy Factory and was successful in demonstrating that the cause of the trouble was primarily due to over-acidity in cream.

The origin of home separation in New Zealand dates back to 1897, when the system was introduced by Mr. Geo. Finn, of Messrs. Finn, Chisholm, and Co., of Wellington. This firm had taken up the agency for the Sharples separator, and were successful in persuading a number of dairy-farmers of the efficiency of the machine and of the benefits of separating the cream on the farm and delivering the lesser bulk to the factory. In those days of bad roads, or no roads at all, milk-delivery was often a very difficult matter, and distance from the factory or creamery an all important factor. In many instances it was impossible to use a wheeled vehicle of any description, and there were even cases where at certain times of the year the back-country track would

not carry a sledge, so that the milk was delivered on packhorses. These matters are mentioned to indicate how natural it was that isolated dairy-farmers should welcome any means of lessening the time and labour of delivering the raw produce to the manufacturer. After persuading dairy-farmers of the advantages of home separation, Messrs. Finn, Chisholm, and Co. found, however, that it was a more difficult matter to persuade the factories to take the cream. The company met the position by building a factory in Cornhill Street, Wellington, to handle the supply. They ran the business for about eight years as separator agents and distributors of home separation butter—Gold Leaf Brand. The company was afterwards developed into the Wellington Fresh Food and Ice Co., one of the best-known concerns of its day in that city. There, then, we have the origin of home separation in New Zealand, even though the system did not begin to truly establish itself until some years later.

Mention should be made of the fact, however, that a dairy-appliance catalogue issued by Monrad, of Palmerston North, in 1883 advertised hand-separators, and in effect foreshadowed the home-separation system.

Messrs. Joseph Nathan and Co. introduced home separation at their Makino factory in 1903 and appear to have been the second company to adopt the system.

(b) THE INFLUENCES OF HOME SEPARATION.

The home-separation system has been developed to such a stage in New Zealand and is of such importance that the subject would appear to justify fairly full consideration from the point of view of its principal influences not only on manufacture, but on the establishment and equipment of dairy factories.

The hand-separator made possible the skimming of milk on the farm. Accessibility to the factory was the determining factor in the first instance, and in the beginning milk-suppliers on bad roads were allowed to separate and deliver cream in the spring months before the roads dried up with the summer sun. The factories, knowing little about cream-testing, measured the samples instead of weighing them, and read the fat columns full, which with 50-per-cent. test-bottles and doubled reading, gave a payment

for more fat than received and more than balanced skimming losses. This probably led to the belief, very prevalent in the early days, that home separation and the delivery of cream gave a better return than the delivery of whole milk. The loss sustained by the companies was not obvious in a mixed supply, though overruns suffered. The measured sample caused the supplier of thin cream to get the best payment.

The system extended gradually to more and more suppliers and was found most suitable for new districts, where the smaller quantity of cream, one-tenth of the bulk of the milk, could be sledged or packed out to main roads. Moreover, it allowed more time on the farm for development-work, while the plant required on the farm cost less than for milk-delivery. Districts with comparatively small supply could support a factory since operations could be conducted over a wide area without the expense of equipping skimming-stations. The advent of the milking-machine, power driven, led to the use of farm separators with power attachment and enabled the extension of home separation to larger herds. An important influence of farm separation was that it obliterated the export trade in milled butter. Farm buttermakers eagerly embraced the opportunity to sell their cream in preference to making butter and trading it to local storekeepers for milling and mixing purposes.

The next stage worthy of mention was the development from individual delivery to community delivery, the contract collection of cream controlled by dairy companies and usually paid for at so much per trip. The costs were charged against general expenses and all suppliers debited at the same rate, whether they were near or far. This determined the location of the factory as all suppliers received the same price for fat, and later brought about the collection of cream by the companies with their own motor-vehicles. In some instances the position caused the erection of cheese factories by nearby suppliers who objected to the flat rate. A further influence was the inauguration of a system of subsidies on side roads and sub-contracts. Altogether the general situation at this stage had several results. It gave the suppliers a choice of factories other than those in their own district; it enabled dairy companies to go farther afield, hence the large average output in New Zealand compared with Denmark; it gave an opening

to proprietary factories to finance suppliers ; it caused the closing of redundant factories as road and rail facilities improved ; by amalgamation or absorption it made the settlement of bush country possible ; it made dairying by small holders possible, as indicated by the large number of small suppliers for a given quantity of fat at home-separation factories compared with cheese factories ; and it made possible the establishment of small factories in isolated districts. That is one side of the picture.

On the other hand, home separation created a loss of contact between managers and suppliers, which was not in the interests of quality. Small quantities of cream led to less frequent deliveries in spring and autumn, with a consequent drop in average quality of butter made, especially at those periods. The impossibility of weighing sour, thick cream in the factory weigh-can led to the individual weighing of the supplier's cans and consequently a system of tare weights. The collection and delivery by contract required the supplier's name on cans and lids ; the washing of cans before return ; storage-room where the contractor operated from the factory as a centre ; the use of numbers ; dockets showing weights delivered, requiring books for this purpose ; special facilities to give quick handling ; and the introduction of the mechanical can-washer. Then again, it became necessary for the factories to provide for daily testing in many cases, and at a later date home separation, with its variable and often inferior supply, necessitated the introduction of cream-grading and all the problems and influences which went with it. From the point of view of factory construction the elevated receiving-stage with its hoist was brought down to the more convenient and expeditious vehicle-level, and gradually there came about the adoption of the level factory, the elimination of the gravitation system, and the introduction of cream-pumps.

On the manufacturing side the receipt of sour cream caused difficulty in cooling owing to viscosity, and consequently inferior butter. Pasteurization was then introduced to improve quality, and the impossibility of treating sour cream led to partial neutralization with a high-pasteurizing temperature, which was necessary to get full benefit of the neutralizer, and was found to give the best keeping butter which could be made from sour cream. Quick cooling of the cream to prevent acidity and the redevelopment of

germs brought in cooling with chilled water, and later the direct expansion cooler and the adoption of low-churning temperature to give the butter good body and thus assist keeping-quality. Butter made with care along these lines gave the best quality possible under the conditions. It kept well, though it was not altogether clean in flavour, and inclined to be neutral and lacking in true butter-flavour, especially where the use of neutralizer was overdone.

Districts which adhered to daily delivery of a good class of cream made, with the help of the pasteurizer, better butter than was made under the whole-milk system without pasteurization, and a butter much fuller and cleaner in flavour than that from neutralized cream. Pasteurization was followed, in sweet-cream factories, by a change from high- to low-acid butter and the disuse of starter in most factories. This method produced a better-keeping butter.

During recent years larger herds, which tend to reduce the distance travelled to procure a load of cream, and better roads making motor transport possible, have led to a reversion to daily collection in most parts of the North Island, and consequently a better class of butter.

There seem to be, however, endless complications. Competition between factories has led to an increase in collection costs, difficulty in maintaining a standard of grading milk and cream at cheese and butter factories, insecurity of supply, especially at cheese factories, resulting in a fear of incurring expense in maintaining factories at an efficient standard of equipment. Accordingly there has come about the development of dual-plant factories to retain supply, while one also notes the admission of suppliers without shares—a deviation from the basic idea of the co-operative dairy company.

Finally, through home separation, we have got right away from the original idea of a large number of small creameries and skimming-stations owned by one company and operated in conjunction with one main factory. The latter-day idea is centralization of control—large factories which are complete units in themselves.

While it would be idle to deny that home separation has done a great work in assisting in the settlement and breaking-in of new country in New Zealand, it is equally true that the warnings expressed by many during the early years of its adoption were well founded. The butter industry has passed through a period in those districts where a daily delivery was not insisted on, during which butter which was not of the highest class was manufactured, and a marked improvement has been shown since fresh cream has been received by the same creameries.

The facilities which have been provided by dairy companies for delivery to central "dumps," where the cream is weighed, sampled, and emptied into large cans for transport in bulk to a central creamery or for delivery to the creamery by motor-lorries from farms which are far distant from the creamery, has led to a large amount of overlapping and to long-distance transport of cream. As a result a large sum is spent annually which could be avoided, and the competition resulting from these practices has been the cause of the closing-down of a good number of cheese factories during recent years.

In order to meet this position the Executive Commission of Agriculture has been asked to take the matter in hand and has been able to arrange in a number of instances for the voluntary sale of small factories to co-operative dairy companies which have paid compensation to the previous owners on a basis of the amount of butterfat received by each purchaser. In others, amalgamation has been suggested as the best line of action.

Some "dumps" have been closed on similar terms, and in other cases a transfer or exchange of supply has been arranged.

It is not the purpose of the Commission to compulsorily zone suppliers to any factory unless it is satisfied that the company receiving the butterfat is in a position to pay out a price which is comparable to other companies.

By these means it is hoped to reduce the cost of cream-collection, to reduce the cost of manufacture in those creameries where a larger output is assured, and to improve the quality of the butter made.

CHAPTER IX.

THE BUTTERFAT-TEST FOR MILK AND CREAM.

WHILE from the very beginnings of dairying it was obvious that some cows gave more milk than others, it was not until the middle of last century that variations in richness of milk attracted sufficient attention to urge attempts to discover a means of determining the butter value of milk and cream when handling this produce in large bulk. It was, of course, a common practice at least a hundred years ago to try one cow against another by keeping the milk separate, taking the resultant cream, and churning this separately. On this basis was built the first-known butter-test. It was called the churn test, and consisted of churning a measured quantity of cream, weighing the butter obtained, and from this weight calculating the butter value of the full quantity.

In 1880 this method was displaced by what was called the oil test. This test consisted of churning a measured quantity of cream in a graduated glass tube. When fully churned the butter was melted by immersing the tube in warm water and the oil layer formed on the surface was read off with the aid of the graduations.

There then followed, in rapid succession, a large number and variety of methods which do not warrant describing in detail. An interesting one, however, and quite different from the rest, was Feser's lactoscope method. This was a method of deducing the richness of milk from its opacity, and an authority states that "while it appeared to be on a bad basis from a scientific viewpoint, yet it gave fairly good results with normal or mixed milk."

The first method using centrifugal force, the basis of all tests in commercial use at the present day, was devised by De Laval, the appliance used being known as the Lactocrite. The milk-sample was treated with a mixture of concentrated acetic and

sulphuric acids in a graduated tube, shaken, and whirled in the frame of the Alpha separator in a pan which fitted on to the spindle.

Next among the more important inventions came Fjord's control apparatus, as it was called. This was a modification of the lactocrite, but plain test-tubes and no chemicals were used. The tubes of milk were whirled until the cream was well compressed in the top layer, the quantity of cream being then read off by means of a pair of dividers with graduations on a quadrant attached. This method came into wide use in Denmark and is still used by some of the creameries there. It was also used in Ireland. Fjord's test was used for the first time in New Zealand at the Tai Tapu factory in 1892.

In 1892 Dr. N. Gerber published details of the well-known method which bears his name, though the method only assumed its present form in 1895. This was a method of testing for butterfat, and its simplicity, efficiency, and accuracy proved it an undoubted success. A Gerber machine was installed at the Edendale Dairy Factory in 1896, this being the first in New Zealand.

It only remains to mention in this short introductory survey the best-known test of all—the Babcock. In 1888 the United States Government gave large grants of money as a means and incentive to agricultural research. The United States were at the time very prominent in the dairying world, and in many respects leaders in the dairy industry. The necessary finance having been provided, several institutions commenced research and experiment in connection with the butterfat-test, and by 1890 no less than seven new tests were proposed. Only two of these, however, are worthy of note—namely, the Babcock and the Leffman-Beam. Leffman and Beam used commercial sulphuric acid and a mixture of hydrochloric acid and amyl alcohol as reagents. Their method gave good results, but its complexity and expense debarred it from general adoption. Babcock's method, which required only commercial sulphuric acid, was cheap and simple, and experiment proved it accurate. Its use spread rapidly not only in America, but throughout the dairying world, and to-day the Gerber and Babcock methods are the principal ones in use for the determination of fat in milk, cream, and other dairy products. In New Zealand,

where the Babcock method is used almost exclusively^m by dairy factories, there is a common misunderstanding that Babcock invented the butterfat-test. As will be seen from the foregoing, this is not correct—he merely devised an improved method, and the Babcock test was an alteration to a previously existing process rather than an outright invention. In doing so, however, he rendered a great service to the industry and provided a working foundation of inestimable value. Moreover, his service was enhanced by his magnanimous attitude in refusing to patent his discovery, and thereby making it a gift to the dairying world.

Dr. De Laval's lactocrite was being used in New Zealand in 1887 at the creameries of the New Zealand Freezing Co. in the Auckland Province. Early newspapers also make it clear that the oil-cream test and Short's method were in use at various creameries in the "eighties," though the names of those creameries cannot now be found.

The first Babcock milk-testers came to New Zealand early in 1892, four machines being imported at the suggestion of Mr. John Sawers, Dairy Instructor. Mr. Sawers took an outfit with him on his tours of instruction through the colony and gave many lectures and demonstrations concerning its use. It was no doubt largely due to Mr. Sawers' influence that the Babcock method of milk and cream testing was so rapidly and firmly entrenched in New Zealand.

By 1895 the Babcock tester was in many of our dairy factories. Waikouaiti was the first cheese factory to pay for milk on butterfat-test. This was in 1895, the price paid being 7½d. per pound butterfat. This was the only factory at that time paying for milk for cheesemaking by giving so much a pound for the actual butterfat found in the milk. Several factories were paying for the milk according to the fat content, but they calculated per gallon. The first of these was the New Zealand Dairy Supply Co., who started the system at their Dunedin butter factory during the 1892-93 season. Under this system so much a gallon was paid for milk containing a stated percentage of butterfat, with a corresponding increase or fall in price as the milk went above or below the percentage agreed upon. The standard was usually 3.6 per cent., being based on the supposition that it took 2½ gallons of

such milk to make 1 lb. of commercial butter. Under the scale of payments used, low-testing milk gave a better return than high-testing milk. Suppliers were quick to discover this, and consequently the watering of milk soon became a regular practice, and it was not long before this method of using the butterfat-test was abandoned. It took some years, however, to convince a majority of suppliers that the direct method of measuring butterfat by means of the Babcock tester was not only simpler but more accurate. Even to this day there are periodic outbursts of criticism concerning the suitability of the butterfat-test as a basis of payment, more particularly from the point of view of payment for milk for cheesemaking. *There seems to be a feeling in some quarters that there should be a better test.* The fact remains that despite criticism, and having regard to cost, convenience, and reliability, the gift of Stephen Moulton Babcock remains the foundation of present day practice. The test solved important problems. By doing away with the incentive to water milk it simplified the work of the factory-manager, and also protected the honest dairy-farmer. It thereby tended to purer and more suitable milk-supply. It enabled suppliers to receive payment in accordance with the manufacturing value of the raw material supplied. Moreover, it enabled the inauguration of the important work of herd-improvement through the medium of herd-testing. In the final summing up, it rendered a more valuable and far-reaching service than even its inventor dreamed, and must be regarded as one of the foundation stones on which this great industry has been built.

PRESERVING MILK-SAMPLES.

There is another phase of the subject of milk-testing—namely, the preservation of samples. Under ordinary dairy-factory procedure, as well as in the case of herd-testing, &c., it is necessary to hold samples for varying periods prior to testing, which makes it essential for souring to be prevented. One of the chief obstacles to the system of milk-testing in the very early days was the expense of the chemicals employed. Originally boric acid was used, but in 1892 a Swedish chemist discovered the merits of potassium

bichromate for this purpose. This substance will, under reasonable conditions, keep milk for several weeks in a fluid state, and still enable the butterfat content to be accurately ascertained by means of standard methods of testing. Potassium bichromate is a reddish crystalline salt, easily soluble in water and milk. It imparts a yellow colour to the sample, so that there is no mistaking the latter for pure milk. It thus has a decided advantage over corrosive sublimate or formalin, which do not colour the milk. It is poisonous, but not in so marked a degree as the substances just mentioned, and in the quantities required to be used cannot be said to present any serious danger. It is also very cheap, and another important point in its favour is that the amount of bichromate used may vary within comparatively wide limits without the efficacy of the test being interfered with.

CHAPTER X.

MECHANICAL REFRIGERATION IN THE FACTORIES.

THE first mechanical apparatus for the abstraction of heat is said to have been invented nearly two hundred years ago, but it was not until the 1870's that mechanical refrigeration began to reach a stage sufficiently advanced to justify its being classed as successful. Freezing-plants were in commercial use in England and America before 1860, but they were not very satisfactory. In 1875 and 1876 frozen meat was successfully conveyed from America to Great Britain, and in 1880 from Australia to Great Britain. In 1881 an improved type of vacuum machine, using sulphuric acid to absorb the aqueous vapour, was installed by the Aylesbury Dairy Co., London, and was probably the first refrigerating-machine used in connection with the dairying business.

It was some years before refrigeration principles were applied to dairy factories in New Zealand, and development along this line came very gradually. Following the inauguration of the meat-export trade, freezing-works began to spring up in various localities, and in the early years many butter factories used to cart ice from the works for use in the factory. It is also curious to recall that prior to the advent of refrigeration one enterprising person endeavoured to float a company with the object of shipping ice from the southern sounds for use in the dairy factories of Southland and Otago, but the project never got very far.

Chew Chong had a Hall's refrigerating-machine in his factory at Eltham in 1889, and this was probably the first freezing-machine installed in a New Zealand butter factory. It certainly was the first machine concerning which the date of installation may be regarded as authentic. There is much doubt as to the accuracy of dates relating to machines alleged to have been earlier in the

field. Chew Chong's machine was what was known as a CO₂—carbon dioxide. The use of carbon dioxide as a refrigerant was introduced by Windhausen, of Berlin, in 1886, and his patent was acquired by Messrs J. and E. Hall, Ltd., Dartford, Kent, who brought out the CO₂ compression refrigerator in 1888, and were the first manufacturers of that type of machine. It was one of the few small-size machines then on the market and was primarily intended as a cheap machine for supply to butchers in a small way of business. Chew Chong is said to have experienced some difficulty in operating the machine satisfactorily. Any trouble would probably be with the glands of the pump, which were of leather, and leakages of gas were hard to prevent and detect, though some of the machines installed continued in use for over twenty-five years as the result of improvements in their construction as carried out by users.

Chew Chong probably used the machine to keep the butter cool between workings and up to the time of forwarding it to the ship for export. The cream would be water-cooled immediately after separating, and the temperature of the water about 54° to 56°. The general aim was to churn cream at 60° or under, which could be done at most factories except at odd times during the warmer weather. As a rule the churning was done and the butter-making finished for the day in the earlier hours of the morning. The butter was salted and lightly worked on a rotary butter-worker, and let stand in a cool place until the following morning, when it was reworked and packed. Hence the main reason for a mechanically cooled room for holding butter, or, in other words, the need for a refrigerating-machine, or "freezer" as it was usually called. The machine at Chew Chong's was probably fitted with brine-tanks and the cooling done by circulating the brine in them.

In 1893 a similar Hall's freezer was in use at Messrs. J. and R. Cuddie's factory at Mosgiel and was used for cooling water and cream.

The New Zealand Dairy Association was one of the earliest companies to install a British Linde ammonia compression machine. This was installed in the Ngaruawahia factory in 1893.

In 1894 freezers were used at Mangatoki to make ice to put into the cream.

The Hall freezer was also demonstrated at the Edendale Dairy School in 1896, and from this date **mechanical refrigeration came into general use in dairy factories.**

These seem to be the important early dates regarding mechanical refrigeration in connection with our early dairy factories. By the close of the "nineties" freezers were in general use, and no new butter factory was considered properly equipped until it included a refrigerating-machine and a butter cool room, which, as a rule, was fitted with brine cold-storage tank in addition to sundry direct expansion pipes. Machines which were popular in their day were the Linde, the Humble and Nicholson and the Hercules. The direct expansion pipes gradually superseded the brine-circulating pipes in cream-vats, and also brine-tanks in butter cool rooms. The cooling of cream over direct-expansion coolers later superseded cooling of cream in direct-expansion cream-vats, the cream after cooling being delivered into insulated holding vats without coils, but these did not prove satisfactory, and were soon discarded and coils were again brought into use in the jacket of the cream-vat.

Apart from making it possible to transport such a perishable commodity as dairy-produce from one end of the earth to the other, and to store it in good condition for protracted periods, mechanical refrigeration has also contributed in a large measure to the improvement of the quality and particularly the keeping-quality of both butter and cheese.

CHAPTER XI.*

DAIRY MACHINERY AND APPLIANCES.

(a) CHEESEMAKING-PLANT.

ONE of the problems which confronted the promoters of the dairy industry in its earliest days was that of procuring suitable plant with which to equip the factories. Both buttermaking and cheesemaking had been carried on on the farms, the former being continuous, with provision in the South Island for stall-feeding the cows in winter in order to provide for the requirements of that season of the year. Cheesemaking was a summer industry with a change-over to buttermaking in winter: in other words, a dual plant was used.

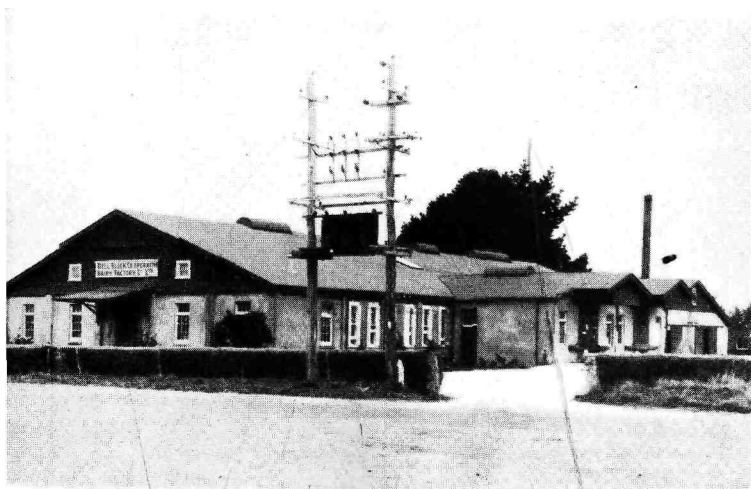
It was on this system that some of the earliest factories were designed, Edendale (1882) and Bruce (1885), for instance, being equipped with the deep-setting system of gravity skimming for buttermaking and also a cheesemaking-plant. As the best results could only be obtained with gravity setting when the milk was placed in the pans as soon as possible after being drawn, it was necessary to deliver it twice daily, and the pans were set in water to reduce the danger of loss from souring.

There was, in those early years, practically no provision for the exportation of dairy-produce under cold storage, and it was not until this was available, and the invention of the cream-separator made it possible expeditiously to handle large quantities of milk that the butter industry became possible.

The establishment of cheese factories was, under these circumstances, less difficult than butter factories, although the lack of cooling facilities on home-going vessels was the cause of some disastrous experiences in attempts to ship cheese to Great Britain.

*This chapter was written by Mr. G. M. Valentine, Assistant Director of the Dairy Division.

TWO MODERN CHEESE FACTORIES.



BELL BLOCK.



OPOURIAO.

[To face page 312.]

The plant required for the equipment of a cheese factory was at that time a comparatively simple one, but the various units which were suitable for use on a farm were quite unsuited for the factory, and since cheesemaking was already established in Britain and America the thoughts of the promoters naturally turned to those countries. The records show that the plants for Edendale (1882) and Flemington (1882) were procured in Britain, and a cheesemaker, Mr. William Harding, came with the latter to manage the factory. The same course was followed by Wyndham (1885), the plant being purchased in Canada, and Mr. S. M. Robbins coming with it to New Zealand, while some Waikato factories (1882) sent Captain Runciman to the United States of America to get the information required and the necessary plant.

The Greytown (1883) directors decided that "there was nothing required for plant which could not be made locally," and later on we read that "Mr. Kingdon, of Masterton, has supplied all the utensils."

Probably the first illustrated catalogue of dairy plant, a very complete one including both butter and cheese-making requisites, was issued in 1883 by J. H. Monrad, who was at that time engaged in farming at Bunnythorpe, and who at a later date became prominent in the dairy industry in the United States of America.

This catalogue deserves more than passing mention, as besides outlining the central skimming-station method it forecasted the home-separation system run on lines which obtain to-day, and also pointed out the need for mechanical refrigeration for the control of temperatures in the manufacture and storage of butter.

While the difficulties mentioned above were very real at the time, the fact that the industry was a new one made it possible to select the best that was offering, and in many instances New Zealand has adopted and perfected practices which were not accepted so readily in older dairying countries where established custom had to be overcome. As the manufacture of cheesemaking plant presented no difficulty, the work was very soon undertaken by local firms, and all factories after the first few were equipped with plant made in New Zealand.

A number of the earliest factories received morning's milk only as there was a theory that good cheese could not be made from mixed night's and morning's milk. In many instances the

milk was received twice daily, a portion of the night's milk being run into each cheese-vat and cooled by the circulation of cold water through the space between the metal lining and the outer casing of wood, usually referred to as the jacket.

In at least one instance an automatic agitator operated by water was used to keep the milk stirred and prevent the cream from rising. A number of devices of this nature have made their appearance in the industry from time to time since for use in the milk-held overnight on the farm.

HOISTS.

In many factories, more especially in butter factories built on the gravitation principle, all milk was raised from the vehicle in which it was delivered by a hoist, these being operated by hand in the first instance, and later on the friction hoist driven by a belt came into use. Among many makes the Chambers and McGowan hoists were most commonly used. To-day the hoist is almost unknown, the receiving platform being approached by a "ramp" where necessary and kept up to a level which allows sufficient fall to the receiving-vat or to the cheese-vats direct when raw-milk cheese is being made.

SCALES.

As payment for milk was based on the gallon, measuring-cans were in common use up to the time of the introduction of payment by the Babcock fat-test, which necessitated a record of the weight, but even as late as 1900 some factories were still measuring the milk and calculating the weight from the measurement, while one factory in Southland—Orepuki—continued paying on the gallon until 1931-32. At Greytown, however, we read that on the day of opening in 1883 "the cans were put upon the scales and weighed before being emptied, &c." The stages through which this simple operation of weighing passed typify the stages of development followed by other processes, from making use of any means which was at hand to the use of a specialized unit for the purpose. Thus we have the single-beam scale with loose weights and a weigh-can having a Perfection cock in the front, the five or seven-beam scale, and Kinsella weigh-can with a plug operated by a lever from the

back to release the milk, and later again the scale with suspended weigh-can (1905) with plug and lever and a dial to indicate the weight which is visible to both the operator and the supplier. This is in use to-day.

CHEESE-VATS.

The early records mention the circular cheese-vat which was fitted with a removable knife to cut the curd after setting and a rake to keep it stirred after cutting, the vat being revolved during these processes.

The cheese-vat as we know it to-day was in general use, however, although the size has gradually been increased from 600 to 1,000 gallons capacity. Minor changes such as the arrangement of the steam-heating pipes have been made by different manufacturers and probably from this the practice of heating with water in the jacket has continued in the South, where submerged steam coils are in general use, while heating with live steam is a common practice in the North, where perforated steam-pipes are fitted in the jackets.

In quite recent years iron casings are beginning to replace the wooden ones, and Staybrite steel to replace tinned steel for linings.

CURD-KNIVES.

Little change has taken place in the design of the curd-knives used, these being of the steel-blade type having eighteen, twenty, twenty-two, or twenty-four blades in the vertical knife and the equivalent in the horizontal knife, to give cubes of curd approximately $\frac{1}{2}$ in. to $\frac{5}{16}$ in. Those giving the smaller cube are in most common use. A knife in which the blades are "staggered" or in two rows which are not in line with one another has been used in a few factories.

The wire knife has not been used in New Zealand except in a few isolated instances.

CURD-AGITATORS.

In the early days of the industry all stirring of the curd in the whey during the cooking-process was done with hand-rakes. To-day the curd-agitator with belt or motor drive is looked upon as one of the necessary units in the equipment of a factory. The

first of these machines of the present-day type, the MacEwan, came into general use about 1914, though there is some evidence that there had been another make used before that date. In this machine a number of blades are suspended over the vat and revolve in the mixture of whey and curd. The speed of the blades can be varied to suit the condition of the curd at the different stages of cooking.

About 1919 a second type, the Dunn, was introduced, and the blades of the agitators in this make travel round the sides and ends of the vat.

RACKS.

The practice followed in the earliest factories was that of "dipping" the curd from the whey, but this was superseded later by the cheddaring process referred to elsewhere, the curd being placed on racks covered with cheese-cloth, and the racks placed in the vat after the whey had been run off. Racks are now hardly known in New Zealand cheese factories.

CURD-TURNERS.

A later addition to the Dunn agitator is the curd-turner, a machine for turning the curd after milling and consisting of a revolving drum studded with wooden pegs. An automatic device controls the action in such a manner that the drum travels up and down the length of the vat, reversing automatically at each end.

CURD-MILLS.

A number of makes of curd-mills have been used, the first being probably the peg-mill which had a tearing or shredding action on the curd. The McPherson (1890), was a rotary mill somewhat like a chaffcutter with the cutting blades divided into sections, and the Harris or Dominion mill (1893-94) one in which the curd was pressed down by a lever through the horizontal cutter consisting of steel blades fixed at right angles which gave a cut about $\frac{1}{2}$ in. square. The pressure exerted on the curd was regarded unfavourably by cheesemakers, and the present mill, which seems to be confined to New Zealand factories, was designed to overcome this defect. In this mill the cutter is horizontal and is pressed through the curd, which is fed into the hopper vertically, thus reducing the pressure.

The only change which has been made in the last-mentioned curd-mill since its general adoption about forty years ago has been the drive. Until electric power became available a belt-drive was used, and this made it necessary to change the belt from vat to vat, a practice which has been the cause of a number of accidents, and also to have the mill fixed so that the blocks of curd had to be brought to it and again spread after being milled. The electric drive has done away with the belt, and as the mill can be moved from end to end of the vat the curd can be cut where it lies.

HOOPS.

Few changes have been made in the type of cheese-hoop used, the first being the Fraser, a solid hoop with approximately parallel sides and solid bottom, and having a wooden "follower" or plug. This was followed by the Wilson hoop, consisting of a loose top and bottom, solid outer band and flexible inner section, the type in general use at present.

In the rimless or Luxford hoop the follower was encased in tinned steel in the lid with a groove recessed for the inner section, while the Bucket hoop was the Fraser hoop with tapered sides, each one fitting into the one behind it when placed in the press. The purpose of these two was to produce a cheese without a "lip" or ridge which may induce cracking at that point and allow mould to penetrate into the cheese. This defect has been reduced to a minimum by the exercise of care in filling the hoops, and by the use of inner sections of varying depth at different seasons of the year, while the "rimless" finish can be obtained by the use of loose, wooden followers of different thickness.

THE PRESS.

Practically speaking, the "gang" or horizontal press is the only one which has been used in factory work for export cheeses. These have been made with wood, angle iron, and channel iron for the sides, while many devices aiming at continuous pressure on the cheese overnight or to provide extra pressure when screwing up have been tried. Of the former were the spring head, the lever with weight operating on the head, and, lastly, an arrangement of levers which raised the full press when the pressure was applied

to the hoops and depended on its weight to maintain continuous pressure. In more recent years (1927) the hydraulic head on which the pressure is maintained by a pump automatically operated by an electric switch has come into use. The last named are of two kinds, gradual and continuous pressure, and continuous pressure only. The aim of these devices is the reduction of the openness complained of in New Zealand cheese.

TEMPERATURE-CONTROL.

Although control of the temperature of cheese-curing rooms by mechanical refrigeration was tried at Dalefield in 1907, the practice is at present confined to comparatively few factories and to central curing-rooms, but efficient insulation of the curing-rooms is receiving much more attention at present.

Revolving shelves in curing-rooms which were provided in most of the early factories have now been replaced by semi-fixed shelves.

CHEESE-WAXING.

The object of waxing cheese for export or storage is to prevent the evaporation of moisture. Experience has shown that when the cheese is well made there may be no harm done by this treatment, but it has also shown that cheese containing an excess of moisture or cheese of an acid character, or having a growth of mould on the rind should not be waxed, and in many instances there is after a time an accumulation of slime between the rind and the wax.

Waxing-machines are simply an insulated bath fitted with steam-pipes immersed in the wax. The temperature is maintained by passing steam through the pipes under pressure, the pressure being maintained by a valve on the discharge end.

As the temperature of the wax must be maintained at 300° F. in order to avoid an excessive coating on the cheese, various devices are provided in the different makes for immersing the cheese in the bath and draining after immersion.

The advisability of waxing cheese for export is one of the debated questions among both manufacturers in New Zealand and importers in Britain, and power has now been taken to prevent the export of waxed cheese which has the defects mentioned above. During 1929-30, 70 per cent. of the cheese exported was waxed.

PASTEURIZATION OF CHEESE MILK.

This practice probably originated as the result of cheesemakers pasteurizing milk in the vat or through small milk-heaters previously used for heating milk for separation for the manufacture of show cheese, which was an admission that the quality of the milk was defective. Like many other practices in the industry, the general application has been due to the importation of appliances which were in use in other countries by machinery-supply houses. In this instance the Universal regenerative pasteurizer (1914) was the first to come into general use, although the regenerative principle for treating milk for town supply was in use in 1906 at Aramoho. It is perhaps significant that the adoption of pasteurization was coincident with the very rapid extension of the use of the milking-machine due to the shortage of labour during the war years, a period during which it was a fairly common experience that a large number of installations of these machines in a district resulted in a drop in the quality of the milk and cream received, and at one stage over 90 per cent. of the cheese produced in New Zealand was made from pasteurized milk.

To-day that is not true of the condition of the milking-machines, and a number of factories have reverted to the manufacture of raw-milk cheese, but it is accepted in Britain that pasteurization has given to New Zealand cheese a uniformity of quality and a mild flavour which makes it acceptable to a very large section of the cheese-consuming public and commends it to the trade. These advantages and the increased yield obtained can be set against the increased cost of manufacture which it entails.

The Universal was a bottom-feed machine with two domes having a revolving beater between them, and though many variations in the details of the construction of the regenerative pasteurizer of the vertical type have been used the only distinct difference was the feed and delivery of the milk at the top instead of at the bottom. Regenerators of the first type require two milk-pumps, one to force the milk up between the two domes and a second to deliver it on to the cooler.

The second or top-feed type requires only one pump, as the delivery of the milk to and from the machines is at a height corresponding with the level of the cooler. The capacity of these

machines reaches up to 4,000 gallons of milk per hour. Pumps for this purpose are of the wing type, travelling at a speed of about 1,200 revolutions per minute.

THE HEAT-EXCHANGER.

The first machine of the plate or heat-exchanger type was imported from Denmark from the Silkeborg factory (1930), and after being used for cream was further tried for the pasteurization of cheese milk, but was not favourably received. In 1933 the A.P.V. machine of the same type was installed in a number of factories, and as it reduces the floor space required and does the work of both a regenerative pasteurizer and a cooler with a reduction in the amount of steam and water required, it has made rapid progress and is now in use in a large number of factories.

Owing to the resistance to the flow of the milk through the heat-exchanger rotary pumps designed for heavier duty are used with this machine.

COOLERS.

Coolers have been of one general type—viz., tubular coolers fitted with pear-shaped pipes of $1\frac{1}{2}$ in. to 2 in. diameter, and having a capacity in keeping with the capacity of the pasteurizers.

CURD-TEST.

The New Zealand curd-test, an adaptation of the "Wisconsin test," was evolved in 1932 in order to provide for the work of milk-grading, the container in which the bottles of milk are held being revolved by a motor during the cooking process, while the temperature is maintained by steam.

STARTER MACHINES.

The starter machine with steam-jacket and beater propelled with either steam, belt, or electric motor is in use in many of the larger factories for making starter. The pan has been made of tinned copper, nickel, enamelled iron, and Staybrite steel, the last named being now practically universally used.

REFRIGERATORS.

Refrigerators of the domestic type are used for the storage of milk-samples where the system of payment for cheese milk on yield is adopted, and where no freezer is in use for whey-butter making, or for control of the temperature of the curing-rooms.

WHEY BUTTER.

The manufacture of whey butter led to a number of changes in the design of cheese-factories requiring as it did provision for the storage of large quantities of whey.

The practice commonly followed was to provide tanks below floor-level which were lined with glazed tiles. The difficulty with this type of tank is to find a suitable cement with which to make the joints, it being necessary for the cement to be capable of resisting the action of the acid in the whey.

More recently overhead tanks have come into use, the whey being run into a small sump from which it is raised to the tank by a pump of large capacity. From the tank it is fed into the whey separators and thence to the outside tank to be returned to the suppliers.

In other respects the plant required is the same as that used in a butter-factory, but on a smaller scale, the yield of butterfat recovered from the whey being about 6 per cent. of the total quantity paid for in the whole milk.

(b) BUTTERMAKING PLANT.

The invention of the continuous-flow cream-separator in 1878 provided a means of expeditiously handling large quantities of milk with a minimum of fat-loss in the skim-milk, and it soon replaced the few attempts which had been made to establish buttermaking on the deep-setting system.

The heavy drive of the earlier types of machines made it necessary to have power available ; consequently, the butter-factory equipped with separators to which the milk was brought to be skimmed came into being. This was followed later by the skimming-station which could be equipped at a comparatively low cost, especially where separators with a steam-turbine drive were installed.

It is probable that the centrifugal separator came into more general use in New Zealand, where a new industry was being established, than in Sweden, where it was invented, as the Swartz system of gravity skimming in deep cans surrounded by natural ice continued to be used in that country for some years after the separator was put on the market.

DISTRIBUTORS.

As the separated milk was returned to the suppliers, automatic machines for its distribution were an important part of the equipment, and these took many forms depending on volume or weight to operate the automatic mechanism. The central skimming-station had one serious drawback—namely, the danger of spreading stock diseases from one to another—and with a view to checking this experiments in the pasteurization of skim-milk and whey were carried out by the Department during 1909 when it was demonstrated that this could be done by utilizing the exhaust steam from the engine. In its simplest form the tank was covered and the exhaust simply discharged into it. More elaborate devices on the same principle as exhaust heaters for heating hot water for boiler feed were also used, and in cheese-factories where an ejector was used to elevate the whey to an overhead tank the heat developed served the same purpose.

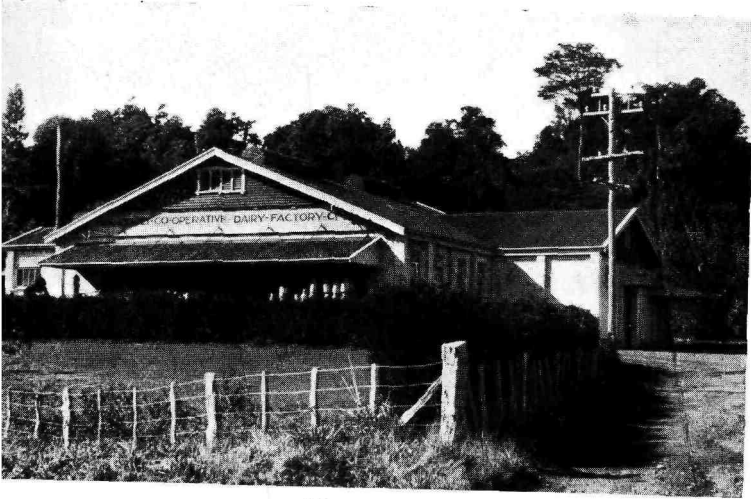
The coming of the home separator confined any disease to the farm where the milk was produced and provided a better food for calf-feeding than reheated mixed milk from a factory.

It was some years after the power separator had come into common use that a satisfactory hand-separator was produced, and even these were very hard to drive. The development of a reliable type of combustion engine and of the milking-machine was soon followed by the addition of the hand-separator to the dairyman's plant, and the natural sequence was the establishment of the home-separator system as we have it to-day.

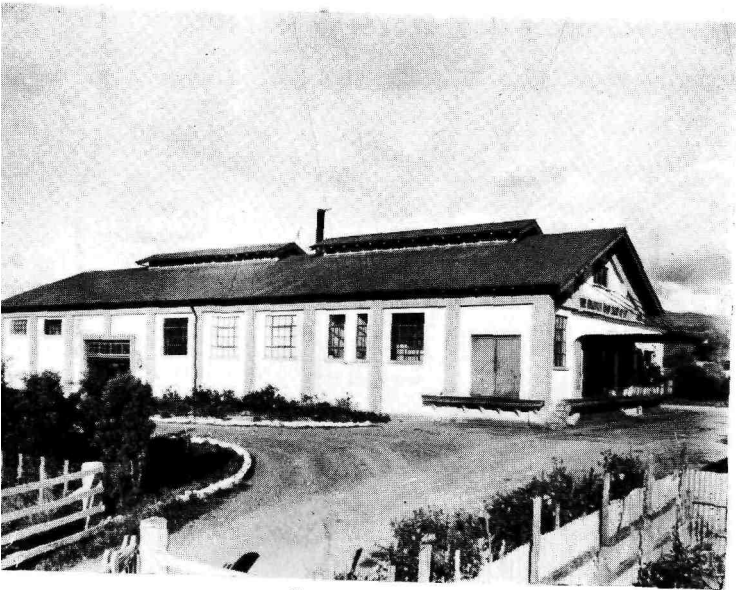
MILK-HEATING.

The mixture of night's and morning's milk in the receiving-vats in cases where it was delivered to a central skimming-station made heating before it was fed into the separators a necessity, and the means used were: Live steam direct into the milk; a

TWO MODERN BUTTER FACTORIES.



MANGOREI.



SHANNON.

To face page 322.

jacketed pipe with hot-water circulation ; turbine jacketed heaters (1908), in which the steam which drove the beater also heated the milk ; belt-driven jacketed heaters (1908) ; an overflow steam-heater which stood on top of the separator ; and many others. As there was at that time no satisfactory test for fat in skim-milk the losses in separating due to wrong methods of heating must have been considerable, and it was not until the manufacture of casein started that close attention was given to this point.

COOLING.

Cream-cooling under the central-separation system was not a difficult matter, as the flow from the separators was comparatively small, and factories were generally designed on the gravitation system so that the cream ran from the separators or cream-receiving vat placed at the highest floor-level, over water-coolers of the chute, tubular or circular type, to the cream-vats at a lower level, and thence on the following day to the churns at a still lower level.

Submerged cans in which the cream was held for cooling again came into use, but the temperature of the water available determined the churning temperature, except in a few cases where ice was added to either the cream or the water. The fat content of the buttermilk was frequently as high as that of the whole milk received, and 5 per cent. has been recorded. In an endeavour to free the soft butter from the sour viscous buttermilk washing in salt brine was a common but not very successful practice, as it was difficult to churn to a granular condition at these high temperatures.

Although mechanical refrigerators were first installed in a number of factories as early as 1889, these were used almost exclusively for holding the butter between workings and during storage before being despatched to the export stores, and it was not till 1896 that an ammonia compressor, a direct expansion rectangular cream-vat, water-cooling coils for washing the butter, a brine-tank and coils for cooling the insulated cold room and an icemaking tank were imported from Australia by the Moa Farmers Co-operative Dairy Co. of Inglewood. This was the first plant installed with a view to controlling the temperature of the cream

and butter throughout the whole process of manufacture, although a few more or less crude appliances had been used here and there, but there was no systematic method of cooling. Churning temperatures were still maintained at between 50° and 60° F., however. Under this system the initial cooling was done by passing the cream over pipe or circular water-coolers to be further cooled by ammonia-expansion coils surrounded by water in the jacket of the vats.

As a high degree of acidity was developed in the cream for churning, the cooling was a slow and expensive process owing to the viscosity which developed in the cream in the vats during the ripening period.

Cooling by means of attemperators or coils travelling from side to side of the vat or rising and falling through the cream, while a stream of chilled brine was pumped through them, was a later though not a new development, and even stationary coils were used for cooling purposes. In these vats the sides were insulated and not jacketed. Cream was also held in the cans in the cooled room in some instances.

HOME SEPARATION.

Home-separation developed in the first instance on farms remote from a factory or skimming-station, and the small bulk of the cream in comparison with milk led to the delivery of the cream less frequently than daily. The system gradually spread as time went on, until to-day the only factories receiving whole milk are those which manufacture from it some product other than butter. The home-separation system of buttermaking had a far-reaching influence on the equipment of butter-factories because of the large number of small cans to be handled and the opportunity which it presented for concentration of large supplies at one point which made a speeding-up of the handling process necessary.

SCALES.

Weighing must necessarily be done in the can in which the cream is received, and the development of scales for this purpose has therefore been on similar lines to the milk-scale while retaining the platform on which the cans are placed.

Even the work of recording has been mechanized, and machines for this purpose are in use, the McDonald recorder (1934) being a New Zealand invention.

THE CAN-WASHER.

The work of removing the cream from the cans has led to many devices using steam or a mixture of steam and water for the purpose, and mechanical washing-machines naturally followed. The first was recorded in 1912, this being of the revolving brush type, but a satisfactory machine of the rotary type, which would handle cans of all sizes and also wash the lids, did not come into use until 1924. This type is still in general use.

The receipt of sour cream had two results, the first being the necessity for pasteurization, which had not come into general use before, and, secondly, the necessity for neutralization of the cream in order to make pasteurization possible, as it was found that such cream was difficult to heat and equally difficult to cool unless this was done. The addition of a neutralizer reduced the acidity and the viscosity and made these two processes comparatively simple.

PASTEURIZATION.

Pasteurization of whole-milk cream is recorded as early as 1896, and in one instance this practice was carried out in the skimming-stations—the present practice in Ireland—and it was again repeated on receipt of the same cream at the central factory. One thing which checked the adoption of pasteurization of cream was the belief that it was not possible to get the same yield of butter as it was from raw cream, and the trials which were carried out in 1907 at several factories were for the purpose of deciding this point. The use of the combined churn and worker gave control of the moisture content of the butter, and the increase in yield thus obtained more than balanced any loss from this cause, if it had ever been made. The practice developed slowly, however, and it was a considerable time before the stage was reached where uniform and reliable results were obtained. The evolution was from the heater which had formerly been used to heat the milk for the separators, through a series of copper-lined, vertical, belt-driven pasteurizers with plain wing or disk beaters and with or without

tipping-devices. The fat content of cream in New Zealand being higher than in most dairying countries, and being also high in acid in many cases, it was found that the capacity of pasteurizers was not as high as the schedules issued by the makers indicated. This led to two-stage pasteurization in which the cream passes through two machines in succession, the temperature being raised to the final point in two stages, and it is probable that the keeping-quality of New Zealand butter is largely due to the efficiency of this system.

Regenerative heating and cooling machines of the vertical corrugated flat type (1910), corrugated circular type with agitator to raise the cold cream (1914), the external and internal flow horizontal tubular types followed, and later this last type combined with heating rollers (1926). During this period the Murray deodorizer (1923) came into use and has gone through several stages of development—namely, treatment under vacuum after passing through a pasteurizer; heating and deodorization in a jacketed chamber under vacuum; heating by injection of live steam and deodorization in one chamber, followed by the same treatment with a second chamber attached which also has the effect of materially reducing the temperature of the cream. The purpose of this treatment is the removal of feed flavours, and the machine is made almost entirely of Staybrite steel. It is a New Zealand invention of very fine workmanship, and is manufactured in this country. Other types of pasteurizer which have been less widely used are the heat-exchanger (1930), with or without degasser, and the twin-heating vertical pasteurizer (1932) with internal steam cylinder and steam jacket with beater between the two.

Many other devices using a blast of air which is driven through the cream during heating or cooling or inducing a current of air by suction in order to remove flavours have been used, none of which have been generally adopted.

COOLING.

The high pasteurizing temperatures adopted, up to 205° F., in order to obtain full use of the neutralizing agent and to effect efficient pasteurization of cream of inferior quality, rendered more efficient methods of cooling necessary and the practice of pumping

water or brine chilled by an expansion coil in a tank, through the whole or a part of the second cooler, where two were in use, became the common practice, and very much lower churning temperatures were employed which resulted in reduced losses of fat in the buttermilk.

At a later date (1920) the direct expansion ammonia cooler was brought into use, resulting in still better control of temperatures, and cooling in bulk in the vats is not now practised, the liquid in the jackets being reduced only to the point which will prevent a rise in temperatures overnight. The direct-expansion cooler has not been an unmixed blessing, however, unless it is used with discretion. "Shock cooling," resulting from a very rapid reduction from a comparatively high temperature to a very low one, has been shown to cause a short brittle body in the resulting butter. It is therefore necessary to gradually reduce the temperature of the cream either on the water-cooler or, if necessary, by the use of two expansion coolers, the first of which is not working at a low temperature in order to ensure a spreadable body in the butter. In some instances it is found advisable to stop using the expansion cooler in the autumn in order to avoid a sticky body in the butter. The heat-exchanger, used as a regenerator and cooler only, is now installed in a few factories, chilled brine being the final cooling medium.

There have been two schools of thought in regard to cooling, one which leans to low temperatures "off the cooler" with a rise to churning temperatures overnight, and a second which prefers a moderate temperature "off the coolers" with dependence on the chilled water in the jacket of the vat to reduce it to or maintain it at churning temperature overnight. Whichever is followed, the aim should be to secure a uniform temperature throughout the cream at churning.

EXPANSION COOLERS.

Expansion coolers are of many types—namely, the surface coolers in various forms, double-pipe internal coolers made of tinned-iron pipes, and the vertical internal-pipe type consisting of a series of Staybrite steel pipes enclosed in an iron casing through which the ammonia circulates.

The last two have the advantage that the cream is pumped through them, and thus no difficulty is experienced in getting an even spread of the cream, a difficulty which has resulted in many types of distributors being evolved, more especially for use on the first water-coolers, where the cream is at its highest temperature.

METALS.

One great difficulty, especially with neutralized sour cream, has been that of finding a suitable metal of which to construct the parts of pasteurizers and coolers which come in contact with the cream. Soon after this class of cream made its appearance difficulty was experienced in retaining a coating of tin on the copper lining of the pasteurizers and nickle was then tried (1928). This metal has now been replaced by Staybrite steel for practically all work of this nature.

CREAM AND MILK PUMPS.

The object of the gravitation factory was to avoid the use of pumps for either milk or cream as the belief was held at that time that the action of the pump had an influence on the quality of the butter made, and long pipe-lines were not regarded favourably. There is, however, considerable difficulty in handling cream by gravitation on account of the froth. Later experience has shown that the use of high-speed pumps for either milk or cream when in a heated condition, or, indeed, any treatment which involves extreme agitation or high velocity when in that state, has a direct influence on fat-losses in the skim or butter milk.

As the gravitation factory gave way to the open factory with few partitions and a level floor, the cream-elevator, a machine fitted with buckets which tipped automatically and were attached to an endless chain travelling over sprocket wheels was used to raise the cream. The tipping-device was not very reliable, and pumps gradually came into general use in both cheese and butter factories for elevating the milk and cream, and as many as ten may be seen in the course of the journey taken by the cream during the pasteurizing and cooling processes in one factory, although experience has shown that pumps are a very dangerous source of recontamination in the hands of a careless operator.

The increasing use of pumps is due to the improved types for specialized purposes which have been produced by manufacturers both from the point of view of sanitation, materials from which they are made, and design.

These may be summarized as high-speed pumps of the wing or centrifugal types for pumping milk or whey, and for filling churns and slow-speed rotary or half-rotary type for handling cream during the pasteurizing and cooling processes.

CREAM-VATS.

These have developed from the cream-holder submerged in water to the rectangular vat with metal lining, and water-jacket with direct expansion coils and wooden casing, followed by the insulated vat with attemperator coils, glass-enamel-lined circular vats (1921) with or without cooling coils and insulation, until the present time when practically the only vats being installed are circular vats with Staybrite lining, water-jacket with submerged coils, outer casing of metal, and insulation protected by metal sheathing.

As with pasteurizers, the most difficult problem in connection with cream-vats has been the lining, and this has ranged from tinned steel, tinned copper, glass-enamelled iron (1921), nickel (1929), and, finally, Staybrite stainless steel (1930).

Capacities have risen with the expansion of the industry from 200 gallons to 3,000 gallons, and stirring-devices have become necessary in order to thoroughly mix these large bodies of cream. As the result of the height of the vats, raised platforms in the factory with gravitation feed to the churns have been done away with and pumps are now used for the last-named purpose.

THE BATCH VAT.

This type of vat was first imported in 1910, but has never been used to any extent, due probably to the low point to which the acid in the cream is reduced in New Zealand butter factories; a practice which necessitates a high pasteurizing-temperature. A firm body in the butter has also been aimed at, and this again requires rapid cooling which cannot be achieved by the batch system.

CHURNS.

There is perhaps no unit in the equipment of a butter factory which has seen so great a change as the churn, developing as it has done from a larger size of the barrel churn as used on the farms and costing a few pounds, and with a capacity of 200 lb., to the combined churn and worker of to-day which costs over £700 and delivers 3,600 lb. of finished butter ready to be packed into the boxes.

The barrel churn was followed by the box or concussion churn of various shapes and up to 600 lb. capacity.

Many other types were tried out at various times, the swing churn having rather a longer life than the rest, having been used in both the North (1890) and South Islands. One of these worth noting was made of tinned steel (Dunedin, 1892) but was not a success owing to the butter sticking to the metal.

Others were the Vacuum churn (1893), the Streamlet, the Disc, and the Evenden Lightning (1896) churn, all of which failed to fill the factory requirements in some way, though it is possible that the lack of efficient temperature-control may have been a contributing cause. The Vacuum churn referred to above actually churned the cream by a current of air which passed up through the cream as the result of a partial vacuum exerted on the space above the cream. The year 1934 has again seen the vacuum treatment applied to the churn, but during the working process in this instance. The barrel of the churn is enclosed in a metal casing and a partial vacuum is exerted on the space between. This vacuum is applied to the inside of the barrel by valves and cams which open at intervals. At the time of writing only one churn of this type is in use.

Vacuum treatment of butter after the ordinary making process is finished has also been carried out, the Abel process (1932) having been installed in a few factories on trial.

Both of the above aim at removing the air from the butter, and a reduction of 8 per cent. in the bulk is claimed as the result. A further process has been the replacement of the air with CO₂ gas but this has not been carried out on commercial lines.

Packing in vacuumized containers has also been carried out with both butter and cheese, and the product has been placed on the London market.

THE RADIATOR, 1902.

The Radiator was a centrifugal machine which served the dual purpose of separating the cream from the milk and churning it to the stage where the butter was formed in minute granules, in which condition it was delivered into cans and then placed in a churn to finish the churning and washing processes. Difficulty was experienced in rapidly reducing the temperature of the cream from the high point necessary for efficient skimming to the low point required for churning which would produce butter with a good body and avoid excessive losses in the buttermilk. Although the machine was tried in a number of factories it was soon discarded.

THE BUTTER-DRIER.

This was a centrifugal machine in which the granular butter was placed in a cotton bag which fitted into a perforated bowl. The bowl was then rotated at a comparatively high speed, thus expelling the water. This machine did not come into very general use.

BUTTER-WORKERS.

Before the use of the refrigerator became general the butter was removed from the churn after washing and placed on a circular butter-worker, where it was salted and partially worked. Owing to the high churning-temperatures the butter was so soft that this could not be completed at once, and it was therefore held over till next day and reworked before packing. After the installation of refrigerators this practice was continued for a time, but with better control of temperatures and, consequently, firmer butter it was found that the salting could be done in the churn (1900) and the working completed in one operation without any danger of streakiness in the butter. The objective at that stage was to work the water, which contained a large percentage of curd, out of the butter. Control of temperature made it possible to get rid of the buttermilk with one washing where several had been required previously, thus giving a better keeping and a better flavoured butter.

Butter-workers varied little in construction, the chief difference being the inward or outward slope of the revolving table; two rollers at different levels above the table, on one or both

sides, or one roller at each side. Two hundred pounds of butter at a time was a large capacity. The turning was, of course, done by hand, and it required judgment on the part of the operator under this system to ensure even salting and working while the water was worked out of the butter. The amount retained was practically uncontrolled and ranged from 9 per cent. to 10 per cent.

THE COMBINED CHURN AND WORKER.

In the early "nineties" the combined churn and worker was introduced from the United States of America, but it was not until after 1900 that it was adopted, and from that date the circular butter-worker gradually went out of use. Many changes in the construction were necessary owing to the light nature of the imported machines and the firm body of the butter, resulting from the low churning-temperatures used in New Zealand.

For this reason local manufacture was encouraged and the Topliss churn was placed on the market in 1908. With the big increase in factory outputs the capacity of the churns has gradually been increased, until practically the only churns used to-day are of 40-, 50-, and 65-box capacity, and they are made in the Dominion.

Three main types of churns have been used—the short barrel churn with detachable worker and end delivery—the long barrel churn with fixed internal worker and side delivery, and the short barrel churn with fixed internal worker and end delivery.

The drawback with the first two was the uneven distribution of the water in the butter, the variation being as high as $1\frac{1}{2}$ per cent. in different parts of the same roll of butter. This has been reduced to between 0.2 per cent. and 0.3 per cent. in the last-mentioned type, and it is probably due to the fact that this loss or gain with different makes of churns could be so accurately shown that the development of this last type is due. This has required a large expenditure on innumerable changes of construction in practically every part of the churn, details of which are too numerous to mention here.

With properly regulated cream-temperatures a skilled operator can control the moisture content of the butter within about 0.2 per cent. from churning to churning, and maintain an average

between 25.6 per cent. to 15.8 per cent. in contrast with the figure of round 10 per cent. which was possible with the circular butter-worker. The butter will also be more uniform in colour and texture, so that the expenditure has been justified.

UNLOADERS.

The removal of such quantities of finished butter from the churn necessarily entails correspondingly heavy appliances for unloading, and this has kept pace with the requirements, and there is actually less manual labour entailed in the factories to-day than when smaller units were in use.

BUTTER-PACKERS.

Because of the very firm character of New Zealand butter and the low churning temperatures employed, the work of packing it into the export boxes presents a greater problem than in other countries, and, consequently, hand-packing was a laborious job, and the use of a packing-machine is recorded in 1891.

The Hussey packer (1910), which handled only one box at a time, was the first to be used for this purpose, and this was closely followed by the Topliss of the same type, but fitted with double hoppers. Both depended on the thrust of a lever to press the butter into the box, but as there was no provision for adjusting the lever in order to provide for the varying condition of the butter, cavities in the block of butter when turned out of the box were frequently complained of. In the Benhill moulder (1928) this defect is corrected by passing the butter through an opening of the same width and depth as the butter-box, the block of butter being cut off at the correct length by wires. The block is then passed over the scales, where the weight is accurately adjusted, wrapped in parchment, and the box is slipped over it. This machine was manufactured in the first instance under specifications from New Zealand and is now made by a number of manufacturers in this country, where it is gradually displacing the older type.

BUTTER-MOULDERS (PATS).

The first record of these is contained in a description of the plant of a factory started in 1885, and they naturally followed the pattern of the hand-mould used on the farms.

In 1885 a power machine for this purpose was patented, built on the principle of extrusion of the butter through openings by a thrust operated by a screw. This has seen many variations, and the continuous-feed machine operated by impellers running right and left is now in fairly general use, and in those factories having a large local trade a wrapping-machine is also attached to it.

THE REFRIGERATOR.

For two reasons mechanical refrigeration is of paramount importance to the dairy industry, and particularly the butter industry, in both New Zealand and Australia, and in some respects these two countries have pioneered its application to the dairy industry. First, the absence of supplies of natural ice for use in manufacturing, and, secondly, the fact that the bulk of the finished product had to be marketed in the Northern Hemisphere, entailing a protracted voyage through the tropics.

The absence of supplies of natural ice led to the use of mechanical refrigeration in butter factories, as it soon came to be recognized that temperature-control determined not only churning losses, but also the quality of the butter made, and appliances were adapted to those ends. It was universally adopted before some countries had considered it as one of the necessary units of equipment, notably in the United States of America, where trade journals within the last ten years were drawing attention to the advantages of mechanical refrigeration compared with cooling with natural ice in both the technical and the advertising pages.

The earliest machines were introduced about 1890 and were of the CO₂ type with brine circulation, but the ammonia compressor of both the wet and dry types followed soon after, and the development of these machines has been on similar lines to the development in other industries in which refrigeration is used.

The problems which the dairy industry had to solve were the selection of suitable machines for its purposes, these being in many instances in the care of untrained men, and also the provision of means to apply the machines to the wants of the industry. These have been described in dealing with cooling during the manufacturing processes. In the application of cooling after manufacture and during transport, the lines of development have been similar to those followed in similar businesses, but a large amount of specialized experimental work has necessarily been required.

THE TEST FOR FAT.

One of the difficulties which confronted the dairy industry in its earliest years was that of preventing the supplier from adding water to his milk or removing cream from it. The Creamometer, a graduated glass cylinder, was the only means of checking these practices, and it showed the amount of cream which would rise on a measured quantity of milk in a certain time.

In 1893 a Fjord controller was imported by the Department of Agriculture. In this machine tubes containing a measured sample of milk were placed, and it was then put into a bowl which was revolved at a high speed in a separator frame. The cream was concentrated to a fat content of 70 per cent. and measured. This system was used for many years in European countries, even after the Babcock and Gerber tests became available.

The Babcock test came into use in New Zealand in 1892, and payment for the fat in the milk for buttermaking followed almost immediately, but at a rate per gallon. The small eight-bottle hand-machine imported by the Department of Agriculture was taken as a pattern from which twenty-four-bottle hand-machines were made locally.

The Lister, a British machine, followed, and shortly afterwards (1894) the steam turbine centrifuge, as we know it to-day, came into use, to be again followed by the machine with electric drive and heating-element.

The Gerber system has never been used to any extent in New Zealand factories, but has found a place in herd-testing on the group system, for which the hand-machine is peculiarly adapted.

POWER.

Most of the early factories were equipped with a steam boiler and engine, but hot water was used in some of the smaller ones for heating and cleansing purposes. Some cheese factories again had a boiler, but no engine, the curd-mill being driven by hand and the whey elevated to an overhead tank by an ejector if necessary.

Boilers have necessarily increased in size as factory outputs increased, and stoking-appliances and equipment for economizing in the use of steam have been adopted as they became available in common with other industries.

The Province of Taranaki had made use of the water power which is available in that area, and water wheels and turbines have both been applied to dairy-factory work, while steam, combustion engines, suction, gas, and electricity have followed in due course. Since 1929 crude-oil internal-combustion engines have come into common use, especially in those areas where electricity is not yet available.

The problem of heat and power in small factories was a very real one at one stage in the development of the industry as the cost of fuel per ton of butter or cheese decreases rapidly as the output increases, and *vice versa*. A cheese factory requires large quantities of steam for heating purposes, while pasteurization and cooking is in progress, but the power-requirements are comparatively light. In a butter factory both pasteurizing and churning are probably going on at the same time, and large quantities of steam and power are both required. Most of the heating-requirements of a cheese factory are for live steam, but in a butter factory pasteurizing and hot-water heating can be done by the use of exhaust steam, except where the vacreator is in use for the first named. In many instances steam power has been discarded for suction gas or electricity, and as outputs have grown steam power has again been installed, as it has been found to be more economical where large outputs are being handled, due to the use of more efficient boilers and firing equipment, more efficient engines, and utilization of exhaust steam.

Where it is available, electric power will always be used for certain operations because of the convenience which it provides both in butter and cheese factories, while electric power developed in the factory itself is in use in some plants even where current is available from an outside source.

OTHER BRANCHES OF DAIRY MANUFACTURE.

CASEIN.

The manufacture of casein commenced at the Rapanui factory in 1911. Lactic-acid casein, rennet casein, and mineral-acid casein have all been made at various times, but manufacture is now confined to the two former kinds, with the first named most common.

Encouraged by the high price of casein, a not very successful effort was made in 1915-16 to make casein from buttermilk, and in 1917 a chemical process was patented by the Department of Agriculture, the treatment having been developed by J. Pedersen, the Casein Instructor for the Dominion. A difficulty with this class of casein was the high percentage of fat in the finished product, and this process was for the purpose of getting rid of it and also to consolidate the very fine powdery granules of which buttermilk casein is composed. The manufacture did not long outlast the war years.

The plant required for precipitating the casein from the skim-milk is much the same as for cheesemaking, though wooden vats are commonly used, and the drying-stations for drying and grinding the curd are fitted with appliances which have been developed by those in charge at each one. Although some attempts have been made to operate small drying-plants the three large ones which are in operation to-day handle the curd from a very much larger number of dairy companies and precipitating stations.

Buttermilk skimming was tried as early as 1893, the fat content at that time being very high, and it has been started at various dates since, but it has not been carried on for any lengthy period in any instance.

MILK-DRYING.

This process was first started in 1901, the Hatmaker system being used. The same system was installed in a number of other factories up till 1920, when the Merrell-Soule and Gray-Jensen processes were installed following the visit of a number of factory representatives to the United States of America, which is referred to elsewhere in this history.

The principal product is skim-milk powder, but whole-milk and buttermilk powders are made, and in one instance at least the Hatmaker process has been installed for buttermilk drying only.

CONDENSED MILK.

This has been dealt with in another part of this book. The plants used were as in all countries very defective in the early stages of the industry and were established in many areas without success. There are at present three plants operating.

SUGAR OF MILK.

The one factory established for the manufacture of **sugar of milk** started operations at Edendale in 1913 and produces **milk**, **sugar**, and **whey** paste.

THE MILKING-MACHINE.

No description of the plant used in the dairy industry would be complete which did not deal at least briefly with the development of the milking-machine, which, although not a New Zealand invention, has been practically developed in New Zealand in the sense that since the manufacture was taken in hand seriously no imported machine has come into general use, and that probably a greater proportion of the milk produced is drawn by machines than in any other country in the world.

The beginning of practical milking by machinery in New Zealand dates from the year 1902, when four Lawrence-Kennedy bucket plants were installed, at least one of which was an ejector plant. So far as extracting the milk was concerned they were quite successful, but an inflamed mark round the upper part of the teat resulted.

During the next season no further installations were made, and in 1904 the Gillies patent, which admitted a small stream of air into the hollow metal mouthpiece of the inflation, came into use. This was the invention of an Australian dairy-farmer, and successful mechanical milking can truly be said to have dated from the time of its adoption.

On 4th September, 1908, the releaser was patented by a dairy-farmer, Gane, of Normanby, and this to a large extent solved the labour difficulty on dairy-farms. This was a double-compartment tipping-device, which was superseded by the Eureka a short time afterwards. This releaser was of the double-compartment type, the milk being discharged automatically, and it became practically the standard releaser of all machines as time went on, although modifications from the automatic to the mechanical release were introduced at various periods.

Mechanical pulsation has largely replaced automatic pulsation, and a single pipe for both air and milk has replaced the double pipe in certain makes, while the combined vacuum pump and releaser is an invention of recent years.

The development was accompanied by innumerable changes in the details of design in every part of the machine, and it passed through a stage of complexity to one of simplicity, until to-day material differences in the design of the various makes is difficult to find.

To any one who has watched the development of the New Zealand dairy industry the striking feature in connection with plant must have been the willingness of the dairy companies to install new plant which would do better work or more work with less labour as improved units became available. The continuous increase in outputs provided this opportunity, and it is probable that more depreciation has been allowed for plant which has outlived its economic life than has been allowed for plant which was worn out.

This continued increase also presented the opportunity for trying out new methods or developments from old methods, and, though New Zealand can claim few original inventions of plant, many instances can be cited where machines have been developed to a stage far beyond that of the original conception, as in the case of the milking-machine.

In like manner the pasteurization of milk for cheesemaking and moisture-control in buttermaking are processes which New Zealand can claim to have commercialized at a stage when they were not seriously considered in many dairying countries.

In reviewing this phase of the industry the writer is taken back to the season 1895-96, when a director of a dairy company which had been running less than three years said, in referring to the fact that practically the whole of the plant had been replaced, "The marvel of the dairy industry is its vitality."

CHAPTER XII.

THE PACKING OF DAIRY-PRODUCE.

(a) BUTTER-CONTAINERS.

AN interesting history attaches to the wrapping and packing of butter, but to treat the subject completely would necessitate a book to itself. To devise an efficient and economical means of packing such a perishable and easily contaminated commodity as butter has certainly been a test for man's ingenuity, and many and varied have been the attempts to solve a problem which even yet has not been met with a quite perfect solution. Here again New Zealand's remoteness from world markets and the consequent protracted period of time between production and consumption, and the amount of handling involved, makes the problem more difficult.

If we go back to the days of our pioneer dairy-farms—that is to say, beginning with the 1840's—we find that the butter for local trade was sent to market in a variety of containers. Linen and calico were frequently used as wrapping. In the hot weather butter was sometimes rolled in dock-leaves or cabbage-leaves, the parcel being neatly tied with a strip of flax. Earthenware crocks and jars—probably the oldest vessels known to modern civilization—were used right through to the “nineties,” although there is no record of their having figured in our export trade. Owing to weight and liability of breakage it is unlikely that they would have been used for export purposes.

Wooden tubs, firkins, casks, and kegs can be traced back to the very earliest years of our dairying history, and were still used for export in odd lots almost to the close of last century. These varied in capacity, ranging from 60 lb. to 112 lb., but the standard firkin or keg was reckoned to hold about 70 lb. of butter. The original containers of this type were made of oak. In some instances they were imported from England ready made and came out filled

with rice, flour, grass-seed, or other produce which would not impair their subsequent usefulness for butter, while in other cases the oak staves were imported and made up locally. New Zealand woods were tried and pronounced unsatisfactory, though later both kauri and tawa, particularly kauri, were used for the purpose. Early records show that average containers of the cask type cost about 6s. 6d. each.

For many years salt played a very prominent part in the butter trade, both as a preserver and as an insulator. Our early butters were heavily salted; the interior of tubs, firkins, &c., was thoroughly soaked in brine before use, while the butter itself was packed in salt within the crock or jar or other container. Sawdust was also tried as an insulator, but its vogue was short-lived. So far as the export trade is concerned, the only butter to reach its market in satisfactory condition prior to the advent of refrigeration was that which was heavily preserved in salt and packed in brine-soaked wooden casks, and even for many years after the coming of refrigeration there were many manufacturers who considered the brine-tight and airtight cask the only satisfactory article of its kind.

A branching out on to an entirely different line came in 1881, when airtight tins were used. Between 1882 and 1890 one or two companies set up as specialists in the tinning and exporting of tinned butter. So far as can be gathered from early newspapers, the produce reached its market in sound condition, but the trade never reached any magnitude and after a short and never robust existence slowly died out. It is interesting that the dealers in tinned butter attempted to foster foreign trade and shipped trial lots to Fiji, Honolulu, South America, India, and the Far East. The tins used were small, being made in varying sizes from 1 lb. to 10 lb., while the butter was sent as ordinary cargo.

Contemporaneous with the experiments in butter-packages were the attempts to discover a suitable butter-wrapping. As previously stated, linen and calico were used to a certain extent, though in the case of crocks and containers of the barrel pattern the butter was, as a rule, put direct into the container without a protective covering. There were, however, a few buttermakers who lined the kegs with cloth before putting in the butter, as well as using tops and bottoms cut the same as cheese-cap cloths.

The growing demand for a butter-covering led to the manufacture of what was called butter-muslin, more popularly known to the trade as butter "cloth." Beyond standardizing and cheapening the material, this innovation represented no advancement.

For a while the attention of experimenters was diverted from cloth materials to paper. Many varieties were tried, the most successful being a paper impregnated with wax. Even this, however, did not prove quite suitable.

Solution to the wrapping problem came at last with the adoption of vegetable-parchment paper. The process for making vegetable parchment had been discovered in England in 1850, but the material did not come into general use until the early "eighties." Parchment paper was first used for butter-wrapping in New Zealand in 1888 by the New Zealand Dairy Association at Auckland. A point worthy of mention is that when first used it was gummed round the inside of the boxes. In the first years there was a heavy duty on the product, but it was considered so important to the growing butter trade that the Government of the day needed little persuasion to remove the duty.

The first butter-box patented in New Zealand was one designed by Messrs. John and Samuel Smith, of Marton, and patented on the 24th October, 1882. It was a tapered box measuring 24 in. by 16 in. on the top, reducing to 18 in. by 12 in. and was made in sizes varying from 12 in. to 15 in. in height. This means that the boxes would hold anything from 75 lb. to 100 lb. of butter. The most interesting feature is that strips of paper were placed between the joints and between the butter and the lid to hold the contents air and water tight.

In January, 1885, Mr. J. A. Pond, Colonial Analyst, Auckland, patented his patent enamel butter-box. This was made of New Zealand white pine (kahikatea), was cube-shaped, "enamelled" on the inside, and held about 56 lb. of butter. The "enamel" used was a methylated-spirit shellac. This box had quite a vogue for several years, and may be regarded as New Zealand's first successful attempt to meet the demand. It set a standard for subsequent inventions, but its use seems to have died out about 1889. Probably the necessarily high cost of the box, about 4s., and the advent of parchment paper were the main causes.

In 1886, Mr. A. Mofflin, of New Plymouth, patented his enamel brine tight butter package. This was a tapered box, tongued and grooved, and strengthened with metal straps. The enamelling was similar to Pond's box.

The next box worthy of mention strikes a new note. This box was patented in 1888 by Mr. W. H. Brightwell, of Kaupokonui. It was a simply constructed box of about 1 ft. cube, and made out of 12 in. by 1 in. boards. Provision was made for a layer of salt $\frac{1}{2}$ in. thick all round the block of butter, the butter itself, being encased in calico. The cost of the box, including the salt, was quoted at 2s. 5d. Brightwell's box was small in comparison with its predecessors and would hold about 36 lb. of butter.

Several patterns of tin-lined boxes were placed on the market about this time, but the idea was abandoned when it was found that the tin rusted and therefore tainted and disfigured the contents.

By this date, the close of the "eighties" the butter-export trade was developing rapidly. Refrigeration on overseas steamers was established and shipping facilities vastly improved. Parchment paper was in general use. The old cumbersome and elaborate butter-boxes were dispensed with as no longer necessary, and a plain white-pine box, cube-shaped, nailed, and holding about 56 lb., took their place, though, as previously stated, a few manufacturers held to the butter-keg until almost the close of the century.

Some idea of prices may be gained from the fact that at the 1894 annual meeting of the North Island Division of the National Dairy Association tenders were accepted for butter-boxes at 9 $\frac{1}{2}$ d. each and cheese-crates at 8 $\frac{1}{2}$ d. each.

The 56 lb. cube box had a practically uninterrupted career until 1897, particularly in the North Island, when a movement in favour of a rectangular box was begun. Two principal reasons were advanced for the change. First, in those days only white-pine and only one-piece boards were considered satisfactory. The cube box necessitated wide boards and a consequent extravagance of timber. The capacity, 56 lb., was considered ideal, and it was logically argued that by changing the shape of the box to a rectangle narrower boards could be made use of. The second

reason was that Australia was using an identical cube box, made of New Zealand white pine, for its butter-export trade, and New Zealand desired to adopt a distinctive package. As a result the cube box was changed, in 1898, to a rectangle of similar dimensions to the standard box still in use. The use of the rectangular box, it may be mentioned, was made compulsory by legislation as from November, 1918.

From the point of view of thickness of timber the present-day (1935) standard box is made of $\frac{5}{8}$ in. ends and $\frac{1}{2}$ in. sides, tops, and bottoms. In 1933 a box known as the sub-standard was officially recognized by regulation. This was similar to the standard box, but made of lighter sides, tops, and bottoms ($\frac{3}{8}$ in.), while added strength was given by the use of wire binding.

It looked as if the butter-box question was settled once and for all time. It was only one season, however, before problems of another nature arose. These were wood-taint, coupled with mould-growth on the wood. Wood-taint was attributed to unseasoned timber. The butter trade had then assumed such dimensions and was growing so rapidly that box-manufacturers found it difficult to keep adequate stocks of seasoned timber. Mould was considered to be due partly to unseasoned wood and partly to the leakage of moisture from the butter. In those days it was the fashion to expect ideal butter to possess a granular character and show a slightly perceptible amount of small beady moisture. Although the butter was dry in comparison with the moisture content of our present-day article, and contained only from 10 per cent. to 12 per cent. water on an average, it was but lightly worked, and the moisture leaked freely. Needless to say, neither parchment paper nor wood could stand so severe a test.

In 1900 Mr. J. A. Kinsella, recently appointed Dairy Commissioner, took up the problem and advocated the coating of the inside of butter-boxes with paraffin wax in accordance with a process in operation in Canada. The idea was taken up by the New Zealand Dairy Association, Auckland, in 1901, and in the same year by the T. and P. Milk Supply Co., of Dunedin, other companies later following suit. Mr. Kinsella also introduced in the same year the lock-jointed butter-box, slightly tapered, for ease in removing the butter. The lock-jointed box, however, did not meet with favour, and in a year those who had tried it reverted to the standard pattern. Waxing continued until 1905.

It became unnecessary after concentrating on the seasoning of timber, but more particularly after the advent of the combined churn and butter worker and the consequent removal of the free-moisture evil.

The next change of any moment did not come until 1923, when the first of a series of what might be termed light-weight fabricated butter-boxes made its appearance in New Zealand. This innovation was prompted by price. Before the Great War butter-boxes were costing about 1s. 3d. each on an average. By 1922 the price had risen in stages to around 3s. Another factor, though one of lesser importance, was a revived press agitation for the conservation of our white-pine forests. New Zealand's annual requirements had already reached a colossal figure, while, in addition, the bulk of Australia's requirements were supplied from this Dominion. The purpose of the light-weight butter-box, therefore, was to reduce cost and to conserve kahikatea. The Australian demand increased the price of boxes in New Zealand.

The first and most successful of the new pattern boxes was copied from Victoria, Australia, where the box had been in use since 1895. In this Dominion the New Zealand Co-operative Dairy Co., Ltd., was the first manufacturer of the box (1923), their particular type being known as the Saranac box, after the name of the manufacturer of the fabricating machinery in the United States. Roughly expressed, these boxes were made of very thin timber strengthened on the edges by the addition of cleats, the finished box being bound with wire or metal straps. A considerable saving of timber was effected by reason of the use for the main faces of timber of little more than half the thickness of the old standard box, while the cleats could be cut from waste material, and, further, need not necessarily be of white pine. This box cost 3d. to 4d. less to produce than boxes of solid timber. Whether this was a real saving is doubtful. It certainly represented a saving at this end, but in Britain there has always been a demand for sound and complete empty boxes of the standard pattern, and shopkeepers could usually get up to 6d. each for them. The empty fabricated boxes, however, were practically unsaleable, so that the purchaser was sometimes influenced in his selection by the container.

The next step was a still further conservation of timber and was represented by the introduction of a box of identically the same construction as the original Saranac but made from rotary-cut timber.

Next came a slatted veneer package known as the Coombs patented butter-box (1926), designed by Mr. H. Coombs and manufactured by Messrs. Ellis and Burnand, of Hamilton. The sides, top, and bottom formed the unique feature of the box. Each piece consisted of an inner sheet of white-pine veneer, $\frac{1}{8}$ in. thick, glued and strengthened by four narrow battens. The grain of the wood of the veneer was disposed at right angles to that in the battens. While the invention looked promising at first, the box did not stand the test of export conditions and ere long was listed among the failures.

Many attempts have been made to develop a suitable butter-box, using plywood and veneer or laminated construction, but while some have reached the trial stage, none have proved commercially acceptable in New Zealand. There has been ample evidence, however, to indicate that, apart from mere suitability as a container and conveyer of butter, the appearance of the package is of major importance, while the merits of uniformity have also been clearly demonstrated.

This lengthy list, by no means complete, but including the more important, may be brought to a close with a brief mention of fibre-board boxes, the product of a more recent day and still the subject of experiment. Ever since the solid fibre and corrugated fibre boxes became of importance in the shipment of domestic produce, attention has been directed to their use for the export of butter. Amongst others who have experimented in this direction have been the Banks Box Co., Ltd., and the Empire Card Box Manufacturing Co., Ltd., of Auckland and Wellington, and the New Zealand Co-operative Dairy Co., Ltd., of Hamilton. Up to the present fibre board has failed to prove itself a satisfactory substance for the making of containers for export butter.

It should also be recorded that the tin has again come under investigation during recent years, regular though comparatively small shipments of butter packed in tins, under vacuum, being sent forward to the Home market. While this form of packing now seems to be meeting with a certain measure of success, it is yet too early to forecast its future development.

From the foregoing it will be seen that much attention has been devoted to the wrapping and packing of butter. Inventions have been many and varied, and each year seems to find the long list lengthening. It would appear, however, that so long as wood is used there will be no better wood than New Zealand white pine, and it is questionable if importers in the United Kingdom will ever consider any box quite so satisfactory as the standard white-pine box which helped to make New Zealand's reputation on the British butter markets, though latest reports indicate that the wire-bound sub-standard box is probably the most suitable type in use at the present time.

The various types of butter-boxes in use during the six years 1931 to 1936, inclusive, are classified by percentages in the following table :—

TIMBERING OF EXPORT BUTTER-BOXES.

Description of Box.	Year ended 31st March,					
	1931.	1932.	1933.	1934.	1935.	1936.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
White pine (standard) ..	31·11	26·87	31·63	28·63	26·81	25·03
White pine (sub-standard) ..	8·61	12·13	11·32	10·68	8·39	12·81
White pine (Saranac) ..	29·19	38·63	46·94	50·93	61·15	56·37
White pine (Coombs) ..	0·92	..	..	..	..	..
Swedish (standard) ..	21·00	14·94	7·29	4·04	0·86	0·29
Swedish (sub-standard) ..	8·30	7·42	2·81	5·72	2·78	5·49
Canadian spruce (standard) ..	0·86	..	..	..	..	..
Total classified (boxes) ..	3,873,751	4,073,756	4,923,400	5,688,888	5,296,148	5,863,243
Total classified (tons butter) ..	96,844	101,844	123,085	142,222	132,404	146,581

(b) CHEESE-CRATES.

Prior to the establishment of the regular export trade in cheese, all cheese were made on farms, and the general custom with respect to farm-dairy cheese was to deliver them to the dealers just as they were and not in containers. This method obtains to-day to a certain extent. The quantity of farm-dairy cheese, however, is now comparatively trifling, and the makers are principally the descendants of the earliest farm-cheese makers in more or less out-of-the-way places on Banks Peninsula. A certain number export what surplus they have in excess of the local trade. This

surplus when ready for export is sent to packers in Akaroa and Christchurch, where it is suitably crated and branded prior to forwarding for grading for export.

The packing of cheese for export in wooden containers or crates as the packages are termed, as a regular practice commenced with the manufacture of cheese in factories. Medium-size cheese of a weight of about 35 lb. to 40 lb. were the most popular, but loaf-size cheese of 10 lb. to 14 lb., and some large size of 56 lb. to 60 lb. were also made. The first cheese-crates for the medium and export-size cheese were four-sided and of white pine, loaf cheese being packed, when required, in flat boxes containing various quantities of from four to twelve cheese.

Mr. R. G. Barr, first manager of the Egmont Box Co., Ltd., Eltham, is said to have been the first person, when located in Southland as a sawmiller (or sawmill employee), to cut the four corners off the ends, and thus make the crate an eight-sided one. This improvement reduced the cubic measurement on overseas freight, reduced the timber required for battens and increased the stability of the crate, and at the same time did not add to its cost.

A considerable trade in factory cheese was done with Australia in the earlier years of factory cheesemaking, but the eight-sided crate may be said to have commenced with the opening of the export trade in cheese to Britain. For this trade the cheese made were principally of the same size as the large cheese supplied to Britain from the United States of America and Canada—namely, about 60 lb. each. Mediums were also exported, but most of these were the surplus not required for shipment to Australia or for use in New Zealand. The large export size were packed two cheeses per crate, and the mediums four cheeses per crate, the crates of mediums being taller than those of the large cheese. Dividing boards about $\frac{1}{2}$ in. thick were placed between the cheese. Ends were made of 1 in. boarding, plane-dressed on one surface. Battens were $\frac{1}{2}$ in. boarding dressed on one surface, and some of these were chamfered on the outer side edges.

Soon after the opening of the export trade with Britain, the North American cheese box, or "band box" as it was popularly called, was tried out for large export cheese. This was about 1889 or 1890. The box was made by Thomson, Bridger, and Co., Dunedin, and was of white pine. This box was not popular with

dairy companies. It was apt to split and shatter, and also was probably a more expensive package to manufacture apart from being most costly to transport to factories. The deciding reason for the non-adoption of the box was the fact that the crate met with general approval in Britain and was acclaimed the best ventilated cheese-crate then in use.

Timber for cheese-crates was sawn and planed at the mill direct from the green log, while the seasoning was done at the cheese factory by laying out ends and battens in separate stacks in the open air. The cost of the timber for a crate averaged out about 1s. at the mill. A few of the factories in Southland may perhaps be using green, mill-cut crate timber to-day. In the North Island the practice appears to have been to purchase only crate timber in a seasoned condition and ready for immediate use.

Crates of cheese were first shipped without bindings at the ends, but the need for a binding or some reinforcement, or a more stable crate, soon became apparent. The shipping companies were the first to demand improvement, and they brought pressure to bear on shippers by not giving a "clean receipt" for the goods. A few factories tried out binding the ends with green hide, and some others used plain black hoop or galvanized-iron strapping. Green hide was unsatisfactory owing to the influence of atmosphere from the point of view of expansion and contraction.

In 1898 the twelve-sided crate was introduced, and about the same time a cylindrical crate was invented and tried out. The latter consisted of circular ends and centre board, and a number of battens about 2 in. wide and $\frac{3}{4}$ in. thick set about 1 in. apart. Also light, wire binding stapled to the ends came into use and was considered a better binding than any other. The cylindrical crate was not considered so good as the twelve-sided crate, and its use was soon discontinued.

Mr. A. A. Thornton, Dairy-produce Grader, strongly advocated the use of wire binding and was largely responsible for its general adoption. About 1910-12 the placing of a wire binding round the centre of the crate in addition to the wire binding at each end was commencing to come into general use, on the recommendation of Thornton, by many factories grading at Auckland, particularly those factories whose cheese came to Auckland by sea transport.

This practice was also adopted by some factories grading at other ports whose cheese came by sea. Up to this time many factories did not nail the centre boards, there being no authority to insist upon the nailing.

Scaleboards were commencing to come into use about 1908-10, Messrs. Ellis and Burnand being the first and only makers for several years. The first scaleboards, however, were imported from Canada as far back as 1892, and later a number were imported by Mr. J. B. MacEwan when he started in business as a dairy-produce merchant.

Finally, regulations were introduced standardizing the twelve-sided crate for 80 lb. cheese, and requiring the use of scaleboards, and also prescribing the branding and marking. Cement-coated nails were also prescribed.

In connection with the branding of cheese-crates, the original method was to mark the brand on the ends by means of a stencil and the weight on one of the battens. The latter marking was subsequently placed on the both ends owing to frequent loss of the marked batten. The North Island practice of obtaining seasoned timber for cheese-crates fit for immediate use also led to the impressing of the brand by the sawmillers, and as the sawmillers were also makers of butter-boxes and were impressing butter brands, the impressing of cheese brands was an easy matter to them. An extra charge of 1d. per crate was at first made, but this charge was soon dropped. A few factories used a fire-branding machine at the factory, the brand being heated in the machine, and the board laid on and the brand burned in.

The change in the size of export cheese from 60 lb. to 80 lb. commenced about 1902, new factories starting with the large-size hoop, and the older factories gradually replacing the smaller with the larger.

At one time all crate-ends were of single-piece boards 14½ in. in diameter, the increasing scarcity and price of timber for this width having led to the use of two-piece boards about 1910-12. The first two-piece boards were jointed with dowels and glued, Mr. Brichnel, of Carterton, being the maker. Corrugated steel fasteners made their appearance soon after and were used instead of dowels.

The first *Pinus insignis* was used for cheese-crates in 1917. Hemlock was imported from the United States of America in 1922, and later Canadian spruce, Swedish pine, and *Picea excelsa* were used. Various timbers are now in use, and in some instances more than one timber is used in the same crate, but white pine is predominant, either wholly or in part. Southland beech is fairly common, and poplar and willow are also used to a small extent. Actually any good nailing timber is suitable.

Many efforts have been made to produce a crate at lower first cost by altering the pattern, but none has proved successful. This is perhaps all to the good, inasmuch as when a regular buyer is satisfied with what he buys it is generally a sound business principle to continue to supply him with the same kind of article all the time.

Particulars of the timbers used in export-cheese crates are given in the following table; 1931 is the first year for which details are available.

TIMBERING OF EXPORT-CHEESE CRATES.

Particulars of Timbering.	Year ended 31st March,					
	1931.	1932.	1933.	1934.	1935.	1936.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
White pine.. ..	35·97	40·85	18·95	15·16	12·64	4·98
White-pine battens, <i>Pinus insignis</i> ends	10·59	23·60	42·00	23·02	32·49	10·61
White-pine and rimu battens, <i>Pinus insignis</i> ends	..	..	..	..	2·75	1·59
White-pine battens, rimu ends	..	..	0·81	1·94	0·23	..
<i>Pinus insignis</i>	23·33	12·64	13·05	16·19	17·50	11·85
Mixed battens, <i>Pinus insignis</i> ends	..	..	11·36	19·01	25·39	41·14
Mixture of New-Zealand-grown timbers	..	0·09	0·06	14·84	0·14	20·51
Beech	8·32	12·91	11·54	9·00	8·67	9·31
Willow .. ..	..	..	0·13	0·79	0·13	..
Poplar .. ..	..	..	0·27	..	..	..
Hemlock	13·84	7·53	1·70	..	..	..
Swedish	1·46	0·37	0·04	0·04	0·05	..
Canadian spruce	6·48	2·00	0·08	..	..	..
Total classified (crates) ..	1,274,940	1,156,485	1,349,838	1,448,687	1,297,205	1,157,887
Total classified (tons cheese) ..	92,205	83,638	96,417	104,771	93,816	83,740

CHAPTER XIII.

DAIRY-COW TESTING IN NEW ZEALAND.

(a) DESCRIPTIVE.

ALTHOUGH as far back as 1900 odd dairy-farmers were testing their herds for butterfat-production, it was not until 1909 that an attempt was made to establish the work on a systematic basis. The introduction of systematic herd-testing to New Zealand was the direct outcome of a visit paid to Denmark in 1908 by Mr. David Cuddie, then Director of the Dairy Division. Mr. Cuddie was so favourably impressed by the development and influence of the herd-testing work in that country that on his return he strongly advocated its inception in this Dominion. Cow-testing associations were started in Denmark in 1895, and, following the example of the Danes, many of the dairy-farmers in Scotland took up the work in 1903 under the heading of what were termed milk-recording societies. Cow-testing associations were also started in Canada in 1904 under the direction of the Government.

Before embarking upon a brief historical survey of the movement it may be well to give an outline of the mode of operation of the principal systems, which number four, namely :—

(1) Non-official systems :—

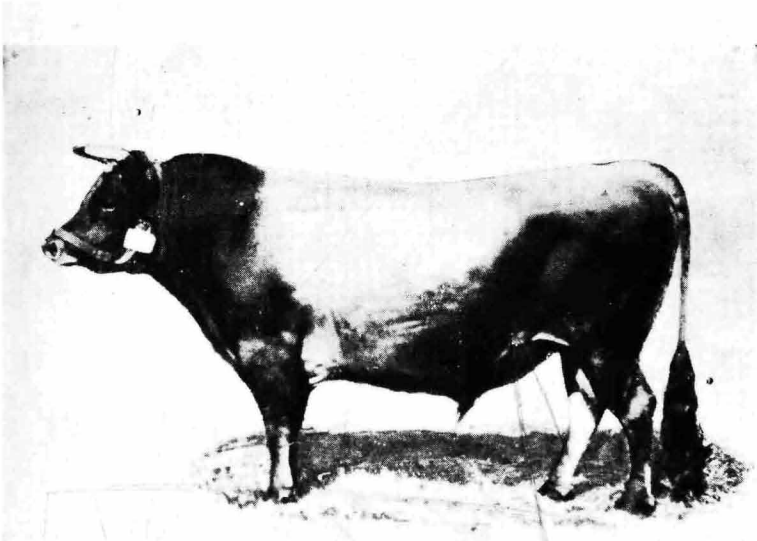
- (a) Association.
- (b) Group.

(2) Official systems :—

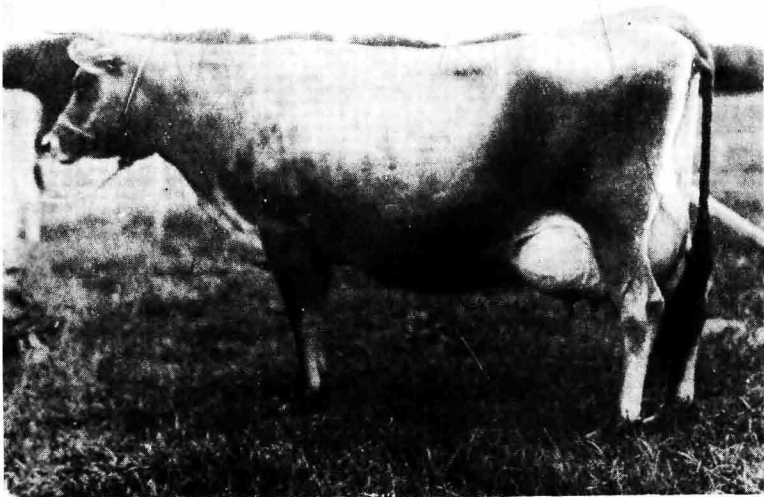
- (a) Certificate-of-record test (C.O.R.).
- (b) Government Official Herd-test (Gov't O.H.T.).

THE NON-OFFICIAL SYSTEMS.

(a) The association system, now called the "association own-sample" test, provides for the weighing and sampling, by the herd-owner, of each milking for two consecutive days in each thirty days, known as a testing-period. The milk-weights are entered on a form specially provided for the purpose by the



JERSEY BULL, "GRANNIE'S KNIGHT."



JERSEY COW, "WOODLANDS FELICIE."
C.O.R.: 17,332-6 lb. milk; 1,220-89 lb. butterfat.

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Government. The samples are placed in a specially constructed milk-sample box, the weight-sheet included, and sent to the testing-depot—usually the dairy factory to which the herd-testing association member is a supplier. The testing officer then tests the samples and enters the result on the form, which also contains the record of the milk-weights. The record of performance is then calculated, and the sheet, with the completed results, returned to the herd-owner.

Practically all associations are formed among suppliers to dairy companies, and seeing that the great majority of dairy companies in New Zealand are co-operative there is little difficulty over the testing of samples, which is usually arranged by the factory, nor the compilation of returns, which is usually carried out by the secretarial staff. The collection of fees is simply a matter of deducting the amount due from monthly milk or cream payments.

(b) The group system was introduced in 1922 and is now the most important system numerically so far as the testing of ordinary dairy-factory-supply herds is concerned. Under the group system an independent testing officer visits each testing dairy herd-owner's farm once each month, takes milk-samples and checks the milk-weights for one day, and does the testing of the milk for butterfat content. In a few instances the testing officer does the figuring of returns on the farm, but in most organizations, particularly the larger ones, the clerical work is done at a central office. The number of members in each group is obviously restricted to the number of farms the testing officer is able to visit each month. The average would be about twenty-five. Fees are usually collected through the dairy companies, the member giving an order against his milk or cream cheque for the five flush months of the season. The majority of groups are co-operative enterprises, although a few are operated by testing officers as private businesses.

The group system owes a considerable part of its extension to the use of the milking-machine. In New Zealand about 75 per cent. of the dairy cows are machine-milked. The use of the milking-machine complicated the taking of milk weights and samples, and it became apparent that if herd-testing was to progress the dairy-farmer would have to be relieved of the work of

milk-sampling. The testing officers are equipped with appliances which intercept the milk between the cow and the milk can and enable a sample to be taken and the milk weighed. For many years the Babcock method of testing the milk-samples was the only one used, but a number of groups now use the Gerber system. Herd-testing fees vary considerably, but the average charge for group testing is approximately 4s. 6d. per cow per season, and for the association test 2s. 6d. per cow per season.

THE OFFICIAL SYSTEMS.

(a) *Certificate-of-record testing* was inaugurated by the Dairy Division of the Department of Agriculture in 1912. Only such cows as are registered in the New Zealand herd-book of the breed to which they belong are eligible for testing. In other words, the C.O.R. test is an individual cow test and is confined to registered purebreds, while the system is administered by the Government. The principal restrictions relate to calving-requirements and to butterfat-production. The C.O.R. test is in two divisions—namely, the yearly (365-day) test, and the ten-months (305-day) test. There are also three classes of certificate—first, second, and third. In the yearly test no four-year-old or mature cow is eligible for entry unless she gave birth to a calf within 455 days prior to the calving for commencement of test, and in order to gain a first-class certificate, every cow, irrespective of age, must drop a calf within 455 days after calving for commencement of test. For second-class certificate an extra thirty days for calving subsequent to test is permitted, while a third-class certificate is granted if the cow fails to calve within 485 days, or proves not in calf. For the C.O.R. ten-months test the calving periods are sixty days less in each case.

A cow, in order to qualify for certificate, must produce the following minimum requirements for her age and class :—

Age.	365-day Test.	305-day Test.
	lb. Fat.	lb. Fat.
Two-years-old or under at commencement of test	275·5	250·5
Three-years-old at commencement of test . .	312·0	287·0
Four-years-old at commencement of test . .	348·5	323·5
Five-years-old or over at commencement of test	385·0	360·0

For every day the cow is over two years old she is required to give 0.1 lb. of fat more than her requirement as a two-years-old, this daily increase continuing until the cow is five years old.

Under the certificate-of-record system the owner weighs and records the weight of each and every milking during the period the cow is on test. A testing officer pays a surprise visit to the owner's farm at least once a month and makes a twenty-four-hour check. For the first milking during his visit he records the time at which the milking is made, strips the cows to ensure that they have been milked dry, and checks the milk-yield. For the remaining milkings of the twenty-four-hour visit he checks the milk-yield and takes a sample from each milking for testing. The samples are kept under lock and key or sealed until testing and are tested separately. The monthly butterfat-production is obtained by computing the total milk-yield as shown on the owner's milk-weight sheet at the test found by the testing officer. The *annual* butterfat-production is calculated by totalling the production of pounds of milk and butterfat for each month or part thereof during the one lactation period and not exceeding 365 days for the C.O.R. yearly test or 305 days for the C.O.R. 305-day test, as the case may be.

Authentication checks by means of graphs, &c., are made to ensure that the owner's milk-weights compare satisfactorily with those found by the testing officer, and where considered necessary additional check visits are carried out.

Five breeds of dairy cattle are represented in the certificate-of-record testing—namely, Jersey, Friesian, Ayrshire, Milking Shorthorn, and Red Poll—although a few cows of the Shorthorn and Guernsey breed have also been tested. The various purebred dairy cattle breeders' associations play an important part in the C.O.R. test and co-operate with the Dairy Division of the Department of Agriculture in controlling the work. All entries for testing must be made through the appropriate breed society. These associations give considerable encouragement by way of substantial monetary subsidies and numerous medals and awards. Each association publishes a herd-book, annually in the case of the Jerseys and Friesians, while these associations also publish annually a booklet embodying general information concerning the breed, together

with a list of the performances made during the year by those cows which gained certificates of record or were tested under the Government official herd-test.

The fees charged for the certificate-of-record testing are eight guineas for the first entry each year and three guineas for each additional entry within the same year.

(b) The Government official herd-test, which is an adjunct of the C.O.R. system, has been in operation since the 1927-28 season, and is open to all breeders who have at least one cow accepted for C.O.R. test. The test is confined principally to registered purebred dairy cows, although in special circumstances cows other than registered purebreds are accepted. The test covers a ten-months period. There are no special requirements relating to calving or production, and no individual certificates are granted, though owners receive a signed statement at the close of the season with particulars of the season's yield for each cow. The owner records no milk-weights. The testing officer makes a similar check to that for the C.O.R. test—twenty-four hours and at the same visit each month. A composite sample is used instead of a separate sample from each milking. The monthly yield is obtained on the basis of the testing officer's milk weights and test, and the season's yield by totalling the monthly records.

The fees charged for the Government official herd-testing are 5s. per cow per season.

(b) HISTORICAL.

Checks on the milk-producing capacity of cows doubtless date back to very early years of history, and to that far-off day when man first began to take an interest in the cow from the point of view of her ability to produce milk for household purposes. It would be noticed that some animals gave more milk and maintained their yield for a longer period than others, and the better cows in this respect would be chosen for breeding-purposes. In view of the importance of milk and milk-products to the welfare of mankind it is somewhat surprising to find that there was no organized or systematic milk recording before the middle of the nineteenth century. The introduction of a convenient test which took cognizance of the quality of milk was, of course, essential to the modern

herd-testing association, which in most countries, though not all, provides returns relating to butterfat as well as milk. The practical butterfat-test, as previously mentioned, came about 1890, though for many years prior to that date many individuals and odd-breed societies were conducting butter-tests as a means of determining the productive capacity of milch cows.

Denmark was the first country in which milk recording was organized. The first milk-recording association was established at Vejen, in Jutland, in 1895, and was followed by a second during the same year, and the movement spread rapidly from the outset. Denmark is still the leading country as regards the percentage of cows tested to the total number of dairy cows, the present figure being approximately 38 per cent. It is noted, however, that there has been no increase for several years, the position tending to remain stationary, or, if anything, to evidence a slight downward tendency.

Following is a list of dates relating to the introduction of organized dairy-cow testing in various countries throughout the world: Germany 1894, Austria and Belgium made no true beginning until after the Great War, France 1905, Hungary 1897, Norway 1898, Netherlands 1893, Sweden 1898, Ireland 1910, England and Wales 1914, Scotland 1903, Canada 1904, Australia 1912, South Africa 1917. The United States had cow-testing associations conducted by breed societies commencing in 1883, though independent associations did not first come into operation until 1906. The foregoing particulars have been taken from the monograph "Dairy Cow Testing throughout the World" published by the International Institute of Agriculture, Rome, in 1935.

THE ASSOCIATION SYSTEM.

New Zealand's first cow-testing association was organized in 1909 in the Wairarapa district. The work was carried out by the Dairy Division in co-operation with the Dalefield Dairy Co. and a number of its suppliers, 815 cows being systematically tested. During the following season the testing was continued at Dalefield and extended to Cambridge, Stratford, and Kaupokonui. The third season, 1911-12, saw two further associations in operation, these being Whangarei in the North and Stirling in the South. Woodville, Kairanga, and Tai Tapu came in 1912-13. By 1918-19 the

dairying districts of the Dominion were fairly well catered for as, in addition to the localities already named, there were cow-testing associations at Cheltenham, Konini, Riverbank, Te Rehunga, Ngaere, and Hawera.

These various organizations were conducted by the Dairy Division and were regarded as "illustration" associations, inasmuch as it was hoped that they would illustrate to dairy-farmers the method of conducting the work and the benefits to be obtained from the information relating to yield provided by the returns with which the member was supplied, both monthly and at the end of the season. No charge was made for the service for the first two seasons, by which time it was considered the movement should be sufficiently firmly entrenched to continue under its own direction. In some cases, however, it was found necessary to extend the illustration period to three years, but it is pleasing to find that practically every association founded by the Dairy Division continued to operate for many years after the Division had withdrawn its direct support.

The inaugural work regarding the establishment of herd-testing was under the supervision of Mr. W. M. Singleton, then Assistant Director of the Dairy Division.

The advantages of the association system were that it was simple and inexpensive. The principal disadvantages were that for two days a month it slowed up the milking operation, and that it placed additional work on the shoulders of the dairy-farmer at his busiest period of the year.

By 1914-15 the number of cows tested during the season had reached the 25,000 mark. Thereafter, for a year or two, the numbers declined, due partly to shortage of labour on the farms, and partly to concentration on the tremendously increased output of dairy-produce, both factors being the direct result of the Great War. The years 1920 to 1922 witnessed a revival of interest in herd-testing, and the number of tested cows rose from 17,000 in 1918-19 to 45,500 in 1921-22. It was apparent, however, that general circumstances demanded a change of system. Although the Government was still conducting a large number of associations its policy was to withdraw as rapidly as practicable in favour of private enterprise.

THE GROUP SYSTEM.

The start of a sort of second growth came with the establishment in 1922 of the Waikato Farmers' Herd-testing Association, with headquarters at Hamilton. The founding of this body was the outcome of certain activities on the part of the Waikato branch of the Farmers' Union. Copying, with modifications considered necessary to meet local requirements, a variant of the original Danish system, which was rapidly advancing in popularity in Australia, this association inaugurated what was destined to become, in a comparatively short space of time, New Zealand's principal system of testing herd cows—namely, the group test. During its first year of existence the Waikato Farmers' Herd-testing Association operated six groups, all in the South Auckland district, the number of cows tested being 6,900. The following season, 1923-24, the association was reorganized and adopted the name which it still bears—The New Zealand Co-operative Herd-testing Association. In this season groups were also operating in the Bay of Plenty, Wairarapa, and Feilding (Rangiotu) districts, while, in addition, a small group was operating at northern Wairoa. In 1925-26 the first South Island groups commenced, these being Otago and Southland and Maitara Island. This was the year that the Taranaki Co-operative Herd-testing Association began.

The group-herd-testing operations in New Zealand have developed into a thoroughly organized movement, and to-day (1935) over 90 per cent. of the cows tested are tested under this system. Practically every group organization is now registered under the Incorporated Societies Act, while the various groups are in turn affiliated with the Dominion Group Herd-testing Federation (Incorporated), established July, 1926. This organization was primarily established to standardize or assist in standardizing group-herd-testing methods throughout New Zealand and also to extend the work. Membership of the federation is confined to group-herd-testing associations registered under the Incorporated Societies Act. The expenses of the federation are met by a levy per cow on all cows tested by federated groups. This organization employs an officer, known as the federation supervisor of herd-testing, whose principal duties are to supervise the entire group-herd-testing movement with a view to standardizing practice,

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increasing efficiency, effecting economy where possible, and, where possible, assisting to extend the membership. His salary and expenses are defrayed partly by the Government and partly by the federation.

The officer referred to is Mr. C. M. Hume, who has been associated with the group-herd-testing work practically since its commencement, and whose organizing ability and enthusiasm have been largely responsible for the progress of the movement in the Dominion. Mr. Dynes Fulton also played a prominent part, particularly with regard to the foundation of the Dominion Group Herd-testing Federation, and afterwards as chairman for a number of years of the New Zealand Herd-testing Central Executive.

CALF-MARKING.

In 1925 the New Zealand Co-operative Herd-testing Association commenced a system of registering and marking heifer calves, the work later being taken over by the Dominion Group Herd-testing Federation. The mark is placed in the ear by means of tattooing. Only heifer calves from registered purebred sires and from dams that have been tested by an affiliated association are eligible for registration. The dams must be credited in the records of the association as having produced in one lactation period not exceeding 305 days, the following minimum amounts of butterfat according to age at commencement of test, viz.—

Up to 2 years 6 months ..	.. 250 lb. butterfat.
Up to 3 years 6 months ..	.. 275 lb. butterfat.
After 3½ years, mature ..	.. 300 lb. butterfat.

The principal object of the scheme is to bring about improvement in dairy herds by way of encouraging the use of purebred sires and to distinguish heifer calves with butterfat-record sires and dams. In 1926, on the formation of the Dominion Group Herd-testing Federation, the calf marking system was taken over by that body.

A certified bull scheme, conducted on similar lines, is also in operation.

SUBSIDY TO HERD-TESTING.

Since 1927 the Government has given an annual subsidy to testing dairy-herd owners and by way of assistance in establishing new organizations and extending the movement. The largest amount given in any one year was £10,500, the smallest, that for the 1934-35 season, £4,000. The Government has laid down the policy that the subsidy shall diminish at the rate of £1,000 per annum until it automatically expires. This means that the final grant will be given in 1938. In 1932 the New Zealand Dairy-produce Board also gave a grant to herd-testing, the amount being £6,000.

THE NEW ZEALAND HERD-TESTING CENTRAL EXECUTIVE.

In 1927 a small committee, known as the Herd-testing Subsidy Allocation Board, was set up to allocate the Government subsidy to herd-testing. In 1929 this developed into a more representative body under the title of the New Zealand Herd-testing Central Executive, whose purpose was not only to allocate the Government subsidy, but to advise concerning the operation of the movement generally. This is purely an advisory body with no statutory powers. The central executive comprises nine members and a secretary. The representation is as follows: The Dominion Group Herd-testing Federation, four members, one of whom acts as Chairman; the New Zealand Dairy-produce Board, one member; the Dairy Research Institute, one member; the New Zealand Dairy Breeds Federation, one member; the Department of Agriculture, two members. Mr. H. G. Philpott, of the Dairy Division, Department of Agriculture, has been Secretary to the Central Executive since its inception.

DEVELOPMENT OF HERD-TESTING.

Table 1 affords a general review of the numerical position from 1922-23—the first year of group testing—to the end of last season, 1934-35. Under the heading of *tested cows* are included all cows which have been tested twice or more.

TABLE I.

Season.	Cows in Milk and Dry.	Cows in Milk.	Tested Cows.	Percentage tested Cows to Cows in Milk.
1922-23 ..	1,248,643	1,124,671	84,825	7.5
1923-24 ..	1,312,589	1,184,977	151,214	12.7
1924-25 ..	1,323,432	1,195,567	196,850	16.4
1925-26 ..	1,303,856	1,181,441	169,776	14.4
1926-27 ..	1,303,225	1,181,545	170,150	14.4
1927-28 ..	1,352,398	1,242,729	224,130	18.0
1928-29 ..	1,371,063	1,291,204	259,594	20.1
1929-30 ..	1,440,321	1,388,872	283,731	20.4
1930-31 ..	1,601,633	1,499,532	271,404	18.0
1931-32 ..	1,702,070	1,582,664	259,857	16.4
1932-33 ..	1,845,972	1,723,913	286,054	16.5
1933-34 ..	1,932,511	1,816,402	297,647	16.4
1934-35 ..	1,952,094	1,827,962	265,944	14.5

Table 2 includes average production figures and also shows the distribution according to system. This table is based on all effective summaries received, and on all cows in milk 100 days or more, this being the classification commonly adopted in New Zealand for tabulations of this nature. Also, for statistical purposes, any records for cows in milk more than a year are corrected to 365 days. This table clearly indicates the supplanting of the "association own-sample" system by the "group" system.

TABLE 2.

Season.	Organizations.		Herds.		Cows (100 Days or over).			Average Butterfat Production 100 Days or over.
	Group.	Associa-tion.	Group.	Associa-tion.	Group.	Association.	Total.	
1922-23..	..	..	..	..	..	..	50,683	233.82
1923-24..	..	..	..	..	..	..	107,201	212.75
1924-25..	70	120	1,847	2,968	82,961	68,914	151,875	223.54
1925-26..	81	120	2,219	2,239	97,575	48,823	146,398	220.51
1926-27..	96	115	2,538	2,140	108,150	46,878	155,028	240.48
1927-28..	127	115	3,538	2,389	158,734	47,589	206,323	224.68
1928-29..	158	99	4,663	2,000	206,089	39,722	245,811	240.50
1929-30..	184	98	5,186	1,921	236,941	35,613	272,554	253.61
1930-31..	193	77	4,983	1,364	234,799	25,670	260,469	241.05
1931-32..	197	81	4,772	1,213	229,606	21,835	251,441	236.87
1932-33..	200	78	5,090	1,242	253,016	23,163	276,179	255.57
1933-34..	213	73	5,120	1,105	266,481	20,408	286,889	262.44
1934-35..	222	58	4,559	889	240,993	15,938	256,931	252.01

REORGANIZATION OF GROUP HERD-RECORDING.

Since the foregoing was written a change has been made with regard to the control of group herd-testing. On the 27th February, 1936, an Order in Council was gazetted bringing the future control of the group-herd-testing movement under the New Zealand Dairy Board, provision being made for the new organization to function as from the 1st April, 1936.

Prior to this new arrangement the only control of the work was that provided by the restricted powers of the Dominion Group Herd-testing Federation. The federation, however, was essentially a voluntary organization, and while it had been successful in making methods of group herd-testing uniform throughout the greater part of the Dominion it had no statutory power to compel affiliation nor to prevent the establishment of competitive organizations. Under the new arrangement the Board will have power to regulate and control the group-herd-testing system and the calf-marking schemes associated therewith. It will be compulsory for all group organizations to register with the Board and to abide by rules laid down by the Board, and no organization will be permitted to operate without the sanction of the Board. It is also expected that the new control will include a certain amount of association "own-sample" testing.

The actual supervisory work will be done by the committee of the Board. The Herd-testing Central Executive will be replaced by what is to be known as a Herd-recording Council, the new organization preferring the description "recording" to the old title of "testing." The Dominion Group Herd-testing Federation will cease to function except from the point of view of periodic meetings and the selection of representatives for appointment to the Herd-recording Council. Mr. C. M. Hume is to be the officer in charge of the work.

So far as finance for the new control is concerned, the Government has agreed to make certain annual grants until 1941, at which time the matter is to come up for review in the expectation that the Dairy Board will thereafter provide the whole of the necessary finance.

THE CERTIFICATE-OF-RECORD TEST.

The certificate-of-record testing of purebred dairy cows, originally known as the semi-official testing of purebred dairy cows, was, as stated previously, inaugurated by the Dairy Division of the Department of Agriculture in 1912, in co-operation with the New Zealand Jersey Cattle Breeders' Association and the Holstein-Friesian Association of New Zealand. In 1913 the New Zealand Ayrshire Cattle Breeders' Association joined up, while the Milking Shorthorns came in in 1914 and the Red Polls in 1920. Odd cows entered in the New Zealand Shorthorn Herd-book, Christchurch, were tested from 1921 onwards, while one Guernsey was tested in 1927-28 and another in 1928-29.

Table 3 provides a general numerical survey year by year and according to breed since the inception of the C.O.R. system for the various breeds. Economic conditions are almost entirely responsible for the marked variations. The most noticeable feature is perhaps the rapid increase in the proportion of Jersey cows and the gradual decline of the other breeds.

As indicated, this table relates to first-class certificates of the 365-day class. Some 443 second-class and 294 third-class certificates have been issued to date, this latter class having been in operation for only two seasons.

The C.O.R. 305-day division was inaugurated in 1930, and to the end of 1914 some 295 cows had received first-class certificates in this Division, of which 268 were Jerseys, 24 Friesians, 1 Milking Shorthorn, 1 Red Poll, and 1 Ayrshire. Only 13 second-class certificates were granted in the C.O.R. 305-day Division to the end of 1935.

Some tables relating to production, &c., are given in the third section of this volume. Full summaries of the C.O.R. work are published annually in the Department's *Journal of Agriculture*.

Mention might well be made here, however, of some outstanding individual performances. To the end of 1935, ten cows had gained first-class certificates on records exceeding 1,000 lb. butterfat,

TABLE 3.—CERTIFICATE-OF-RECORD TEST: NUMBER OF COWS WHICH HAVE RECEIVED FIRST-CLASS CERTIFICATES-OF-RECORD (YEARLY DIVISION) SINCE THE COMMENCEMENT OF THE SYSTEM.
(BASIS OF YEAR ENDING 31ST DECEMBER.)

Breed.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	Total.	
Jersey	..	66	103	91	94	94	113	150	227	339	351	518	583	501	371	333	328	315	454	459	317	337	415	352	6,911
Friesian	..	48	67	62	44	62	57	54	82	128	136	129	148	107	94	65	66	68	78	74	56	54	41	44	1,764
Ayrshire	17	12	9	4	4	2	5	10	18	17	23	20	15	16	3	6	13	11	6	5	2	1	219
Milking Shorthorn	2	7	21	22	53	59	31	25	24	32	24	9	25	10	26	21	17	16	11	9	10	454
Red Poll	12	8	3	6	6	8	10	2	1	2	1	3	..	6	1	69
Shorthorn	5	1	..	..	..	..	..	..	..	..	..	1	..	..	7
Guernsey	1	1	..	..	..	..	..	..	2
	114	187	167	154	181	196	259	373	520	543	692	792	658	497	449	410	417	568	562	398	408	473	408	9,426	

one cow having twice qualified for this distinction. Particulars are as follows:—

TABLE 4.

Name of Cow.	Breed.	Yield.			Age at Start of Test.	
		Days.	Milk.	Butterfat.	Yrs.	Dys.
			lb.	lb.		
Woodlands Felicie ..	Jersey ..	365	17,332·6	1,220·89	4	364
Alcartra Clotilde Pietje ..	Friesian ..	365	31,312·5	1,145·24	7	357
Totara C.R. Buttercup ..	Friesian ..	365	27,108·1	1,079·14	4	267
Ivondale Tiny Heather ..	Jersey ..	365	17,419·5	1,061·30	4	273
Holly Oak's Annie ..	Jersey ..	365	18,522·7	1,056·49	5	9
Totara C.R. Buttercup ..	Friesian ..	365	28,073·0	1,050·07	5	308
Hilda Minto de Kol ..	Friesian ..	365	27,773·8	1,046·31	12	56
Vivandiere ..	Jersey ..	365	17,282·1	1,036·09	6	10
Totara Sylvia Colantha ..	Friesian ..	365	26,310·1	1,024·37	5	229
Pretty's Flirt ..	Jersey ..	365	16,684·1	1,010·49	6	353
Monavale Queen Bess ..	Friesian ..	365	26,461·8	1,002·20	7	363

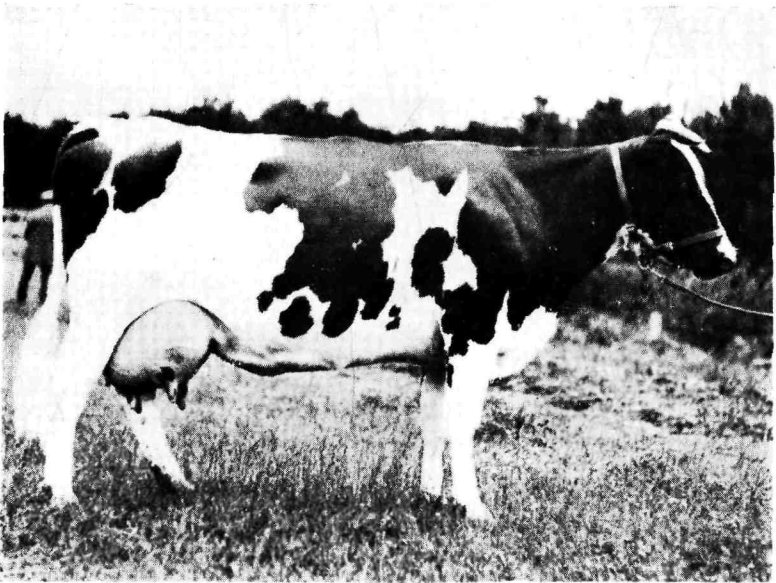
In regard to these records it should be mentioned that the New Zealand system does not unduly encourage concentration on individual performances, the policy of the Dairy Division being to bring about a higher average standard of purebred dairy cow. The C.O.R. rules have very strict provisions regarding period between calving and feeding of dairy cows, while it is not permissible to milk any cow more than three times daily while on test, all of which tends to limit extremely high production in comparison with the more lenient conditions obtaining in most other countries.

EXPORT OF PUREBRED DAIRY CATTLE.

The certificate-of-record testing system had been in operation for only a few years when butterfat records under this test began to attract the attention of buyers from outside New Zealand, with the result that an export trade in purebred dairy cattle was initiated. Many intending purchasers have visited this Dominion for the purpose of making their own choice, though in recent years the tendency has been to leave the selection in the hands of certain firms which have specialized in the sale of pedigree dairy cattle. Messrs. Wright, Stephenson, and Co., Ltd., and the New Zealand Loan and Mercantile Agency Co., Ltd., have been especially prominent in this line of business.



FRIESIAN BULL, "TOTARA PONTLAC CLOTHILDE REFORMER."



FRIESIAN COW, "ALCARTRA CLOTHILDE PIETJE."
C.O.R.: 31,312.5 lb. milk; 1,145.24 lb. butterfat.

[To face page 366.]

The first consignment worthy of mention was made in 1919, when 61 Friesians, valued for Customs purposes at £3,045, were exported, some to Australia and some to the Pacific Islands. In 1920 the number rose to 162, some of which went to Java. A peak was reached in 1923, when 203 head of dairy cattle, valued at £8,650, left our shores. In recent years the trade has dwindled almost to insignificance, the 1933 figure being 18 animals valued at £589, though the 1934 total was favourably affected by a shipment of 248 head, Friesians and Jerseys, to China.

From 1919 to 1935 over 1,600 purebred dairy cattle, valued at nearly £60,000, were exported from New Zealand to destinations as varied as Australia, Tasmania, Java, Fiji, Samoa, Tonga, New Caledonia, South Africa, Patagonia, Argentine, and Shanghai. While many of the animals were of such superior quality that we could ill afford to lose them, the fact that purchasers have been attracted from so far afield must be accepted as a tribute to the work of our breeders and to the quality of their stock. The position is also indicative of the world-wide recognition of certificates of production issued under our various testing systems.

GOVERNMENT OFFICIAL HERD-TESTING.

There is nothing to be said concerning this system from an historical point of view beyond the fact that it was inaugurated by the Dairy Division in 1927.

Table 5 indicates that, comparatively, the Government official herd-testing system has been well supported.

NUMBER OF REGISTERED PUREBRED COWS TESTED UNDER THE GOVERNMENT OFFICIAL HERD-TEST SINCE THE COMMENCEMENT OF THE SYSTEM. THE TABLE INCLUDES ALL COWS WHICH REMAINED ON TEST 180 DAYS OR MORE. (BASIS OF YEAR ENDING 30TH SEPTEMBER.)

Breed.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	Total.
Jersey ..	605	817	643	1,187	998	1,087	1,393	1,368	8,098
Friesian ..	376	546	399	632	269	253	399	285	3,169
Ayrshire ..	65	106	97	42	37	31	25	31	434
Milking Short-horn	53	108	131	128	174	125	142	182	1,043
Red Poll ..	28	59	34	19	18	29	25	4	216
Guernsey ..	..	..	..	..	..	..	5	6	11
Shorthorn ..	..	..	..	..	..	..	6	..	6
	1,127	1,636	1,304	2,008	1,506	1,525	1,995	1,876	12,977

CHAPTER XIV.

MAORI DAIRY-FARMERS.

VISITORS to New Zealand have often expressed surprise, when considering the magnitude of the dairy industry and the large area of land held by Natives, that more Maori dairy-farmers were not established. Most of the land owned by the Maoris, however, is in large blocks held under the communal system, and it is only within the last twenty years or so that portions have been individualized, and as much of the land was remote from means of transport there was no necessity or inducement for the Maoris to grow more than sufficient for their own requirements.

The individualizing of the land title has done much to provide an opportunity for the Maori to develop his initiative and ability to become a farmer, but too often he was left with insufficient money to work the land and was denied the opportunity of obtaining finance from the usual sources available to the pakeha. Furthermore, much of the Native land was still in its natural state, being covered with fern and tea-tree, and in some parts was light, pumaceous country regarded by both pakeha and Maori as being useless for dairy-farming. With the advent of modern farming methods and top-dressing, the aspect has been changed, as the heavy land and other selected areas previously farmed by the Natives does not now hold the same advantages where pastoral pursuits are practised.

In 1929 the Government enacted legislation giving authority for the development of Native lands and Native-owned land, with Native labour, out of funds supplied by the State.

The development and settlement of Native lands had for its primary object the promotion of the welfare of the Maoris and their education as farmers, as well as the development and settlement of the land. The menfolk were to provide the man-power

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under competent instruction, and in this way receive the necessary tuition in land-development and general farming. Experience has shown that the Maoris are readily adaptable and display enthusiasm and industry in the working of their areas. Much of this enthusiasm was created by Lord Bledisloe, Governor-General of New Zealand, who recognized that before the Maori could become a successful farmer he must cultivate independence and emulation. With this end in view Lord Bledisloe presented the "Ahuwhenua Trophy," with an endowment fund to provide suitable medals for annual competition. In making the awards the judges take into consideration initiative in good husbandry, economy of management, neatness and cleanliness of buildings, general progress of farm, and the wise expenditure of money.

Under the general Native land development scheme there are seventy-four separate development schemes being actively worked, these embracing a total of 653,744 acres. The schemes extend from the north of the North Island to the south of the South Island. At the end of March, 1935, over 100,000 acres had been developed, and of this sufficient was utilized to milk nearly 23,000 cows and to graze 12,000 young cattle for future use. Obviously, therefore, dairying by Maoris under the development scheme has just commenced. While, however, Native dairy-farmers are to be found in many parts of both Islands, the more important dairying section so far as their part in factory dairying is concerned lies towards the East Coast of the North Island.

The Opouriao Dairy Co., in 1907, established a cheese factory at Ruatoki, and this is recognized as the first dairy factory to have the greater proportion of its milk-supply delivered by Maoris. The quality of the cheese has always been of a high standard, and at the Panama-Pacific Exhibition in 1915 this factory won first prize for Cheddar cheese. The Maoris have continued to supply, and at the present time number over eighty.

In 1920 the Rev. Father Langerwerf was instrumental in establishing a butter factory at Waahi, near Tokaanu, and to him must be given the credit for the establishment of the first dairy factory where all the directors and suppliers were Maoris. A well-constructed factory of good design was built and carried on for a few years, but eventually had to close down owing to lack

of finance for the further development of the country in so restricted an area, but while the Tuwharetoa Dairy Factory, as it was called, has ceased to function, it marks a step in the dairying history of Maoris in New Zealand.

In 1925 a simultaneous movement was initiated at Te Kaha and Ruatoria to form dairy companies among the Maoris, and as a result the Te Kaha and the Ngatiporou dairy companies were established in that year. Both were butter-manufacturing concerns. The Te Kaha Co. has had a somewhat chequered career, but is now emerging from its pioneer stage, one of the principal difficulties—namely, the transport of cream—now being overcome. It is pleasing to be able to record that a number of the original suppliers are still supplying and that many of them have reached the stage where they can finance through the merchants. Credit is due to the Native land development scheme for increasing the supply to this company and thus bringing the cost of manufacture down to a payable basis.

The Ngatiporou Dairy Co. at Ruatoria was a success right from the commencement, due largely to the fact that the country from which the cream is drawn is more compact and was in a more advanced stage of grass production. The quality of the butter from this factory compares favourably with that of any district in New Zealand.

The name of the Hon. Sir Apirana Ngata, at one time Minister of Native Affairs, should be recorded because of the prominent part which he played in regard to Native-land development, and in the establishment of Native dairy-farming on the East Coast.

In many districts throughout the Auckland Province Native land has been developed and settled under the Native land development scheme, and there are now some hundreds of Native suppliers sending their cream to the nearest dairy factory. Over 40 per cent. of the suppliers to the Hokianga Dairy Co., North Auckland, are Maoris. Modern transport has made it practicable to collect cream from outlying districts, and with the supervision which the Natives receive there is no reason why the success of the Maori as a dairy-farmer is not assured.

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For information relating to the early history of dairying in New Zealand it has been necessary to rely principally on newspapers, journals, and various reports, particularly for the period from colonization (1840) to about 1900. There are, however, a number of books which it has been found advantageous to read for the purpose of obtaining a correct background as well as for many valuable items which directly concern the work in hand. The student is likely to find useful fragments of knowledge in most unsuspected places.

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SECTION III.

Statistics relating to the New Zealand Dairy Industry.

TABLE I.—VALUE OF BUTTER AND CHEESE EXPORTS FROM NEW ZEALAND IN COMPARISON WITH TOTAL EXPORTS.

Year.	Value of Total Exports from New Zealand (excluding Specie).	Value of Butter and Cheese Exports.	Percentage of Butter and Cheese Exports.	
	£	£	Per Cent.	
1841	10,836	} Not available prior to 1853.		
1842	13,670			
1843	53,945			
1844	49,647			
1845	76,911			
1846	82,656			
1847	45,485			
1848	44,215			
1849	133,662			
1850	194,000*			
1851	244,000*			
1852	278,000*			
1853	303,282		11,599	3·82
1854	320,890		8,374	2·61
1855	365,867		7,949	2·17
1856	318,433	5,251	1·65	
1857	369,394	3,920	1·06	
1858	433,949	6,833	1·57	
1859	521,308	9,884	1·89	
1860	549,133	10,158	1·85	
1861	1,339,241	1,970	0·15	
1862	2,358,020	1,381	0·06	
1863	3,342,891	130	0·00	
1864	3,050,634	1,219	0·04	
1865	3,503,421	246	0·01	
1866	4,396,100	1,655	0·04	
1867	4,479,464	554	0·01	
1868	4,268,762	1,772	0·04	
1869	4,090,134	22,719	0·55	
1870	4,544,682	22,322	0·49	
1871	5,171,104	16,449	0·32	
1872	5,107,186	8,841	0·17	
1873	5,477,970	8,967	0·16	
1874	5,152,143	5,576	0·11	
1875	5,475,844	2,522	0·05	
1876	5,488,901	7,398	0·13	
1877	6,078,484	40,171	0·66	
1878	5,780,508	21,479	0·37	
1879	5,563,455	2,259	0·04	
1880	6,102,400	10,333	0·17	
1881	5,762,250	14,608	0·25	
1882	6,395,465	62,218	0·97	
1883	7,012,028	48,912	0·70	
1884	7,090,227	91,667	1·29	

* Estimated.

TABLE 1.—VALUE OF BUTTER AND CHEESE EXPORTS FROM NEW ZEALAND
IN COMPARISON WITH TOTAL EXPORTS—*continued.*

Year.	Value of Total Exports from New Zealand (excluding Specie).	Value of Butter and Cheese Exports.	Percentage of Butter and Cheese Exports.
	£	£	Per Cent.
1885	6,738,862	138,129	2·05
1886	6,534,513	151,194	2·31
1887	6,680,772	109,483	1·64
1888	7,403,206	197,170	2·66
1889	9,183,954	213,945	2·33
1890	9,569,316	207,687	2·17
1891	9,560,859	236,933	2·48
1892	9,490,920	318,204	3·35
1893	8,680,845	354,271	4·08
1894	9,221,550	366,483	3·97
1895	8,518,119	378,510	4·44
1896	9,299,907	411,882	4·43
1897	9,741,222	553,122	5·68
1898	10,449,838	539,466	5·16
1899	11,923,422	713,617	5·98
1900	13,223,258	969,731	7·33
1901	12,869,810	1,121,091	8·71
1902	13,635,459	1,369,341	10·04
1903	14,971,926	1,513,065	10·11
1904	14,738,750	1,565,946	10·62
1905	15,642,069	1,613,728	10·32
1906	17,992,480	1,901,237	10·57
1907	20,061,641	2,277,700	11·35
1908	16,075,205	1,954,601	12·16
1909	19,636,151	2,744,770	13·98
1910	22,152,473	3,007,348	13·57
1911	18,980,185	2,768,974	14·59
1912	21,511,626	3,769,202	17·52
1913	22,810,363	3,831,948	16·80
1914	26,253,925	4,902,701	18·67
1915	31,430,822	5,430,836	17·28
1916	33,281,057	6,146,603	18·47
1917	31,517,072	5,980,802	18·98
1918	28,480,578	7,489,501	26·29
1919	53,907,925	10,871,118	20·17
1920	46,405,366	9,183,175	19·79
1921	44,828,460	19,368,713	43·21
1922	42,725,949	13,728,404	32·13
1923	45,939,793	17,559,597	38·22
1924	52,509,223	18,664,965	35·54
1925	55,243,047	16,040,940	29·04
1926	45,268,924	14,634,547	32·33
1927	48,496,354	16,497,779	34·02
1928	55,570,381	17,996,618	32·38
1929	54,930,063	20,245,490	36·86
1930	44,940,517	18,292,494	40·70
1931	34,950,698	15,110,820	43·23
1932	35,609,919	15,590,321	43·78
1933	41,005,919	16,415,050	40·03
1934	47,342,847	14,737,225	37·46
1935	46,538,678	17,993,252	38·66

—Government Statistician.

TABLE 2.—IMPORTS OF BUTTER AND CHEESE INTO THE UNITED KINGDOM, YEAR ENDING 31ST DECEMBER.

Butter.

Year.	Imports, New Zealand.	Total Imports.	Percentage, New Zealand.	Value, New Zealand.	Value, Total.
	Tons.	Tons.	Per Cent.	£	£
1894.. ..	3,281	128,742	2·54	318,575	13,456,699
1895.. ..	2,663	141,283	1·88	232,009	14,245,230
1896.. ..	2,819	151,886	1·85	277,898	15,344,364
1897.. ..	3,826	160,890	2·37	366,956	15,916,917
1898.. ..	3,497	160,458	2·17	338,400	15,961,783
1899.. ..	5,582	169,493	3·29	543,367	17,213,516
1900.. ..	8,194	168,926	4·85	784,054	17,450,435
1901.. ..	8,368	185,145	4·51	819,534	19,297,396
1902.. ..	7,900	198,747	3·97	781,872	20,526,690
1903.. ..	12,494	203,035	6·15	1,245,022	20,798,707
1904.. ..	14,749	212,050	6·95	1,394,455	21,117,162
1905.. ..	15,020	207,313	7·24	1,467,628	21,586,622
1906.. ..	15,583	216,862	7·18	1,626,997	23,460,196
1907.. ..	15,693	210,507	7·45	1,599,226	22,417,926
1908.. ..	11,069	210,541	5·25	1,250,211	24,080,912
1909.. ..	13,929	203,140	6·85	1,472,219	22,424,962
1910.. ..	18,133	216,276	8·38	2,001,393	24,493,450
1911.. ..	13,822	215,134	6·42	1,495,242	24,600,619
1912.. ..	17,450	200,257	8·71	2,148,192	24,354,193
1913.. ..	12,583	206,951	6·08	1,351,285	24,083,658
1914.. ..	17,896	199,210	8·98	2,100,958	24,014,276
1915.. ..	18,744	192,692	9·72	2,693,808	27,022,745
1916.. ..	16,558	108,770	15·22	2,727,645	18,964,002
1917.. ..	15,546	90,326	17·21	3,195,608	18,895,707
1918.. ..	18,628	78,932	23·60	4,599,166	19,769,738
1919.. ..	15,943	78,010	20·43	3,910,432	19,854,427
1920.. ..	13,770	85,110	16·17	3,828,280	24,518,748
1921.. ..	35,469	176,198	20·13	8,494,063	42,339,947
1922.. ..	55,172	213,428	25·85	9,340,703	37,315,536
1923.. ..	56,538	254,775	22·19	10,205,809	44,234,534
1924.. ..	54,097	264,362	20·46	9,956,812	49,647,492
1925.. ..	62,771	292,662	21·44	10,788,865	53,204,417
1926.. ..	57,694	290,942	19·82	9,607,459	48,283,312
1927.. ..	62,623	290,930	21·52	10,320,248	48,204,721
1928.. ..	61,113	305,643	19·99	10,228,352	52,044,506
1929.. ..	65,189	319,863	20·38	11,277,012	54,706,404
1930.. ..	78,221	341,081	22·93	10,785,724	46,869,697
1931.. ..	96,280	403,003	23·89	10,773,553	46,297,585
1932.. ..	107,014	418,218	25·58	10,857,148	41,055,142
1933.. ..	125,590	441,584	28·44	10,192,133	34,340,921
1934.. ..	133,839	484,769	27·60	9,826,193	33,271,706
1935.. ..	131,876	480,431	27·44	11,575,756	39,337,657

TABLE 2.—IMPORTS OF BUTTER AND CHEESE INTO THE UNITED KINGDOM, YEAR ENDING 31ST DECEMBER—*continued*.
Cheese.*

Year.	Imports, Australasia.	Total Imports.	Percentage, Australasia.	Value, Australasia.	Value, Total.
	Tons.	Tons.	Per Cent.	£	£
1894.. ..	2,718	113,307	2·39	137,520	5,474,940
1895.. ..	4,638	106,691	4·34	219,645	4,675,130
1896.. ..	2,757	112,226	2·45	115,479	4,900,342
1897.. ..	3,430	130,159	2·63	161,776	5,885,521
1898.. ..	2,230	116,972	1·90	91,161	4,970,242
1899.. ..	1,614	119,203	1·35	72,318	5,503,004
1900.. ..	4,050	135,294	2·99	218,376	6,837,883

Year.	Imports, New Zealand.	Total Imports.	Percentage, New Zealand.	Value, New Zealand.	Value, Total.
	Tons.	Tons.	Per Cent.	£	£
1901.. ..	3,955	129,342	3·05	193,149	6,227,135
1902.. ..	2,594	127,311	2·03	131,036	6,412,002
1903.. ..	2,817	134,718	2·09	168,071	7,054,710
1904.. ..	4,247	127,714	3·32	217,286	5,843,770
1905.. ..	3,931	122,134	3·21	203,344	6,339,811
1906.. ..	6,310	131,939	4·78	370,666	7,607,641
1907.. ..	9,615	118,611	8·10	586,683	6,905,509
1908.. ..	13,249	115,304	11·49	801,131	6,684,203
1909.. ..	18,426	119,504	15·41	1,113,714	6,829,863
1910.. ..	22,689	122,817	18·47	1,310,550	6,809,876
1911.. ..	19,892	117,416	16·94	1,209,549	7,140,042
1912.. ..	27,195	115,439	23·55	1,882,840	7,414,091
1913.. ..	27,359	114,862	23·81	1,685,472	7,035,039
1914.. ..	37,120	121,693	30·50	2,432,117	7,966,162
1915.. ..	35,466	136,326	26·01	3,081,465	11,107,100
1916.. ..	33,360	130,206	25·62	3,352,195	12,945,765
1917.. ..	30,485	147,303	20·69	4,000,665	19,462,390
1918.. ..	30,532	117,855	25·90	3,849,695	15,905,858
1919.. ..	61,977	109,512	56·59	8,455,199	15,170,620
1920.. ..	63,032	137,513	45·83	9,279,901	20,633,946
1921.. ..	65,138	140,873	46·23	8,728,777	17,446,521
1922.. ..	64,738	132,967	48·68	5,883,957	12,437,818
1923.. ..	68,432	141,927	48·21	7,507,511	15,260,707
1924.. ..	73,964	144,375	51·23	6,832,870	13,552,406
1925.. ..	69,575	154,935	44·90	6,726,780	15,696,800
1926.. ..	74,845	150,702	49·66	7,053,025	13,940,648
1927.. ..	80,593	147,454	54·65	7,173,947	13,493,668
1928.. ..	77,718	150,261	51·72	7,586,336	14,997,173
1929.. ..	90,059	149,701	60·15	8,299,734	13,912,535
1930.. ..	98,045	155,615	63·00	7,821,634	12,602,974
1931.. ..	86,631	144,289	60·03	4,947,571	9,062,707
1932.. ..	92,456	150,155	61·57	5,435,623	9,089,757
1933.. ..	102,969	151,972	67·75	4,888,002	7,611,726
1934.. ..	104,602	149,426	70·00	4,677,375	7,014,517
1935.. ..	88,154	135,666	64·97	4,198,400	6,647,341

* Figures for Australia and New Zealand not shown separately for cheese until 1901. Australian quantities, however, for the years affected were unimportant.

—Trade and Navigation Returns.

TABLE 3.—NEW ZEALAND EXPORTS OF BUTTER AND CHEESE, YEAR
ENDING 31ST MARCH.

Year.	Butter.		Cheese.		Total Butter and Cheese.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Cwt.	£	Cwt.	£	Cwt.	£
1853 ..	1,039	7,507	808	4,092	1,847	11,599
1854 ..	807	7,399	169	976	967	8,374
1855 ..	785	5,786	406	2,163	1,191	7,949
1856 ..	647	3,837	290	1,414	937	5,251
1857 ..	382	2,102	549	1,818	931	3,920
1858 ..	532	2,838	934	3,995	1,466	6,833
1859 ..	859	5,588	1,067	4,296	1,926	9,874
1860 ..	1,026	6,623	810	3,535	1,836	10,158
1861 ..	25	126	404	1,844	429	1,970
1862 ..	Butter and cheese not available separately for years 1862-1865. The total export for this period was 617 cwt., value £2,976				}	}
1863 ..						
1864 ..						
1865 ..						
1866 ..	232	1,590	13	65			245	1,655
1867 ..	38	192	90	362	128	554
1868 ..	138	532	335	1,240	473	1,772
1869 ..	2,705	14,070	2,331	8,040	5,036	22,710
1870 ..	3,435	12,995	2,735	9,327	6,170	22,322
1871 ..	4,342	12,426	1,619	4,023	5,961	16,449
1872 ..	1,629	4,462	1,362	4,379	2,991	8,841
1873 ..	722	2,342	1,993	6,625	2,715	8,967
1874 ..	357	1,168	1,326	4,408	1,683	5,576
1875 ..	104	660	442	1,862	546	2,522
1876 ..	871	3,910	885	3,488	1,756	7,398
1877 ..	5,206	23,458	4,999	16,713	10,205	40,171
1878 ..	3,106	12,111	3,019	9,368	6,125	21,479
1879 ..	339	1,631	172	628	511	2,259
1880 ..	2,717	8,350	717	1,983	3,434	10,333
1881 ..	2,426	8,496	3,056	6,112	5,482	14,608
1882 ..	11,264	52,088	3,553	10,130	14,817	62,218
1883 ..	8,869	42,020	2,519	6,892	11,388	48,912
1884 ..	15,766	66,593	10,342	25,074	26,108	91,667
1885 ..	24,923	102,387	15,245	35,742	40,168	138,129
1886 ..	23,175	105,537	16,429	45,657	39,604	151,194
1887 ..	17,018	54,921	23,913	54,562	40,931	109,483
1888 ..	29,995	118,252	36,682	78,918	66,677	197,170
1889 ..	37,955	148,840	26,558	67,105	64,513	215,945
1890 ..	34,816	122,701	40,451	84,986	75,267	207,687
1891 ..	39,430	150,258	39,770	86,675	79,200	230,933
1892 ..	53,930	227,162	41,493	91,042	95,423	318,204
1893 ..	58,147	254,645	46,198	99,626	104,345	354,271
1894 ..	60,771	251,280	55,655	115,203	116,426	360,483
1895 ..	66,283	263,244	79,650	160,383	145,933	423,627
1896 ..	60,066	241,151	71,474	132,039	131,540	373,190
1897 ..	75,287	297,518	71,663	135,711	146,950	433,229
1898 ..	106,840	429,407	78,705	154,144	185,545	583,551
1899 ..	102,479	433,481	50,409	100,992	152,888	534,473
1900 ..	161,792	693,701	98,001	208,258	259,793	901,959
1901 ..	184,853	790,160	109,152	248,883	293,705	1,039,043
1902 ..	219,493	983,224	86,476	189,992	305,969	1,173,216

TABLE 3.—NEW ZEALAND EXPORTS OF BUTTER AND CHEESE, YEAR ENDING 31ST MARCH—*continued.*

Year.	Butter.		Cheese.		Total Butter and Cheese.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Cwt.	£	Cwt.	£	Cwt.	£
1903 ..	263,196	1,268,759	74,611	181,604	337,807	1,450,363
1904 ..	314,319	1,416,484	86,535	206,870	400,854	1,623,354
1905 ..	342,853	1,514,156	82,421	180,874	425,274	1,695,030
1906 ..	299,445	1,443,153	107,503	257,171	406,948	1,700,324
1907 ..	308,330	1,522,113	162,913	449,676	471,243	1,971,789
1908 ..	270,748	1,333,057	260,765	745,099	531,513	2,078,156
1909 ..	275,974	1,422,291	310,087	865,468	586,061	2,287,759
1910 ..	322,070	1,635,373	441,787	1,180,708	763,857	2,822,081
1911 ..	367,496	1,878,320	456,371	1,222,364	823,867	3,100,684
1912 ..	327,282	1,776,440	463,610	1,297,088	790,892	3,073,528
1913 ..	369,008	2,058,683	634,170	1,859,179	1,003,178	3,917,862
1914 ..	395,169	2,140,019	782,371	2,195,278	1,177,540	4,335,297
1915 ..	417,138	2,299,473	791,605	2,387,828	1,208,743	4,687,301
1916 ..	397,533	2,764,945	863,134	3,033,227	1,260,667	5,798,172
1917 ..	355,782	2,787,487	772,395	3,100,168	1,128,177	5,887,655
1918 ..	316,456	2,507,546	985,170	4,461,957	1,301,626	6,969,503
1919 ..	429,627	3,543,724	990,687	4,666,944	1,420,314	8,210,668
1920 ..	310,283	2,832,991	1,540,949	7,720,366	1,851,232	10,553,357
1921 ..	476,730	6,114,464	1,208,263	6,514,519	1,684,993	12,628,983
1922 ..	889,634	8,885,820	1,396,844	7,615,254	2,286,478	16,501,074
1923 ..	1,215,351	10,324,574	1,274,354	5,324,754	2,489,705	15,649,328
1924 ..	1,200,460	10,445,832	1,589,017	7,354,651	2,789,477	17,800,483
1925 ..	1,370,034	12,063,265	1,454,708	6,161,580	2,824,742	18,224,845
1926 ..	1,156,326	9,368,371	1,347,638	5,829,548	2,503,964	15,197,919
1927 ..	1,238,032	9,033,381	1,515,525	5,774,113	2,753,557	14,807,494
1928 ..	1,578,299	11,964,431	1,564,449	6,092,900	3,142,748	18,057,331
1929 ..	1,605,565	13,041,494	1,709,167	7,296,804	3,314,732	20,338,298
1930 ..	1,599,397	12,022,330	1,618,537	6,180,213	3,217,934	18,202,543
1931 ..	1,841,245	10,513,684	1,875,380	5,964,699	3,716,625	16,478,383
1932 ..	1,906,499	9,823,035	1,499,216	4,069,450	3,405,715	13,892,485
1933 ..	2,355,664	10,936,216	1,892,708	5,025,884	4,248,372	15,962,100
1934 ..	2,740,973	11,691,541	1,964,535	4,683,480	4,705,508	16,375,021
1935 ..	2,701,320	10,928,353	1,938,228	4,645,863	4,639,548	15,574,216

—*Customs Returns.*

TABLE 4.—EXPORTS OF NEW ZEALAND DAIRY-PRODUCE OTHER THAN BUTTER AND CHEESE, QUANTITIES AND VALUES.
(Value in New Zealand currency.)

Year.	Condensed Milk.		Dried Milk.			
			Full Cream.		Other than Full Cream.	
	lb.	£	lb.	£	lb.	£
1888 .. ..	..	20	..	..	..	..
1889	4,464	83	..	..	..	..
1890	48	2	..	..	..	..
1891 .. ..	..	..	..	..	..	..
1892 .. ..	..	..	..	..	..	..
1893	288	7	..	..	..	..
1894	15,344	262	..	..	..	..
1895	3,376	76	..	..	..	..
1896	23,280	412	..	..	..	..
1897	47,484	913	..	..	..	..
1898	493,656	9,429	..	..	..	..
1899	643,559	12,012	..	..	..	..
1900	560,528	10,526	..	..	..	..
1901	945,772	17,805	..	..	..	..
1902	614,708	12,305	..	..	..	..
1903	636,942	12,588	..	..	..	..
1904	263,243	5,230	..	..	..	..
1905	755,039	16,597	..	..	..	..
1906	484,493	10,420	..	..	..	..
1907	81,411	1,976	..	..	..	..
1908	80,071	1,619	..	..	..	..
1909	91,680	3,014	..	..	..	..
1910	235,590	5,326	..	..	..	..
1911	281,527	6,898	..	..	..	..
1912	32,392	671	..	..	..	..
1913	17,184	359	..	..	..	..
1914	47,983	791*	..	..	..	..
1915	1,175,106	20,388*	..	..	..	..
1916	984,035	23,780*	..	..	..	..
1917	4,103,849	153,538*	..	..	..	..
1918	7,061,830	341,797*	..	..	..	..
1919	2,146,438	66,345	..	8,348,241	512,921	..
1920	1,791,890	85,793	..	12,158,136	709,819	..
1921	3,028,868	147,604	..	15,567,524	961,727	..
1922	1,482,447	66,956	..	9,938,885	462,694	..
1923	1,442,932	46,786	..	14,778,065	466,709	..
1924	1,407,539	44,881	5,242,790	303,917	6,830,924	156,300
1925	1,144,306	35,693	4,629,803	252,351	7,968,518	137,694
1926	1,224,926	35,278	4,249,562	222,956	5,850,292	86,838
1927	1,556,695	38,240	4,695,102	212,707	6,170,588	95,394
1928	1,366,567	33,049	3,442,177	162,206	12,409,909	197,197
1929	2,175,211	51,379	4,799,007	195,682	6,761,880	105,526
1930	2,330,612	49,651	4,078,897	161,466	8,791,326	140,222
1931	1,004,215	20,990	2,918,719	104,422	8,922,460	121,071
1932	1,812,529	32,422	3,032,894	107,801	11,187,752	128,898
1933	1,960,689	35,386	4,449,724	148,135	11,229,659	132,443
1934	4,369,328	69,169	5,161,813	182,527	12,331,309	156,012
1935	6,205,078	98,508	4,199,267	151,073	10,378,735	121,309

* Includes dried milk not separately stated.

TABLE 4.—EXPORTS OF NEW ZEALAND DAIRY-PRODUCE OTHER THAN BUTTER AND CHEESE, QUANTITIES AND VALUES—*continued.*

(Value in New Zealand currency.)

Year.	Total Milk and Cream, Preserved, Condensed, Evaporated, or Dried.		Casein.		Sugar of Milk.	
	lb.	£	Cwt.	£	lb.	£
1888 .. ..	..	20	..	..	..	..
1889	4,464	83	..	..	..	..
1890	48	2	..	..	..	..
1891 .. ..	..	..	..	..	..	..
1892 .. ..	..	..	..	..	..	..
1893	288	7	..	..	..	..
1894	15,344	262	..	..	..	..
1895	3,376	76	..	..	..	..
1896	23,280	412	..	..	..	..
1897	47,484	913	..	..	..	..
1898	493,656	9,429	..	..	..	..
1899	643,559	12,012	..	..	..	..
1900	560,528	10,526	..	..	..	..
1901	945,772	17,805	..	..	..	..
1902	614,708	12,305	..	..	..	..
1903	636,942	12,588	..	..	..	..
1904	263,243	5,230	..	..	..	..
1905	755,039	16,597	..	..	..	..
1906	484,493	10,440	..	..	..	..
1907	81,411	1,976	..	..	..	..
1908	80,071	1,619	..	..	..	..
1909	91,680	3,014	..	..	..	..
1910	235,590	5,326	..	..	..	..
1911	281,527	6,898	..	..	..	..
1912	32,392	671	640	960	..	..
1913	17,184	359	4,280	6,452	..	..
1914	47,983	791	5,954	8,707	..	..
1915	1,175,106	20,388	1,915	3,587	47,500*	1,066
1916	984,035	23,780	4,029	10,216	227,000*	7,047
1917	4,103,849	153,538	5,179	12,564	332,000*	12,097
1918	7,061,830	341,797	1,235	4,937	512,000*	19,825
1919	10,494,679	579,266	15,501	60,122	528,500*	20,914
1920	13,950,026	795,612	26,563	86,521	1,700*	80
1921	18,596,392	1,109,331	33,071	114,511	5,800*	225
1922	11,421,332	529,650	29,385	77,210	64,500*	2,246
1923	16,220,997	513,495	50,288	182,112	423,780	17,174
1924	13,481,253	505,098	46,210	129,775	280,190	10,607
1925	13,742,627	425,738	43,908	110,171	140,870	4,719
1926	11,324,780	345,072	36,460	106,251	267,232	9,614
1927	12,422,385	346,341	46,763	141,388	173,509	6,605
1928	17,218,653	392,452	42,134	133,859	320,972	10,292
1929	13,736,098	352,587	57,206	167,972	297,920	4,684
1930	15,200,835	351,339	57,309	155,575	231,533	4,415
1931	12,845,394	246,483	52,917	88,720	92,960	2,246
1932	16,033,175	269,121	42,770	59,029	173,600	4,766
1933	17,640,072	315,964	48,674	93,742	439,148	11,522
1934	21,562,450	407,708	57,744	149,666	466,222	12,046
1935	20,783,080	370,890	65,167	161,700	289,016	7,754

* Estimated quantities.

—Figures taken from Customs Returns.

TABLE 5.—EXPORTS OF NEW ZEALAND BUTTER AND CHEESE TO VARIOUS COUNTRIES (EXCLUDING RE-EXPORTS OF FOREIGN PRODUCE).
(All quantities in hundredweights.)

Year.	United Kingdom.		New South Wales.		Victoria.		Queensland.	
	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.
1868	36	1	80	197	2	121	..	..
1869	14	..	10	9	2,549	2,316	..	..
1870	1,831	16	51	42	1,292	2,604	..	..
1871	3,526	433	59	231	219	799	..	..
1872	1,409	53	..	628	50	517	..	..
1873	244	8	30	1,111	206	637	..	40
1874	213	1	15	770	90	211	..	..
1875	..	1	15	235	64	55	..	70
1876	24	..	733	603	48	74	..	20
1877	588	2	3,293	2,716	600	657	268	138
1878	157	5	1,536	2,043	660	136	62	26
1879	..	2	..	66	5	22	15	..
1880	1,945	13	68	140	37	121	14	148
1881	627	1,780	357	447	60	117	23	60
1882	325	19	6,404	2,014	2,825	1,031	78	92
1883	1,988	488	6,215	511	197	1,030	37	298
1884	2,613	3,237	11,369	4,953	537	930	605	734
1885	273	4,057	21,723	6,111	1,726	3,032	291	1,434
1886	635	17	18,787	8,217	1,073	2,508	901	4,048
1887	6,937	9,901	6,174	3,385	2,094	3,559	591	4,809
1888	11,460	25,436	11,973	4,591	1,679	1,570	2,109	2,971
1889	21,099	7,633	70,457	6,486	2,250	2,849	1,566	6,460
1890	26,579	31,043	1,980	1,588	4,239	2,100	133	4,528
1891	28,980	29,565	3,589	2,090	4,403	1,979	286	5,402
1892	41,509	30,000	1,888	850	6,129	3,904	94	5,214
1893	52,363	41,567	193	482	3,291	1,174	76	2,351
1894	58,845	54,540	91	120	808	221	16	164
1895	55,194	73,369	1,233	1,410	504	154	13	905
1896	60,092	53,692	6,973	5,886	2,278	2,805	251	254
1897	79,849	67,681	11,440	5,518	3,189	1,138	236	94
1898	80,814	47,412	3,424	15,493	5,730	4,150	13	292
1899	121,502	40,901	6,938	21,315	2,871	1,770	..	380
1900	165,871	81,908	1,525	13,144	396	4,167	..	146
1901	170,903	74,510	3,826	16,572	14,488	6,478	5	156
1902	170,207	50,325	20,688	7,047	43,898	6,050	3,098	2,350
1903	249,016	64,661	3,121	1,109	10,229	2,253	512	326
1904	299,171	82,046	..	259	151	317	..	46
1905	282,275	85,653	180	254	4,013	1,041	..	70
1906	306,739	129,321	98	227	39	136	..	49
1907	314,081	234,517	765	364	347	504	..	49
1908	211,242	276,212	2,035	1,260	329	1,359	..	52
1909	301,693	398,619	594	215	25	376	..	53
1910	345,400	449,167	515	266	..	78	..	35
1911	283,505	435,616	39	505	..	70	..	8
1912	316,857	572,562	1,714	758	125	595	..	7
1913	288,224	608,933	8	227	..	127	..	2
1914	361,381	859,986	..	..	..	..	..	..
1915	371,959	805,917	..	..	..	..	..	..
1916	336,412	942,773	..	..	..	..	..	..
1917	250,721	865,132	..	..	..	..	..	..
1918	415,250	844,190	..	..	..	..	..	..
1919	336,606	1,517,061	..	..	..	..	..	..
1920	282,679	1,220,409	..	..	..	..	..	..
1921	878,737	1,368,051	..	..	..	..	..	..
1922	1,081,512	1,160,285	..	..	..	..	..	..
1923	1,119,355	1,428,762	..	..	..	..	..	..
1924	1,174,894	1,585,635	..	..	..	..	..	..
1925	1,186,965	1,371,986	..	..	..	..	..	..
1926	1,062,278	1,450,637	..	..	..	..	..	..
1927	1,188,664	1,478,870	..	..	..	..	..	..
1928	1,158,234	1,551,523	..	..	..	..	..	..
1929	1,276,841	1,770,150	..	..	..	..	..	..
1930	1,553,725	1,809,348	..	..	..	..	..	..
1931	1,962,320	1,635,233	..	..	..	..	..	..
1932	2,156,127	1,788,989	..	..	..	..	..	..
1933	2,597,008	1,980,872	..	..	..	..	..	..
1934	2,568,056	1,983,058	..	..	..	..	..	..
1935	2,696,832	1,723,197	..	..	..	..	..	..

TABLE 5.—EXPORTS OF NEW ZEALAND BUTTER AND CHEESE TO VARIOUS COUNTRIES (EXCLUDING RE-EXPORTS OF FOREIGN PRODUCE)—*continued*.
(All quantities in hundredweights.)

Year.	Cape of Good Hope		Natal.		Transvaal.		Union of S. Africa (Total).	
	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879	..	116	..	99	..	..	116	99
1880	..	107	..	..	..	..	107	..
1881	..	332	..	40	..	..	332	40
1882	..	564	..	232	..	..	564	232
1883	..	51	..	6	..	..	51	6
1884	..	97	..	66	..	..	97	66
1885
1886
1887
1888	..	5	..	..	..	..	5	..
1889	..	43	..	35	..	..	43	35
1890	25	..	41	25	41
1891
1892
1893
1894	17	..	..	..	17
1895	8	..	12	..	20
1896	..	5	..	12	..	..	5	12
1897	..	35	..	58	..	1	36	59
1898	57	..	..	..	57
1899	..	37	..	283	..	37	74	383
1900	..	830	..	151	..	975	1,805	430
1901	..	2,705	..	336	..	1,984	4,089	571
1902	..	1,000	..	374	..	4,315	5,315	910
1903	..	2,543	..	14	..	13,780	16,323	661
1904	..	948	..	168	..	11,949	12,953	714
1905	..	2,310	..	302	..	14,608	17,003	818
1906	..	1,097	..	442	..	10,017	11,114	1,185
1907	..	2,806	..	263	..	8,151	10,957	1,227
1908	..	5,394	..	463	..	9,052	14,446	1,401
1909	..	6,228	..	286	..	10,326	16,554	1,067
1910	..	4,611	..	1,115	..	2,225	6,938	2,057
1911	..	1,645	..	878	..	3,710	5,379	2,572
1912	..	4,334	..	995	..	6,557	10,891	2,645
1913	..	1,211	..	564	..	7,107	8,318	2,088
1914	8,941	1,917
1915	200	1,971
1916	1,574
1917
1918
1919
1920	43
1921
1922	1,075	..
1923
1924	1,100	..
1925
1926
1927	825	..
1928	2,357	6
1929	1,909	..
1930	56	..
1931
1932
1933
1934
1935

TABLE 5.—EXPORTS OF NEW ZEALAND BUTTER AND CHEESE TO VARIOUS COUNTRIES (EXCLUDING RE-EXPORTS OF FOREIGN PRODUCE)—*continued.*

(All quantities in hundredweights.)

Year.	Rest of Africa.		Mauritius.		Western Europe.		India and Ceylon.	
	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.
1868
1869
1870	22	..	..	..	..	..
1871	27	41	..	..	..	..
1872	100	27	..	..	..	..
1873
1874
1875
1876
1877
1878	65	60	..	..	..	..
1879
1880	60	..	..	..	..	..
1881
1882
1883	30	..	..	..	..	..
1884
1885	10	18
1886	I	..	22
1887	59
1888	3	..	I	..	8	534
1889	7	35	5	..	..	436
1890	16	..	..	5	213
1891	11	14
1892	12	..	..	13	3
1893	3	54	..	..	5	16
1894	51	..	..	I	202
1895	113	..	..	..	355
1896	26	..	..	I	240
1897	24	..	..	..	318
1898	11	..	..	..	286
1899	8	..	..	..	169
1900	101
1901	3	185
1902	200	..	..	..	..	..	6	64
1903	2	114
1904	5	19
1905	90	16	24	10
1906	4	3
1907	I
1908	8	7
1909	31
1910	2	79
1911	158
1912	..	49	..	..	..	..	..	65
1913	..	40	..	..	..	..	..	8
1914	..	32	..	..	..	..	..	2
1915	11	23
1916	19
1917	..	19,975	..	..	..	..	..	63
1918	..	38,646	..	..	..	..	..	23
1919	1,949	39,796	..	..	..	..	..	2
1920	1,030	..	..	..	..	..	..	14,973
1921	400	..	..	..	..	..	..	32
1922	I	..
1923	10,000	..	34	I
1924	10,996	..	22	37
1925	16,968	..	I	6
1926	38	..
1927	85	..
1928	632	..
1929	1,161	..
1930	4	1,836	..
1931	1,595	I
1932	..	I	..	..	..	I	1,525	14
1933	..	24	..	..	..	..	1,523	11
1934	..	8	..	..	..	..	1,779	..
1935	356	2,302	4

TABLE 5.—EXPORTS OF NEW ZEALAND BUTTER AND CHEESE TO VARIOUS COUNTRIES (EXCLUDING RE-EXPORTS OF FOREIGN PRODUCE)—*continued*.
(All quantities in hundredweights.)

Year.	Malay Archipelago.		Philippine Islands.		Guam.		Japan.	
	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.
1868	..	..	..	..	..	..	..	..
1869	..	..	..	..	..	..	..	..
1870	..	..	..	..	14	60	..	..
1871	..	..	..	..	..	..	..	..
1872	..	..	..	..	..	..	..	..
1873	..	..	..	..	..	..	..	..
1874	..	..	..	..	..	..	..	..
1875	..	..	..	..	..	..	..	..
1876	..	..	..	..	..	..	..	..
1877	..	..	..	..	30	44	..	..
1878	..	..	..	..	4	51	..	..
1879	..	..	..	..	21	6	..	..
1880	..	..	..	..	..	..	..	..
1881	..	..	..	..	..	..	..	..
1882	..	..	..	..	..	..	..	..
1883	..	..	..	..	..	..	..	..
1884	..	..	..	..	33	..	..	..
1885	..	..	..	..	..	..	..	..
1886	..	..	..	..	..	..	..	..
1887	..	..	..	..	3	9	..	..
1888	..	..	..	..	..	..	..	..
1889	3	..	..	..	..	..	..	..
1890	..	..	..	..	..	..	..	..
1891	1	1	..	..	..	..	..	..
1892	17	1	..	..	..	..	..	..
1893	4	14	..	..	20	10	..	..
1894	..	15	..	..	..	..	..	..
1895	..	9	..	2	..	..	..	..
1896	..	15	..	..	..	..	..	..
1897	..	18	..	..	..	..	..	..
1898	..	..	..	..	..	..	..	..
1899	..	..	..	3	..	..	..	..
1900	..	2	..	..	..	..	2	..
1901	..	..	..	..	..	..	5	..
1902	..	..	..	..	..	..	..	..
1903	..	..	56	4	..	..	..	..
1904	..	..	..	1	..	..	..	..
1905	..	..	..	..	..	..	..	..
1906	..	..	..	..	..	..	..	..
1907	..	..	..	..	..	..	..	..
1908	..	..	..	..	..	..	..	..
1909	..	..	..	..	..	..	..	..
1910	..	..	..	..	..	..	..	..
1911	..	..	..	..	..	..	..	..
1912	..	..	..	..	..	..	..	..
1913	..	..	..	..	..	..	..	..
1914	..	..	..	..	..	..	..	..
1915	..	..	..	..	..	..	..	..
1916	..	..	..	..	..	..	..	..
1917	..	..	..	..	..	..	..	..
1918	..	101	..	..	..	..	..	1
1919	..	101	..	..	..	..	..	..
1920	..	80	..	..	..	..	..	..
1921	..	41	..	..	..	..	..	..
1922	..	..	..	..	..	..	35	..
1923	800	97	1,489	53	..	..	680	..
1924	2,226	216	2,157	25	..	..	2,359	..
1925	2,936	41	700	..	..	..	788	..
1926	3,497	..	1,653	..	..	..	1,886	..
1927	5,828	134	1,174	..	..	..	2,844	..
1928	3,669	..	427	..	..	..	1,740	..
1929	3,316	..	2,313	..	..	..	2,206	43
1930	3,381	31	1,703	..	..	..	1,695	2
1931	2,205	28	855	..	..	..	712	..
1932	735	12	188	..	..	..	603	..
1933	1,071	..	50	..	..	..	375	8
1934	2,792	1	460	50	..	..	585	6
1935	3,474	8	774	..	..	..	85	..

TABLE 5.—EXPORTS OF NEW ZEALAND BUTTER AND CHEESE TO VARIOUS COUNTRIES (EXCLUDING RE-EXPORTS OF FOREIGN PRODUCE)—*continued.*
(All quantities in hundredweights.)

Year.	China.		Hong Kong.		Canada.		United States of America.	
	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.
1868	5	6	..	..	..	..
1869
1870
1871	322	..
1872	30	..
1873
1874
1875
1876
1877	..	21	..	..	..	..	33	..
1878
1879
1880
1881	..	14	..	..	..	..	..	..
1882	..	86	..	12	..	..	..	..
1883	20	..	..	..	..
1884
1885	5	..	3	I
1886	5	I
1887	4	2	..	10	I
1888	5	7	..	..	24	..
1889	2	..
1890	3	11
1891	15	2
1892	15	1
1893	10	..	..	I
1894	5	..	3	..
1895
1896	7
1897	42	..	3	6
1898	16	..	96	..	..	220
1899	1	..
1900	5	I
1901	7	I
1902	I	112	..	..
1903
1904	I	13	285	13	..
1905	..	I	..	..	..	397	5	..
1906	293	63	I
1907	455	..	..
1908	101	..	..
1909	50	..	..
1910	..	2	..	I	..	186	1,156	2
1911	..	2	..	..	..	9,224	1,757	..
1912	42,461	3,015	..
1913	56,149	22	16,616
1914	51,599	59	7,917
1915	18,838	2	87
1916	3,557	I	3
1917	304	..	I
1918	11,893	..	..
1919	6,000	..	..
1920	19,526	542	4,843
1921	..	2	..	..	..	9,525	12	7,899
1922	..	525	..	..	..	14,083	I	5,762
1923	..	1,161	..	..	..	27,625	107	33,755
1924	..	2,059	..	..	..	37,164	4,963	20,805
1925	..	630	..	..	..	3,015	749	19,236
1926	..	800	..	..	..	29,403	..	22,958
1927	..	2,876	464	..	..	116,106	1,187	29,610
1928	..	3,790	326	..	..	199,706	2,428	42,718
1929	..	3,896	691	..	..	335,127	3,254	9,512
1930	..	4,386	788	..	..	296,071	2,099	17
1931	..	648	445	..	..	3,612	73	163
1932	..	1,449	745	..	..	6,039	3	3
1933	..	1,732	524	..	..	6,998	* 811	656
1934	..	1,510	297	..	..	6,250	72	1,159
1935	..	1,074	219	..	..	1,918	1,811	46,419

TABLE 5.—EXPORTS OF NEW ZEALAND BUTTER AND CHEESE TO VARIOUS COUNTRIES (EXCLUDING RE-EXPORTS OF FOREIGN PRODUCE)—*continued.*
(All quantities in hundredweights.)

Year.	Hawaii.		British West Indies.		Panama Canal Zone.		South America.	
	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.
1868
1869
1870	120	..
1871	..	138	..	..	..	..	..	..
1872
1873
1874
1875
1876
1877
1878
1879	1	1
1880
1881
1882
1883	18	..
1884
1885	7	31
1886	15	33
1887	223	280
1888	240	..
1889	47	24
1890	19	19
1891	34	52
1892	38	46
1893	26	62
1894	8	18
1895	17	22
1896	7	90
1897	2	17
1898	3	6
1899
1900
1901
1902
1903
1904
1905
1906
1907	..	32	..	..	..	..	3	..
1908	90
1909
1910
1911	1
1912	..	285	..	..	..	..	2	3
1913	..	432	..	..	..	..	1	..
1914	..	1,049	..	..	..	..	62	16
1915	..	1,314	..	..	..	..	..	129
1916	..	1,042	..	..	..	..	..	84
1917	..	6	..	..	..	..	..	..
1918	..	3	..	..	..	..	..	..
1919	..	23	..	6	..	..	..	..
1920	..	223	..	55	..	..	..	..
1921	..	774	..	15	91	..	..	..
1922	..	5,085	..	2	..	..	..	..
1923	..	7,563	..	16	9	..	..	..
1924	..	11,381	..	13	2	15	..	15
1925	..	11,419	..	..	..	..	29	..
1926	..	9,206	..	..	..	..	..	..
1927	..	10,492	..	2	..	250	..	..
1928	..	10,340	..	..	..	67	..	..
1929	..	10,944	..	..	11	4,717	..	2
1930	..	9,942	..	150	11	9,279	235	..
1931	..	7,421	..	400	..	6,161	44	..
1932	..	5,234	..	5	..	8,980	84	..
1933	..	3,493	..	..	..	13,400	33	..
1934	..	2,754	..	..	..	14,795	..	..
1935	..	7,510	..	1	10,200	142	15,226	1,057

TABLE 5.—EXPORTS OF NEW ZEALAND BUTTER AND CHEESE TO VARIOUS COUNTRIES (EXCLUDING RE-EXPORTS OF FOREIGN PRODUCE)—*continued.*
(All quantities in hundredweights.)

Year.	Samoa.		Fiji Islands.		Norfolk Island.		New Caledonia.	
	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.
1868	4	5	..	..	..	5
1869	4	..
1870
1871	10	..	..	..	..
1872	9	4
1873	12
1874	5	23	..	..	1	11
1875	6	35	..	..	..	..
1876	22	27	..	..	5	16
1877	108	69	5	1	78	78
1878	49	40	1	..	50	40
1879	7	25	1	..	5	5
1880	30	49	..	..	..	..
1881	97	48	2	..	4	41
1882	223	93	10	2	78	31
1883	144	69	1	1	3	..
1884	251	119	..	1	6	15
1885	289	110	3	1	10	2
1886	345	125	6	6	29	30
1887	341	137	6	11	11	16
1888	282	111	..	1	34	5
1889	301	130	14	10	35	17
1890	369	125	1	3	64	74
1891	321	122	7	3	..	..
1892	445	141	1	..	..	..
1893	473	117	1	1	..	..
1894	488	53	2	1	..	..
1895	484	32	4	1	..	..
1896	421	83	3	1	..	..
1897	387	67	3	1	..	..
1898	387	94	2	2	..	..
1899	356	81	1	..	..	..
1900	382	124	..	..	..	..
1901	482	110	..	..	..	..
1902	559	117	..	1	..	..
1903	793	142	1	1	..	..
1904	677	91	3	..	..	..
1905	610	127	3	1	..	..
1906	686	100	5	..	..	..
1907	755	130	2	..	..	..
1908	781	158	1	..	..	..
1909	947	192	5	4	..	..
1910	959	155	2	..	..	..
1911	837	135	1	1	..	..
1912	979	153	..	..	2	..
1913	853	149	..	..	1	..
1914	..	566	809	162	..	..	1	13
1915	..	95	1,012	160	1	..	2	3
1916	..	104	882	142	..	..	19	9
1917	..	67	882	142	..	..	39	25
1918	..	544	55	746	184	..	18	20
1919	..	372	40	416	154	..	..	..
1920	..	436	74	783	164	1	..	..
1921	..	534	55	1,133	204	4	15	1
1922	..	382	38	431	229	..	5	..
1923	..	374	24	727	148	..	16	8
1924	..	432	33	767	201	..	44	50
1925	..	448	55	484	244	..	..	..
1926	..	446	47	245	179	1	..	..
1927	..	421	35	184	218	15	3	..
1928	..	448	34	52	199	64	10	..
1929	..	453	56	165	242	133	40	53
1930	..	372	31	47	229	112	55	34
1931	..	481	28	59	214	69	..	..
1932	..	343	40	121	219	89	..	..
1933	..	331	31	52	251	134	..	..
1934	..	248	32	67	231	29	10	10
1935	..	207	26	128	230	..	..	..
1936	..	330	33	118	205	..	12	18

TABLE 5.—EXPORTS OF NEW ZEALAND BUTTER AND CHEESE TO VARIOUS COUNTRIES (EXCLUDING RE-EXPORTS OF FOREIGN PRODUCE)—*continued.*

(All quantities in hundredweights.)

Year.	Other South Sea Islands.		Whale Fisheries.		Other Countries.		Total Cwts.	
	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.
1868	11	..	..	..	..	..	138	335
1869	126	6	2	..	..	..	2,705	2,331
1870	87	8	1	..	..	..	3,435	2,735
1871	45	96	6	..	..	..	4,342	1,619
1872	30	12	2	1	..	..	1,630	1,362
1873	94	45	19	..	..	..	723	1,993
1874	9	39	..	..	..	..	357	1,326
1875	19	4	..	..	..	..	104	442
1876	38	10	1	..	..	..	871	886
1877	36	26	5	..	..	..	5,206	4,999
1878	49	31	3	..	..	..	3,105	3,019
1879	53	26	3	..	..	..	341	173
1880	60	51	3	..	..	..	2,718	717
1881	116	16	1	..	..	..	2,426	3,056
1882	42	10	5	..	..	..	11,264	3,553
1883	67	11	3	..	..	..	8,869	2,579
1884	61	17	4	..	..	..	15,766	10,343
1885	83	21	..	..	..	..	24,923	15,245
1886	151	46	3	..	..	..	23,175	16,429
1887	144	46	..	..	..	..	17,018	23,913
1888	316	82	..	..	..	..	29,995	36,682
1889	271	138	..	..	..	..	37,955	26,558
1890	197	128	..	..	..	..	34,816	40,451
1891	379	191	..	..	..	..	39,430	39,770
1892	237	179	..	..	..	..	53,930	41,493
1893	336	79	..	..	..	..	58,149	46,201
1894	375	80	..	..	..	..	60,771	55,655
1895	312	96	..	..	..	..	57,964	76,743
1896	372	80	..	..	..	..	71,353	71,372
1897	469	69	..	..	..	..	99,002	77,683
1898	512	100	..	..	..	..	96,801	68,711
1899	694	149	..	..	..	..	136,086	69,440
1900	748	143	..	..	..	..	172,583	102,849
1901	854	98	..	..	..	..	201,591	104,294
1902	797	55	..	..	..	..	253,998	74,746
1903	810	30	..	..	..	..	285,106	74,780
1904	1,055	52	..	..	..	..	314,360	84,526
1905	1,049	46	..	..	..	..	305,722	88,562
1906	1,182	33	..	..	..	..	320,225	131,206
1907	1,044	26	..	..	..	..	328,441	236,833
1908	951	23	..	..	..	..	229,971	280,798
1909	1,214	39	..	..	..	..	321,108	400,607
1910	1,373	54	..	..	..	..	356,535	451,915
1911	1,641	32	..	..	..	..	302,387	439,174
1912	1,786	54	..	..	..	..	378,117	577,070
1913	1,653	40	..	..	..	..	372,258	611,663
1914	1,171	12	..	..	..	..	434,067	863,776
1915	895	11	..	..	..	..	420,144	817,258
1916	688	15	..	..	..	..	358,632	949,416
1917	537	15	..	..	..	..	254,397	885,743
1918	686	18	..	..	..	..	431,023	883,430
1919	883	25	..	..	..	..	345,818	1,572,311
1920	1,524	46	..	..	..	..	312,009	1,222,050
1921	607	27	..	..	..	..	898,478	1,368,786
1922	747	18	..	..	..	..	1,120,200	1,161,196
1923	839	19	..	..	..	..	1,250,140	1,441,460
1924	1,198	49	..	..	..	1	1,269,455	1,594,486
1925	849	25	..	..	..	..	1,245,324	1,370,754
1926	554	23	..	..	3	7	1,168,040	1,461,548
1927	683	80	..	..	3	56	1,455,539	1,492,792
1928	993	36	..	..	13	9	1,449,570	1,567,272
1929	996	27	..	..	..	..	1,653,807	1,779,093
1930	1,082	21	..	..	36	..	1,884,237	1,812,981
1931	939	29	..	..	..	..	1,988,566	1,636,347
1932	1,186	33	..	..	..	..	2,185,545	1,790,431
1933	1,517	21	..	..	..	..	2,635,247	1,982,942
1934	1,458	20	..	..	8	..	2,614,519	1,984,496
1935	1,654	16	..	..	402	42	2,789,298	1,727,552

TABLE 6.—IMPORTS OF DAIRY-PRODUCE (EXCLUDING RE-IMPORTS OF NEW ZEALAND ORIGIN).

(Value in Pounds sterling.)

Year.	Butter.		Cheese.		Milk and Cream, Preserved, Condensed, or Dried.		Sugar of Milk.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Cwt.	£	Cwt.	£	Packages.	£	lb.	£
1853 ..	25	204	47	186	..	..	..	..
1854 ..	12	71	210	832	..	..	..	..
1855 ..	43	145	100	446	..	..	..	..
1856 ..	59	324	202	883	..	..	..	..
1857 ..	5	25	174	746	..	..	..	..
1858 ..	27	60	53	221	..	..	..	..
1859 ..			184	1,024	..	..	..	..
1860 ..			253*	1,271	..	..	..	..
1861 ..			1,226	6,338	..	..	..	..
1862 ..	No figures available†		2,873	14,926	..	..	..	..
1863 ..			4,438	25,711	..	..	..	..
1864 ..			8,475	42,342	..	..	..	..
1865 ..			2,089	10,214	..	..	..	..
1866 ..			2,402	15,686	..	..	..	..
1867 ..	7,299	54,227	3,757	21,203	..	..	..	..
1868 ..	5,501	28,760	2,176	12,046	..	..	..	..
1869 ..	1,745	8,499	577	2,776	..	..	..	..
1870 ..	882	3,340	546	2,467	..	..	..	..
1871 ..	564	1,633	164	839	..	..	..	..
1872 ..	369	1,573	22	132	..	..	..	..
1873 ..	246	938	38	178	..	..	..	..
1874 ..	2,506	13,155	25	137	..	..	..	..
1875 ..	2,615	15,234	166	845	..	..	..	..
1876 ..	88	548	165	841	..	..	..	..
1877 ..	28	129	118	596	..	..	..	..
1878 ..	706	2,885	77	437	..	..	..	..
1879 ..	1,999	8,644	1,012	3,314	..	..	..	..
1880 ..	1,495	5,629	319	1,065	6,934	10,149	..	..
1881 ..	413	1,552	76	354	8,408	12,072	..	..
1882 ..	195	1,301	71	383	6,417	7,784	..	..
1883 ..	172	653	213	905	10,355	14,409	..	..
1884 ..	225	841	165	750	9,603	12,823	..	..
1885 ..	5	23	103	401	12,502	15,425	..	..
1886 ..	164	574	79	282	11,485	12,093	..	..
1887 ..	76	246	281	657	9,547	10,174	..	..
1888 ..	64	185	25	83	lb.	8,651	..	..
1889 ..	53	193	359	771	332,988	7,090	..	..
1890 ..	7	28	18	52	510,359	11,259	..	..
1891 ..	..	..	24	70	617,396	13,150	..	..
1892 ..	..	..	25	120	484,943	10,419	..	..
1893 ..	..	..	7	39	672,340	14,219	..	..
1894 ..	10	43	34	146	530,334	11,110	..	..
1895 ..	4	12	15	62	560,428	11,419	..	..
1896 ..	..	..	37	159	865,222	17,758	..	..
1897 ..	..	..	4	21	781,422	15,310	..	..
1898 ..	..	..	4	17	660,104	12,599	..	..
1899 ..	..	..	21	104	765,742	14,576	..	..

* These figures are not reliable prior to 1861. † Butter figures probably included as "Provisions."

TABLE 6.—IMPORTS OF DAIRY-PRODUCE (EXCLUDING RE-IMPORTS OF NEW ZEALAND ORIGIN)—continued.

(Value in Pounds sterling.)

Year.	Butter.		Cheese.		Milk and Cream, Preserved, Condensed, or Dried.		Sugar of Milk.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
1900 ..	Cwt.	£	Cwt.	£	Packages.	£	lb.	£
1900 ..	..	..	39	179	179	681,229	12,785	..
1901 ..	I	5	17	77	809,537	16,094	..	..
1902 ..	I	3	31	137	994,452	18,870	..	..
1903 ..	..	..	45	270	1,003,752	19,065	..	..
1904 ..	I	7	59	218	741,208	13,761	..	..
1905 ..	4	27	45	206	621,233	11,591	..	..
1906 ..	4	14	66	313	595,324	11,310	..	..
1907 ..	..	..	36	167	696,804	12,785	..	..
1908 ..	5	37	20	71	494,392	9,262	..	..
1909 ..	..	..	3	14	221,447	3,971	..	..
1910 ..	..	..	7	30	287,244	5,230	..	..
1911 ..	I, 173*	6,925	8	27	243,375	4,404	..	..
1912 ..	..	..	60	374	278,310	5,175	..	..
1913 ..	17	77	63	304	273,990	6,756	..	..
1914 ..	2	10	46	247	969,538	21,695	..	3,470
1915 ..	I	7	76	726	825,544	19,230	..	3,589
1916 ..	..	..	407	3,780	305,966	9,299	..	1,350
1917 ..	..	..	525	5,743	580,643	19,088	..	630
1918 ..	I	8	551	5,782	725,716	24,321	..	..
1919 ..	..	..	278	2,761	693,799	27,551	..	..
1920 ..	I	9	159	1,822	812,783	39,904	..	37,678
1921 ..	..	..	2	32	38,873	1,920	..	73,989
1922 ..	..	..	..	2	28,600	1,464	..	12,074
1923 ..	I	5	I	4	4,024	269	..	..
1924 ..	I	11	2	16	31,550	1,196	112	6
1925 ..	118	710	14	144	92,891	2,140	134,400	4,793
1926 ..	141	668	10	114	7,131	240	26,432	1,370
1927 ..	..	3	61	568	3,008	121	214,272	7,307
1928 ..	2	10	11	96	2,467	107	132,012	3,467
1929 ..	4	32	56	497	6,848	233	140,000	3,334
1930 ..	3	30	58	463	1,479	82	165,760	3,916
1931 ..	..	4	43	353	9,110	200	2,240	43
1932 ..	4	23	20	155	90,828	2,203	22,400	559
1933 ..	I	5	49	475	4,200	100	224	6
1934 ..	4	14	11	93	3,428	146	32,801	712
1935 ..	5	16	8	35	22,026	452	21,644	867

* Import from Australia due to over-exporting.

—Customs Returns.

TABLE 7.—DAIRY-FACTORY PRODUCTION OF BUTTER AND CHEESE, BY PROVINCES, AND AT FIVE-YEARLY INTERVALS.

Provincial District.	1894-95.			1899-1900.			1904-05.		
	Number of Establishments.	Butter.	Cheese.	Number of Establishments.	Butter.	Cheese.	Number of Establishments.	Butter.	Cheese.
Auckland	21	Cwt. 14,818	Cwt. 5,100	27	Cwt. 34,268	Cwt. 7,967	57	Cwt. 83,283	Cwt. 6,726
Taranaki	53	50,309	24,740	102	110,928	31,719	69	146,772	42,561
Hawke's Bay	8	1,519	2,320	8	6,468	2,605	19	21,895	2,301
Wellington	18	16,100	6,400	37	67,775	32,375	51	108,201	34,747
Marlborough	2	1,985	500	14	4,422	2,747	17	18,831	5,016
Nelson	10								
Westland	..	..	..	..	..	..	..	..	..
Canterbury	14	10,838	5,200	17	15,935	10,017	16	33,453	9,079
Otago	44	5,649	42,200	42	25,903	52,527	35	50,229	49,631
Totals	170	101,218	86,460	247	265,699	139,687	264	462,666	150,061

Provincial District.	1909-10.			1914-15.			1919-20.		
	Number of Establishments.	Butter.	Cheese.	Number of Establishments.	Butter.	Cheese.	Number of Establishments.	Butter.	Cheese.
Auckland	57	Cwt. 196,776	Cwt. 18,285	64	Cwt. 311,486	Cwt. 63,129	90	Cwt. 320,305	Cwt. 224,810
Taranaki	75	142,913	197,690	61	92,909	386,091	75	54,865	509,098
Hawke's Bay	18	16,906	24,917	21	9,637	51,455	25	14,726	66,504
Wellington	65	111,158	74,568	69	105,756	135,936	84	87,098	233,922
Marlborough	8	872	9,956	7	3,734	7,507	9	1,983	19,850
Nelson	10	7,046	5,261	10	10,483	7,662	13	13,436	9,052
Westland	4	3,661	2,010	5	4,097	1,119	8	6,831	5,107
Canterbury	33	33,208	14,013	32	26,743	20,794	34	45,013	35,133
Otago	15	27,295	21,110	29	33,331	44,062	33	28,369	54,223
Southland	53	2,016	106,301	50	5,294	87,348	55	4,437	105,393
Totals	338	541,851	474,111	348	603,470	805,103	426	577,065	1,262,892

Provincial District.	1924-25.			1929-30.			1934-35.		
	Number of Establishments.	Butter.	Cheese.	Number of Establishments.	Butter.	Cheese.	Number of Establishments.	Butter.	Cheese.
Auckland	94	Cwt. 913,862	Cwt. 201,077	104	Cwt. 1,438,682	Cwt. 306,472	106	Cwt. 2,086,448	Cwt. 372,661
Taranaki	70	141,340	600,587	113	199,891	702,634	24	101,001	86,831
Hawke's Bay	26	66,479	71,729	24	78,956	76,023	113	244,638	702,678
Wellington	91	250,569	275,378	80	296,439	316,405	89	404,881	303,107
Marlborough	10	17,260	16,904	8	18,286	18,925	8	18,951	13,540
Nelson	11	35,695	10,920	13	40,708	11,316	11	57,940	1,361
Westland	8	14,464	4,616	10	17,516	1,937	8	22,880	1,707
Canterbury	40	102,374	37,763	39	89,738	48,718	37	90,341	35,883
Otago	32	58,001	43,995	26	54,495	57,900	24	56,413	56,407
Southland	63	24,289	173,572	65	19,460	21,588	65	22,481	250,283
Totals	445	1,624,333	1,436,541	491	2,254,171	1,781,918	485	3,105,974	1,914,458

—Government Statistician.

NOTE.—With regard to the foregoing table there have been certain changes in provincial boundaries from time to time, but the variations were not sufficient to materially affect the accuracy of the particulars given.

TABLE 8.—DAIRY-FACTORY PRODUCTION OF BUTTER AND CHEESE,
BY SEASONS.

Year.	Number of Establishments.	Butter.	Cheese.
		Cwt.	Cwt.
1884-85	36	2,451	16,460
1889-90	74	17,587	39,200
1894-95	170	101,218	86,460
1899-00	247	265,699	139,687
1904-05	264	462,666	150,061
1909-10	338	541,851	474,111
1914-15	348	603,470	805,103
1919-20	426	577,065	1,262,892
1920-21	423	812,467	1,115,650
1921-22	436	1,182,862	1,268,534
1922-23	431	1,553,710	1,247,987
1923-24	445	1,442,880	1,534,980
1924-25	445	1,624,333	1,436,541
1925-26	518	1,515,687	1,520,169
1926-27	507	1,708,219	1,564,276
1927-28	500	1,778,999	1,550,090
1928-29	490	1,951,163	1,782,237
1929-30	491	2,254,171	1,781,918
1930-31	482	2,306,842	1,857,852
1931-32	480	2,439,069	1,781,782
1932-33	478	2,926,449	2,071,181
1933-34	482	3,187,212	2,135,599
1934-35	485	3,105,974	1,914,458

—Government Statistician.

TABLE 9.—UTILIZATION OF TOTAL ESTIMATED BUTTERFAT-PRODUCTION IN THE DOMINION.
(The estimation is for all butterfat in milk as at the pail.)

Season.	Butterfat for Butter.	Butterfat for Cheese (including Whey Butter).	Butterfat in Milk consumed.	Butterfat in Cream consumed.	Butterfat for other Dairy Products	Butterfat in Milk fed to Calves and in Milk and Cream split and wasted.	Total Butterfat produced.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1901-2 ..	35,016,472	4,291,375	7,095,863	877,532	275,000	970,536	48,526,778
1902-3 ..	39,346,079	4,070,442	7,269,006	898,945	300,000	1,058,867	52,943,339
1903-4 ..	46,486,236	4,551,224	7,478,910	924,903	355,000	1,220,332	61,016,605
1904-5 ..	48,740,072	4,659,252	7,692,725	951,345	375,000	1,273,845	63,692,239
1905-6 ..	47,874,011	6,152,024	7,905,592	977,670	380,000	1,291,618	64,580,915
1906-7 ..	48,412,170	8,525,018	8,169,099	1,010,258	400,000	1,357,481	67,874,026
1907-8 ..	44,512,787	13,431,226	8,346,393	1,032,183	405,000	1,382,196	69,109,785
1908-9 ..	48,132,711	14,980,744	8,612,514	1,065,094	440,000	1,494,511	74,725,574
1909-10 ..	54,055,145	20,374,669	8,802,841	1,088,631	520,000	1,731,455	86,572,741
1910-11 ..	55,965,397	20,038,949	8,971,552	1,109,496	530,000	1,767,661	88,383,055
1911-12 ..	56,128,690	22,998,934	9,183,733	1,135,733	550,000	1,836,675	91,833,742
1912-13 ..	60,200,111	28,788,881	9,416,205	1,164,485	620,000	2,044,687	102,234,369
1913-14 ..	63,478,200	32,540,372	9,689,816	1,198,322	670,000	2,195,443	109,772,153
1914-15 ..	64,580,179	33,320,078	9,786,602	1,210,291	628,145	2,235,210	111,760,505
1915-16 ..	65,553,753	40,634,519	9,844,681	1,217,474	784,177	2,408,869	120,443,473
1916-17 ..	70,699,562	42,347,831	9,825,045	1,215,046	835,515	2,549,449	127,472,448
1917-18 ..	64,415,332	41,797,167	9,800,353	1,211,992	1,112,672	2,415,051	120,752,567
1918-19 ..	60,560,737	47,628,423	9,891,750	1,223,295	2,657,895	2,489,022	124,451,122
1919-20 ..	62,529,400	57,625,002	10,481,353	1,249,210	1,189,405	2,716,763	135,838,133
1920-21 ..	86,289,100	49,950,775	10,741,255	1,328,352	3,563,218	3,099,443	154,972,143
1921-22 ..	122,901,762	56,213,282	11,042,590	1,365,617	3,443,789	3,978,919	198,945,959
1922-23 ..	153,579,405	52,658,559	11,264,588	1,393,071	2,120,187	4,510,527	225,526,337
1923-24 ..	145,802,150	63,780,243	11,470,742	1,418,566	1,474,766	4,570,336	228,516,803
1924-25 ..	160,090,656	61,020,797	11,704,612	1,447,488	1,902,311	4,819,711	240,985,575
1925-26 ..	149,932,385	64,083,464	11,967,905	1,480,049	1,770,993	4,678,261	233,913,057
1926-27 ..	171,329,058	66,579,951	12,209,829	1,509,967	1,890,384	5,173,861	258,693,050
1927-28 ..	177,580,362	65,553,951	12,385,219	1,531,658	1,900,715	5,284,733	264,236,638
1928-29 ..	191,983,119	75,391,935	12,529,237	1,549,468	1,835,558	5,781,410	289,070,517
1929-30 ..	219,334,751	72,304,066	12,688,458	1,569,159	1,890,361	6,281,363	314,068,158
1930-31 ..	223,733,816	75,478,174	12,863,258	1,590,776	1,900,000	6,440,123	322,006,147
1931-32 ..	237,385,977	79,631,084	12,998,445	1,607,494	1,397,837	6,796,344	339,817,181
1932-33 ..	282,003,967	90,877,774	13,099,374	1,619,976	1,526,242	7,941,374	397,068,707
1933-34 ..	308,009,466	93,366,960	13,203,745	1,632,883	1,952,203	8,533,985	426,699,242
1934-35 ..	300,951,674	83,494,540	13,298,704	1,644,627	2,350,000	8,198,766	409,938,311
1935-36 ..	321,382,715	77,763,499	13,394,056	1,656,419	2,589,607	8,505,843	425,292,139

—Farm Economics Section, Department of Agriculture.

TABLE 10.—THE PROGRESS OF CO-OPERATION IN NEW ZEALAND.

The following table shows the number of dairy *factories* in New Zealand operated by co-operative as against proprietary interests over the period 1894-1935.

Year.	Creameries (Butter Factories).		Cheese Factories.		Total Factories.		Proportion of Co-operative.
	Co-opera- tive.	Proprie- tary.	Co-opera- tive.	Proprie- tary.	Co-opera- tive.	Proprie- tary.	
1894 ..	23	59	25	17	48	76	38·7
1899 ..	64	94	47	35	111	129	46·2
1900 ..	64	108	47	44	111	152	42·2
1901 ..	72	101	46	40	118	141	45·5
1902 ..	96	112	46	35	142	147	49·1
1903 ..	102	103	45	32	147	135	52·1
1904 ..	114	103	50	28	164	131	55·5
1905 ..	115	99	51	33	166	132	55·7
1906 ..	123	88	60	22	183	110	62·4
1907* ..	124	88	74	35	198	123	61·6
1908 ..	128	68	98	49	226	117	65·8
1909 ..	126	67	100	52	226	119	65·5
1910 ..	126	63	128	66	254	132	65·8
1911 ..	132	53	154	64	286	117	70·9
1912 ..	126	46	163	61	289	107	72·9
1913 ..	129	45	192	84	321	129	71·3
1914 ..	134	47	207	86	341	133	71·9
1915 ..	119	48	249	81	368	129	74·0
1916 ..	126	47	309	72	435	119	78·5
1917 ..	120	44	329	63	449	107	80·7
1918 ..	123	39	353	49	476	88	84·3
1919 ..	123	36	353	35	476	81	85·4
1920 ..	112	42	343	41	455	83	84·5
1921* ..	114	41	340	36	454	77	85·4
1922 ..	154†	41	345	24	499	65	88·4
1923 ..	166	43	352	18	518	61	89·4
1924 ..	174	46	343	16	517	62	89·2
1925 ..	183	42	323	13	506	55	90·1
1926 ..	190	37	328	11	518	48	91·5
1927 ..	193	37	327	10	520	47	91·7
1928 ..	178	32	312	11	490	43	91·9
1929 ..	186	31	325	11	511	42	92·4
1930 ..	176	28	316	11	492	39	92·6
1931 ..	181	25	317	12	498	37	93·0
1932 ..	181	26	309	11	490	37	92·9
1933 ..	172	24	310	11	482	35	93·2
1934 ..	171	24	309	10	480	34	93·3
1935 ..	167	24	307	10	474	34	93·3

* Estimated. † As from 1922, dual-plant factories have been treated for the purpose of this table as being more correctly both creameries and cheese factories.

—Compiled from Dairy Division Factory Lists.

TABLE II.—REGISTRATIONS OF DAIRY PREMISES.

Year.	Creameries (Butter).	Factories (Whey Butter.)	Factories (Cheese).	Dual Plant (Butter and Cheese).	Private Dairies.		Packing-houses (MilledButter).	Dried-milk Factories.	Condensed-milk Factories.	Casein Factories.	Sugar-of-milk Factories.	Total Registrations.
					Butter	Cheese						
1894 ..	82	..	42	..	..	..	..	..	..	..	..	124
1895 ..	..	..	..	..	..	..	..	..	..	..	..	170
1896 ..	91	..	79	..	..	..	..	..	..	..	..	199
1897 ..	117	..	82	..	..	..	..	..	..	..	..	223
1898 ..	136	..	87	..	..	..	..	..	..	..	..	240
1899 ..	157	..	83	..	..	..	..	..	..	..	..	330
1900 ..	172	..	91	..	326	74	167	..	..	..	..	912
1901 ..	180	..	90	..	372	80	190	..	..	..	..	1,035
1902 ..	206	..	82	..	457	85	205	..	..	..	..	890
1903 ..	205	..	77	..	368	60	162	..	..	..	..	983
1904 ..	217	..	78	..	448	65	175	..	..	..	..	1,063
1905 ..	214	..	84	..	502	69	194	..	..	..	..	809
1906 ..	211	..	82	..	340	44	132	..	..	..	..	852
1907 ..	212	..	109	..	361	42	128	..	..	..	..	858
1908 ..	196	..	147	..	347	46	122	..	..	..	..	799
1909 ..	193	..	152	..	308	36	116	..	..	..	..	752
1910 ..	189	..	194	..	263	13	93	..	..	..	..	777
1911 ..	185	..	218	..	272	18	84	..	..	..	..	713
1912 ..	172	..	224	..	216	17	84	..	..	..	..	729
1913 ..	174	..	276	..	199	14	66	..	..	..	..	661
1914 ..	181	..	293	..	100	23	64	..	..	..	..	648
1915 ..	167	..	330	..	64	24	63	..	..	..	..	702
1916 ..	173	..	381	..	59	24	65	..	..	..	..	639
1917 ..	164	..	392	..	19	22	42	..	..	..	..	651
1918 ..	162	..	402	..	23	18	41	4	I	..	..	617
1919 ..	159	..	388	..	18	18	29	4	I	..	..	579
1920 ..	154	..	384	..	7	..	28	5	I	..	..	547
1921 ..	..	..	..	..	..	..	..	..	..	..	..	564
1922 ..	156	..	330	39	2	..	11	8	I	..	..	538
1923 ..	165	..	326	44	2	3	16	7	I	..	..	524
1924 ..	156	..	295	64	..	6	5	7	I	3	I	524
1925 ..	156	..	267	69	..	15	5	5	I	5	I	430
1926 ..	159	..	271	68	..	17	5	4	I	4	I	623
1927 ..	162	81	269	68	..	26	5	6	I	4	I	580
1928 ..	144	74	257	66	..	23	3	6	2	4	I	613
1929 ..	151	79	270	66	..	29	4	6	2	5	I	597
1930 ..	150	80	273	54	..	22	4	5	2	6	I	591
1931 ..	147	81	270	59	..	14	5	5	2	7	I	578
1932 ..	149	85	263	56	..	6	4	5	2	7	I	556
1933 ..	150	63	275	46	..	6	3	4	2	6	I	552
1934 ..	150	60	274	45	..	6	3	4	2	7	I	542
1935 ..	149	56	275	42	..	3	3	4	3	6	I	..

The above table deals simply with registrations of dairy premises as recorded by the Dairy Division of the Department of Agriculture and published in their "Annual List of Dairy Factories." The Act providing for the registration of premises was passed in 1894, and consequently the table cannot be regarded as an accurate indication of the number of premises actually in operation for the first two or three years shown. For instance, the table shows a total of 124 registrations in the year 1894, whereas there were in that year actually 170 factories in operation in New Zealand. In the following year (for which no registration figures are available) the number of dairy factories in operation was 226.

Other registrations, such as for whey-butter and dual-plant factories, and for the premises devoted to the manufacture of the various by-products, have only been included as separate identities in the official lists in comparatively recent years, and, of course, can only be considered accurate as from the year of their inclusion.

No official list is published of cream-receiving depots, skimming-stations, or precipitating-stations, although all premises used for these purposes must be registered.

No list was published in 1921, and consequently no figures are available for that year.

TABLE 12.—NUMBER OF SUPPLIERS TO BUTTER AND CHEESE FACTORIES.

Year.	Butter.	Cheese.	Dual Plant.	Totals.
1906	13,632	1,953	..	15,585
1907	..	..	..	..
1908	11,929	3,634	..	15,563
1909	12,320	3,669	..	15,989
1910	14,572	4,608	..	19,180
1911	14,967	5,028	..	19,995
1912	15,346	5,286	..	20,632
1913	17,642	6,411	..	24,053
1914	19,275	6,969	..	26,244
1915	19,429	7,585	..	27,014
1916	18,483	7,450	..	25,933
1917	20,824	9,391	..	30,215
1918	23,176	10,183	..	33,359
1919	24,889	10,126	..	35,015
1920	25,157	10,447	..	35,604
1921	..	..	..	..
1922	36,463	7,930	5,758	50,151
1923	40,099	7,336	5,997	53,432
1924	41,704	6,695	6,231	54,630
1925	43,381	5,726	6,081	55,188
1926	41,883	5,611	7,111	54,605
1927	42,472	5,720	6,915	55,107
1928	43,580	6,424	5,655	55,659
1929	43,153	6,501	6,443	56,097
1930	45,592	7,193	6,632	59,417
1931	46,906	7,357	6,482	60,745
1932	51,407	7,168	5,371	63,946
1933	56,819	8,432	4,371	69,622
1934	59,135	8,381	4,321	71,837
1935	58,358	8,108	4,264	70,730

No figures available for the years 1907 and 1921.

—Dairy Division Factory Lists.

TABLE 13.—VALUES OF NEW ZEALAND BUTTER AND CHEESE AT THREE STAGES BETWEEN NEW ZEALAND AND SALE IN LONDON BY CALENDAR YEARS.

(In shillings per hundredweight.)

Year.	Butter.			Cheese.		
	F.o.b.(*), New Zealand.	C.i.f.(†), United Kingdom.	Sales(‡), Quotations.	F.o.b.(*), New Zealand.	C.i.f.(†), United Kingdom.	Sales(‡), Quotations.
	s.(N.Z.)	s.(Stg.)	s.(Stg.)	s.(N.Z.)	s.(Stg.)	s.(Stg.)
1924 ..	183·3	184·1	195	88·1	92·5	94
1925 ..	164·4	171·9	187	84·3	96·7	104
1926 ..	148·9	166·5	169	81·3	94·2	93
1927 ..	150·0	164·8	168	74·8	89·0	92
1928 ..	155·9	167·4	176	85·4	97·6	103
1929 ..	160·0	173·0	174	78·9	81·4	91
1930 ..	125·8	137·9	132	71·0	79·8	78
1931 ..	107·1	111·9	114	54·5	57·1	59
1932 ..	97·4	101·5	103	55·3	58·8	61
1933 ..	88·4	81·2	83	48·1	47·5	47
1934 ..	76·8	73·4	73	47·3	46·8	47
1935 ..	97·6	87·8	92	50·7	47·6	49

(* Calculated from declared values as shown in "Statistical Report of Trade and Shipping of Dominion of New Zealand." (†) Calculated from declared values as shown in "Accounts relating to Trade and Navigation of the United Kingdom." (‡) Calculated from weekly market quotations.

NOTE.—Whereas the declared values for both New Zealand and the United Kingdom are weighted values—that is, total value divided by total weight—the sales quotations are unweighted, no account being taken of the amount sold each week. Further, sales quotations refer to top quality in both butter and cheese, whereas declared values refer to all grades.

TABLE 14.—AVERAGE DAIRY-FACTORY PAYOUTS, IN PRINCE PER POUND BUTTERFAT.

Season.	Cheese.	Butter.	Dual.	Combined.
1934-35	9·53	9·45	9·69	9·55
1933-34	9·49	8·82	9·32	9·08
1932-33	9·33	8·86	8·83	8·93
1931-32	11·43	10·98	10·94	11·03
1930-31	10·39	11·62	11·77	11·58
1929-30	17·13	15·50	16·64	16·25
1928-29	18·76	17·99	19·00	18·48
1927-28	19·33	17·12	18·55	17·99
1926-27	15·00	15·27	15·61	15·38

TABLE 15.—LOCAL CONSUMPTION: PER CAPITA CONSUMPTION OF BUTTER AND CHEESE IN NEW ZEALAND, SHOWING ALSO THE TOTAL PRODUCTION AND THE PERCENTAGES OF EACH COMMODITY EXPORTED AND AVAILABLE FOR CONSUMPTION LOCALLY. (NEW ZEALAND PRODUCTION ONLY.)

Season.	Butter.				Cheese.			
	Total Butter produced.	Shipments.	Available for Consumption.	Apparent Consumption per capita.	Total Cheese produced.	Shipments.	Available for Consumption.	Apparent Consumption per capita.
	Cwt.	Per Cent.	Per Cent.	lb.	Cwt.	Per Cent.	Per Cent.	lb.
1920-21 ..	875,877	66.55	33.44	26.09	1,115,650	..	..	..
1921-22 ..	1,257,628	76.17	23.82	23.96	1,268,534	..	..	..
1922-23 ..	1,632,348	77.92	22.07	30.60	1,247,987	96.53	3.46	3.67
1923-24 ..	1,525,847	77.10	22.89	29.14	1,534,980	95.55	4.44	5.69
1924-25 ..	1,707,636	77.00	22.99	32.09	1,436,541	97.46	2.53	2.97
1925-26 ..	1,599,733	73.31	26.68	34.12	1,520,169	96.78	3.21	3.91
1926-27 ..	1,793,780	76.19	23.80	33.45	1,564,276	97.74	2.25	2.77
1927-28 ..	1,863,433	76.57	23.42	33.72	1,550,090	97.02	2.97	3.56
1928-29 ..	2,041,649	77.14	22.85	35.63	1,782,237	96.78	3.21	4.38
1929-30 ..	2,338,833	79.54	20.45	36.06	1,781,918	96.28	3.71	5.00
1930-31 ..	2,394,734	78.81	21.18	37.73	1,857,852	94.86	5.13	4.40*
1931-32 ..	2,531,855	80.08	19.91	37.10	1,781,782	98.70	1.29	4.40*
1932-33 ..	3,028,353	82.53	17.46	38.63	2,071,181	97.25	2.74	4.15
1933-34 ..	3,291,609	83.39	16.60	39.60	2,135,599	96.95	3.04	4.71
1934-35 ..	3,210,626	82.59	17.40	40.19	1,914,458	96.02	3.97	5.47

*Averaged.

—Compiled from figures supplied by Farm Economics Section, Department of Agriculture.

The details given in this table refer to the amount available for local consumption from each season's make, corrected for the quantities in store at the beginning and end of the period ending 31st July each year, and divided by the estimated population (including Maoris) as at 31st December each year. Butter includes creamery, whey, and farm butter. Farm butter estimated for the last five years shown in the table. Prior to that particulars were collected by the Government Statistician. The larger farm-cheese enterprises are represented in the cheese figure given, these being mainly located on the Banks Peninsula, where quite a number of dairy-farmers operate small cheese factories throughout a full season, principally from their own supplies of milk. The variability in the *per capita* consumption of cheese is possibly due to the varying quantities held over from one year to another for ample maturing. The bulk of the butter, on the other hand, goes into consumption without delay.

It is worthy of mention that New Zealand's *per capita* consumption of butter is the highest in the world. For cheese, however, we are very low on the list.

TABLE 16.—FARM MACHINERY.

Year.	Number of Suppliers to Dairy Factories.	Number of Separators on Farms.	Percentage of Suppliers equipped with Separators.	Number of Milking-machine Plants.	Number of Cows milked by Machinery.	Percentage of Cows milked by Machinery.
			Per Cent.			Per Cent.
1918-19 ..	35,015	24,736	70·6	7,577	354,760*	49·4
1919-20 ..	35,604	26,678	74·9	8,806	392,747*	51·2
1920-21 ..	43,980*	32,024	72·8	10,450	466,070*	53·4
1921-22 ..	50,151	38,861	77·5	12,468	533,345	53·4
1922-23 ..	53,432	40,916	76·5	13,553	611,287	55·2
1923-24 ..	54,630	42,473	77·7	14,553	670,934	57·4
1924-25 ..	55,188	44,656	80·9	15,561	705,033	59·8
1925-26 ..	54,605	45,765	83·8	16,391	729,772	62·8
1926-27 ..	55,107	45,246	82·1	17,090	753,751	64·9
1927-28 ..	55,659	45,246	81·3	18,049	816,643	66·8
1928-29 ..	56,097	45,781	81·6	18,756	874,971	68·9
1929-30 ..	59,417	48,302	81·2	20,415	967,131	70·7
1930-31 ..	60,745	47,112	77·5	22,547	1,096,561	74·1
1932-32 ..	63,946	51,334	80·2	23,222	1,147,549	73·5
1932-33 ..	69,622	54,200	77·8	24,350	1,247,279	73·2
1933-34 ..	71,837	55,625	77·4	25,178	1,324,063	73·7
1934-35 ..	70,730	55,920	79·0	25,630	1,359,534	74·3

* Estimated.

—Government Statistician.

TABLE 17.—DAIRY COW POPULATION AND AVERAGE BUTTERFAT PRODUCTION PER COW.

Season.	Cows in Milk and Dry.	Estimated Average Butterfat per Cow (in Milk and Dry).	Cows in Milk.	Estimated Average Butterfat per Cow in Milk.	Percentage in Milk to Total Dairy Cows.	Dry Cows.	Percentage Dry to Total Dairy Cows.
		lb.		lb.	Per Cent.		Per Cent.
1900-1 ..	372,416	123.17	..	..	..	..	..
1901-2 ..	381,492	127.20	..	..	..	..	..
1902-3 ..	428,773	123.48	..	..	..	..	..
1903-4 ..	468,125	130.34	..	..	..	..	..
1904-5 ..	498,241	127.83	..	..	..	..	..
1905-6 ..	517,720	124.74	..	..	..	..	..
1906-7 ..	543,927	124.79	..	..	..	..	..
1907-8 ..	541,363	127.66	..	..	..	..	..
1908-9 ..	536,629	139.25	..	..	..	..	..
1909-10 ..	583,163*	148.45	..	..	..	..	..
1910-11 ..	633,733	139.46	..	..	..	..	..
1911-12 ..	653,303*	140.10	..	..	..	..	..
1912-13 ..	678,021*	150.78	..	..	..	..	..
1913-14 ..	701,312*	156.52	..	..	..	..	..
1914-15 ..	725,403*	154.07	..	..	..	..	..
1915-16 ..	750,323	160.52	..	..	..	..	..
1916-17 ..	777,439	163.96	684,032	186.35	88.0	93,407	12.0
1917-18 ..	793,212	152.23	710,561	169.94	89.6	82,654	10.4
1918-19 ..	826,135	150.64	732,253	169.95	88.6	93,882	11.4
1919-20 ..	893,454	152.04	782,757	173.54	87.6	110,697	12.4
1920-21 ..	1,004,666	154.25	890,220	174.08	88.6	114,446	11.4
1921-22 ..	1,137,055	174.97	1,015,325	195.94	89.3	121,730	10.7
1922-23 ..	1,248,643	180.62	1,124,671	200.52	90.1	123,972	9.9
1923-24 ..	1,312,589	174.10	1,184,977	192.84	90.3	127,612	9.7
1924-25 ..	1,323,432	182.09	1,195,567	201.56	90.3	127,865	9.7
1925-26 ..	1,303,856	179.40	1,181,441	197.99	90.6	122,415	9.6
1926-27 ..	1,303,225	198.50	1,181,545	218.94	90.7	121,680	9.3
1927-28 ..	1,352,398	195.38	1,242,729	212.62	91.9	109,669	8.1
1928-29 ..	1,371,063	210.84	1,291,204	223.87	94.2	79,859	5.8
1929-30 ..	1,440,321	218.05	1,388,872	226.13	96.4	51,449	3.6
1930-31 ..	1,601,633	201.05	1,499,532	214.73	93.6	102,101	6.3
1931-32 ..	1,702,070	199.65	1,582,664	214.71	92.9	119,406	7.1
1932-33 ..	1,845,972	215.10	1,723,913	231.18	95.4	122,059	6.6
1933-34 ..	1,932,151	220.80	1,816,402	234.91	94.0	116,109	6.0
1934-35 ..	1,952,094	210.00	1,827,962	224.26	93.6	124,132	6.4
1935-36 ..	1,951,507	217.93	1,823,358	233.25	95.4	128,149	6.5

* Geometric mean.

TABLE 18.—COWS TESTED, AVERAGE PRODUCTION PER TESTED COW, ETC.

Season.	Tested Cows.	Average Fat per Tested Cow.	Percentage Tested Cows to Total Cows.	Percentage Tested Cows in Milk.
		lb.	Per Cent.	Per Cent.
1909-10	815	..	0·1	..
1910-11	4,317	..	0·7	..
1911-12	13,440	..	2·1	..
1912-13	25,000	..	3·7	..
1913-14	25,000	..	3·6	..
1914-15	24,000	..	3·3	..
1915-16	24,105	..	3·2	..
1916-17	14,343	..	1·8	2·0
1917-18	26,768	..	3·4	3·7
1918-19	17,000	..	2·1	2·3
1919-20	25,134	230·25*	2·8	3·2
1920-21	35,757	210·92*	3·6	4·0
1921-22	45,564	232·99*	4·0	4·5
1922-23	84,825	233·82	6·8	7·5
1923-24	151,214	212·75	11·5	12·7
1924-25	196,850	223·54	14·9	16·4
1925-26	169,776	220·51	13·0	14·4
1926-27	170,150	240·48	13·1	14·4
1927-28	224,130	224·68	16·6	18·0
1928-29	259,594	240·50	18·9	20·1
1929-30	283,731	253·61	19·7	20·4
1930-31	271,404	241·05	16·9	18·0
1931-32	259,857	236·87	15·3	16·4
1932-33	286,054	255·57	15·5	16·6
1933-34	297,647	262·44	15·4	16·4
1934-35	265,944	252·01	13·6	14·5
1935-36	245,355	257·64	12·57	13·5

*Associations conducted by the Dairy Division.

—Dairy Division.

TABLE 19.—AVERAGE PRODUCTION, IN CALENDAR YEARS, REPRESENTED BY FIRST-CLASS CERTIFICATES ISSUED IN THE YEARLY DIVISION TO JERSEY AND FRIESIAN COWS FROM THE COMMENCEMENT OF THE CERTIFICATE-OF-RECORD TEST.

Year.	Number of Certificates.	Average Yield for Season.			
		Days in Milk.	Milk.	Test.	Butterfat.
<i>(1) Jerseys.</i>					
			lb.	Per Cent.	lb.
1913	66	313	6,841.9	5.48	375.46
1914	117	334	7,568.2	5.55	412.65
1915	95	347	7,704.9	5.55	428.18
1916	105	342	7,183.3	5.49	395.06
1917	107	340	7,231.2	5.49	397.03
1918	121	343	7,286.6	5.58	406.84
1919	164	341	7,445.5	5.62	419.10
1920	260	343	7,913.3	5.51	436.56
1921	388	340	7,361.9	5.59	412.26
1922	397	344	8,007.5	5.54	443.75
1923	569	348	8,177.3	5.56	455.13
1924	674	348	8,519.8	5.49	468.36
1925	599	345	8,315.7	5.51	458.91
1926	428	346	8,255.3	5.59	461.68
1927	383	349	8,303.3	5.65	469.36
1928	367	346	8,164.6	5.59	456.92
1929	367	343	8,188.3	5.56	455.51
1930	508	345	8,353.3	5.58	466.78
1931	503	351	8,636.7	5.63	486.25
1932	347	355	8,614.9	5.66	488.31
1933	372	358	9,100.6	5.63	513.09
1934	456	358	9,093.1	5.69	518.02
1935	381	359	9,080.8	5.62	511.73
1936	418	354	8,913.4	5.66	505.13
<i>(2) Friesians.</i>					
1913	48	328	10,838.3	3.66	397.04
1914	78	331	12,625.5	3.52	444.97
1915	71	346	12,599.9	3.52	451.39
1916	49	340	12,348.7	3.50	433.37
1917	76	340	12,903.1	3.52	454.47
1918	71	349	12,965.2	3.59	466.65
1919	61	344	13,687.5	3.52	482.74
1920	105	343	12,718.7	3.60	458.93
1921	153	337	12,635.5	3.57	450.94
1922	168	344	13,498.5	3.46	468.31
1923	161	350	14,759.0	3.49	516.37
1924	191	345	14,070.3	3.45	486.08
1925	147	339	14,179.9	3.52	499.93
1926	110	341	13,677.7	3.53	483.10
1927	89	336	14,129.4	3.55	502.09
1928	79	347	15,030.2	3.51	527.97
1929	86	346	15,336.2	3.48	534.51
1930	96	347	14,527.8	3.58	528.04
1931	95	348	15,565.3	3.59	559.01
1932	71	361	15,852.4	3.68	583.61
1933	69	358	16,351.0	3.60	589.01
1934	59	357	17,080.4	3.64	622.87
1935	56	351	15,493.9	3.63	563.95
1936	56	352	15,530.6	3.61	561.50

TABLE 20.—AVERAGE PRODUCTION ACCORDING TO BREED, AND CLASS BY CLASS, REPRESENTED BY ALL FIRST-CLASS CERTIFICATES ISSUED IN THE YEARLY DIVISION SINCE THE COMMENCEMENT OF THE CERTIFICATE-OF-RECORD TEST.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
<i>Jerseys (1913-36).</i>				
			lb.	lb.
Junior two-year-old ..	3,280	349	7,267.1	409.31
Senior two-year-old ..	866	346	7,926.0	448.13
Three-year-old ..	1,217	346	8,705.9	487.25
Four-year-old ..	853	348	9,285.6	519.75
Mature ..	1,976	347	9,598.5	528.74
All ..	8,192	348	8,323.0	465.30
Average test, 5.59 per cent.				
<i>Friesians (1913-36).</i>				
Junior two-year-old ..	676	347	11,980.2	425.51
Senior two-year-old ..	276	349	12,849.5	457.85
Junior three-year-old ..	198	344	13,619.0	481.89
Senior three-year-old ..	201	337	14,183.6	509.34
Junior four-year-old ..	139	345	15,334.1	543.75
Senior four-year-old ..	142	346	16,229.5	568.36
Mature ..	613	343	16,241.3	574.00
All ..	2,245	345	14,069.3	498.87
Average test, 3.54 per cent.				
<i>Milking Shorthorns (1915-36).</i>				
Junior two-year-old ..	58	349	8,406.2	346.25
Senior two-year-old ..	46	350	9,020.3	376.83
Junior three-year-old ..	29	337	9,750.7	398.70
Senior three-year-old ..	32	344	10,999.8	457.26
Junior four-year-old ..	26	350	11,097.5	454.38
Senior four-year-old ..	34	343	11,623.3	462.59
Mature ..	285	342	11,817.6	473.46
All ..	510	344	10,958.8	443.31
Average test, 4.04 per cent.				
<i>Ayrshires (1914-36).</i>				
Two-year-old ..	72	344	8,959.0	372.02
Three-year-old ..	40	347	10,028.0	413.26
Four-year-old ..	27	346	11,378.0	459.52
Mature ..	110	348	11,942.9	485.96
All ..	249	348	10,711.2	438.47
Average test, 4.09 per cent.				
<i>Red Polls (1921-36).</i>				
Two-year-old ..	43	345	7,575.7	336.72
Three-year-old ..	16	346	7,995.1	349.63
Four-year-old ..	8	349	9,806.8	430.72
Mature ..	26	341	10,501.0	443.67
All ..	93	344	8,642.1	376.93

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