

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE

REPORT OF A VISIT

TO

GREAT BRITAIN AND THE CONTINENT OF EUROPE

IN THE

WINTER OF 1897-98

BY

Dr. DUNCAN McEACHRAN

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PUBLISHED BY AUTHORITY OF THE MINISTER OF AGRICULTURE

OTTAWA AUGUST, 1898

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GOVERNMENT PRINTING BUREAU
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DR. DENISON McNICOLL,
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PART I.

Hon. SYDNEY FISHER,
Minister of Agriculture,
Ottawa.

SIR,—I beg to submit the following report of my recent visit to Britain, France, Germany and Denmark, and to direct your attention to the suggestions deduced from a careful, though somewhat hurried study of various matters appertaining to health of animals ; and more especially to contagious disease affecting them, which I trust may be found useful in assisting the deliberations of the department in relation to these matters which are of such vital importance to agriculture.

Arriving at Liverpool on the 30th December, I met, that evening, two of the Canadian Live Stock Agents, Messrs. Elliott and Rodgers, of Toronto, with whom I made an arrangement to visit the cattle sheds and lairages at Birkenhead next morning, where we met Mr. Williams, of Brampton, Ont., and Mr. Piers, of Toronto ; by the latter we were shown over the lairages.

On the arrival at the ports in Great Britain, the steamships are docked at floating wharfs and the cattle landed, whence they are driven by runways to the large cattle sheds, which are divided into yards and alleyways.

Those at Liverpool are several stories high and are similarly divided. The yards are furnished with feeding conveniences and are kept perfectly clean, ventilation and light are carefully provided for. In one part may be seen United States cattle, in another Argentine, and in another Canadian. They are consigned to agents who assume charge of them, see to their care and feeding and effect the sales. They may be sold privately or by auction. Under the existing regulations they must be slaughtered within ten days of their landing, and may be sold on foot or in quarters.

The offal, hides, etc., are disposed of by the buyer or agent as the case may be.

The agents have their offices on the grounds, and every facility for carrying on the trade is amply provided for.

In the lairages we found a consignment of fat cattle owned by J. W. Snell, which I presume were justly pronounced about the best bred and best finished lot of Canadian cattle which had landed there during the past shipping season. The gentleman who was showing us round, remarked: "What a pity that all our Canadian cattle are not like these." This led to an assertion being made which substantiated the statement contained at the foot of page 4 of my annual report for 1897, viz.:—"It is evident to all interested observers that year by year Canadian cattle are failing to hold their own in quality, and the time has come when they must be improved by the importation of fresh blood from abroad."

We were shown a large number of United States cattle evidently from the far west. They were good rough cattle, but capable of being much better finished. A consignment of Argentine Republic cattle was also shown us, and here I saw convincing evidences of the adaptability of that country for stock-raising. Owing to the climate, the cattle get no check on their growth. Their coats are as fine as those of groomed horses, they are large (over 1,400 pounds each), and show evidence of short horn crossing on long horned, probably Spanish cattle. It is well known that the Argentines have been the most extensive purchasers of thoroughbred cattle in Britain for years back, and it is quite evident that they can raise them much more cheaply and incur fewer losses than can be expected in the west of Canada or the United States, and, if we would derive the benefits of our nearness to British markets, as compared with them, we must produce cattle of the most improved and most profitable breeds.

These in the estimation of men in the trade are Shorthorns (Scotch in preference), Polled Angus, Galloways, Herefords and South Devons (which are larger than the North Devons) and Sussex.

The hardy Scotch shorthorn is most favoured for Canadian purposes.

At Glasgow I visited the market and was present at some of the sales of both horses and cattle.

The difference in the prices between inferiorly bred unfinished cattle as compared with well bred finished cattle was most marked—in every instance, when a well bred heifer or steer, well fed and in finished condition appeared in the ring bidding became active and long ; two-year-olds brought from £14 to £20 each, (\$70 to \$100) for beef purposes.

MR. OGILVIE'S IMPORTATION OF AYRESHIRE.

When at Glasgow I was called on by the agent of Mr. W. W. Ogilvie of Montreal, who was engaged in buying twenty-five head of the best Ayreshires procurable. All Mr. Ogilvie's importation were carefully tested before leaving Scotland and declared free from tuberculosis, and were shipped from Glasgow to St. John, N.B, where they are now in quarantine.

I arrived in Perth just at the close of a sale of 334 Aberdeen Angus bulls, and 105 cows and heifers, held by Messrs. McDonald, Fraser & Co., at their sale yards. This being the annual show and sale, the herds of the most noted breeders of this famous breed of Scotch cattle were represented.

In accordance with your instructions I consulted the following gentlemen :—Professor J. McI. McCall, of Glasgow, Professor McFadyean, Principal of the Royal Veterinary College, London, Sir George T. Brown, late Chief Veterinary Adviser of the Board of Agriculture, and Messrs. Cope and Duguid, the present veterinary officers of the board, on the question of the appointment of veterinarians to make tuberculin tests of cattle being exported to Canada and to give certificates to be accepted by Canadian Cattle Quarantine Officers. As a result I confidently recommend the following list of veterinarians, which I sent to the High Commissioner of Canada, at London, with the following explanatory letter :—

17 VICTORIA STREET, LONDON, S.W.,
12th February, 1898.

MY LORD,—In compliance with instructions received from the Minister of Agriculture, who is desirous of meeting the wishes of a number of Canadian exporters of breeding stock to make arrangements for the selection of a certain number of veterinarians in Great Britain, whose certificates of having

applied the Tuberculin Test to animals intended for exportation to Canada will be accepted in the Dominion without the animals being subjected again to the test in Canada, I beg to submit that, having consulted the Veterinary Advisers of the Board of Agriculture, and Professor McFadyean in London and Professor McCall in Glasgow, I would recommend the members of the veterinary profession whose names and addresses are given on the list herewith.

I would suggest to your Lordship that when application is made by an importer for the name of a veterinary surgeon who has been recommended as above, a letter be written to the veterinarian from your office, informing him of this arrangement, and at the same time explaining that it does not mean any appointment to the Canadian Government service, and that their remuneration for such tests will be paid by the parties on this side who employ them.

The Minister suggests that the same scale of fees be charged by them as is charged by the members of the veterinary profession in Canada who test animals for exportation to the United States, viz.: for one animal £1, for the next nine animals 4s. each, for each animal in excess of ten, 2s. I would suggest that these men be informed that, on application to your office, they will be furnished with directions for the application of the Tuberculin Test as applied by the Government Veterinarians in Canada, and charts on which to set out the results of the test, and a certificate which must be signed by them giving their full qualifications and addresses.

I have the honour to be, my Lord,

Your Lordship's obedient servant,

(Signed) DUNCAN MCEACHRAN,

Chief Inspector of Stock for Canada.

The Right Honourable

Lord STRATHCONA and MOUNT ROYAL,

G.C.M.G.

LIST of Veterinary Surgeons in the United Kingdom whose
Tuberculin Test will be accepted by Canadian Cattle
Quarantine Officers.

Aberdeen	James Thomson, Flour Mill Brae, Aberdeen.
"	*W. Skinner, M.R.C.V.S., Oldmeldrum for Tarvies and Inverurie.
"	*John Beattie, M.R.C.V.S., Longside.
"	*W. D. Snowball, M.R.C.V.S., Huntly.
Argyleshire	D. Clerk, Kilmartin.
Ayrshire	T. A. Douglas, Kilmarnock.
Banffshire	A. E. MacGillivray, Banff.
Berwickshire	John Connochie, Ayton.
"	Robt. Watson, Coldstream.
Buckinghamshire	Thos. W. Lapper, Aylesbury.
Berkshire	Sir H. Simpson, Windsor.
"	Albert Wheatley, F.R.C.V.S., Reading.
Brecknockshire	A. I. Cattell, Brecon, South Wales.
Caithness	Robt. Morris, Wick.
Cambridgeshire	Geo. A. Banham, F.R.C.V.S., Cambridge.
Chester	James Stover, F.R.C.V.S., Chester.
Cornwall	Thomas Oliver, Truro.
Cumberland	James G. Bell, Carlisle.
Dunfriesshire	A. J. McIntosh, Dumfries.
Denbighshire	John Roberts, Wrexham.
Derbyshire	R. B. Aulton, Derby.
Devonshire	W. H. Bloye, Plymouth, Devon.
Dorsetshire	Chas. H. Colledge, Sherborne, Dorset.
Dumbartonshire	H. Ferrier, F.R.C.V.S., Alexandria.
Durham	Chas. Hunting, F.R.C.V.S., South Hetton.
Edinburgh	Prof. John R. U. Dewar, F.R.C.V.S., Edinburgh.
Essex	Peter S. Cowan, Colchester.
Fifeshire	J. Borrowman, Auchtermuchty.
Forfarshire	J. Clark, Abbey Hill, Coupar Angus.
"	Andrew Spreull, Dundee, Forfar.
Glasgow	Prof. James McCall, F.R.C.V.S., Glasgow.
Gloucestershire	George Holtham, Gloucester.
Guernsey	*George Burton, M.R.C.V.S.
Hampshire	T. B. Goodhall, Christ church.
Hertfordshire	Wm. Wilson, F.R.C.V.S., Gt. Berkhamstead.
Huntingdon	Fred. Geo. Reynolds, St. Ives.
Invernesshire	Wm. Logan, Inverness.
Kirkcudbrightshire	T. Campbell, F.R.C.V.S., Kirkcudbright.
Kent	W. A. Edgar, F.R.C.V.S., Dartford, Kent.
Lancashire	Samuel Locke, Grosvenor St., Manchester.
"	Wm. Woods, F.R.C.V.S., Wigan.
Leicester	J. Geo. Parr, F.R.C.V.S., Leicester.
Lincolnshire	W. G. I. Dickinson, F.R.C.V.S., Boston.
London	Prof. J. W. Axe, Sloane Street.
Middlesex	Sidney G. Villar, F.R.C.V.S., Harrow.
Monmouthshire	David M. Stowar, F.R.C.V.S., Abergavenay.
"	Chas. Moir, Cardiff.
Montgomery	James McGavin, Montgomery.
Morayshire	Geo. Tait, Elgin.
Norfolkshire	F. Low, Norwich.
"	Wm. Bower, Rudham.
Northernberland	Clement Stephenson, F.R.C.V.S., Newcastle-on-Tyne.
Nottinghamshire	Harry Moore, Worksop.
"	*Charles Taylor, M.R.C.V.S., Clumber Street, Not- tingham.
Oxfordshire	J. P. S. Walker, Oxford.
Renfrewshire	Wm. Houston, Paisley.
Rutland	Justus Littler, Oakham, Rutland.
Roxburghshire	John Hutton, F.R.C.V.S., Kelso.

* These names have been added to list since above letter was written.

LIST of Veterinary Surgeons in the United Kingdom whose
Tuberculin Test will be accepted by Canadian Cattle
Quarantine Officers—*Continued.*

Shropshire.....	W. E. Litt, Shrewsbury, Salop.
".....	*James Martin, M.R.C.V.S., Mansion House, Park Street, Wellington, Salop.
Somerset.....	T. W. Whitney, Shepton Mallet.
Staffordshire.....	Wm. Curless, Stafford.
".....	Geo. Wartuaby, Burton-on-Trent.
Somersetshire.....	Geo. H. Elder, Taunton.
Suffolk.....	Philip Turner, Ixworth, Suffolk.
Stirlingshire.....	*Wm. McQuiston, M.R.C.V.S., Buchlyvie.
Wigtownshire.....	W. A. Macgregor, Stranraer.
".....	J. McMillan McConnell, Wigtown.
Warwickshire.....	J. M. Parker, Birmingham.
".....	Thos. Horton, Warwick.
Wiltshire.....	W. T. Broad, Marlborough.
".....	Henry Hussey, Devizes.
Worcestershire.....	Abraham Green, Dudley.
Yorkshire.....	Frank Halliday, Easingwold, York.
".....	Gavin Scott, Scarborough.
".....	Joseph Abson, F.R.C.V.S., Sheffield.
".....	Fred. Percy Carter, F.R.C.V.S., Bradford.
".....	Herbert John Parkin, Doncaster.
".....	John S. Wheatcroft, Rotherham.

*These names have been added to list since above letter was written.

I cannot too strongly express my appreciation of the courtesy extended to me by the Official Veterinarians of the Government, who took a great deal of trouble to show me everything which would be instructive to me, and who discussed freely with me the contagious diseases of live stock and their existence in Britain, as well as their methods of dealing with them.

I was shown in the post-mortem room intestines from pigs dead from swine fever, and on one occasion a lung from a chronic case of contagious pleuro-pneumonia (an encysted lung).

Professor McFadyean met me on several occasions with Mr. Cope, Chief Inspector of the Board of Agriculture, and we freely discussed contagious diseases and cattle quarantine matters.

I have also to thank Sir George T. Brown, who has recently retired from the active work of the Board, but who is still consulted on all important matters concerning animal diseases, for his kind attention and valuable information. (For Professor

Brown's views on contagious pleuro-pneumonia, see under that head.)

By the invitation of Mr. Cope, I accompanied him to the New South Wales Frozen Mutton Emporium in London, and was shown over the very thorough and extensive establishment where whole ship-loads of frozen carcasses of sheep are constantly being received and distributed. They are all sewn up in cotton cloth, and frozen solid, and stored in cold chambers. Provision is also made for thawing them gradually, which is so nicely managed that they are restored to a non-frozen condition without detriment, which result is not obtained by any other method.

The details of this establishment's apparatus and methods can be studied with advantage by those specially interested in cold storage.

FRANCE, GERMANY AND DENMARK.

Acting on your instructions, I visited France, Germany and Denmark, and having been honoured with letters of introduction from the British Foreign Office to Her Majesty's Ambassadors in these countries obtained for me through the courtesy of His Lordship the High Commissioner, and having numerous professional introductions, I had ample opportunities, so far as time would admit, of visiting such scientific institutions as are controlled, as most of them are, by the different governments.

PARIS.

I was fortunate enough to find an old friend in Paris, Professor Liautard, of New York, who very kindly accompanied Dr. Sugden and me to the Pasteur Institute, where we were introduced to the director, the eminent scientist Roux, a worthy disciple and the successor of the great Pasteur. This eminent scientist is a very plain unassuming man, thoroughly engrossed in his work and with no leisure for anything else.

This is a large thoroughly equipped institution where all diseases are carefully investigated, but its speciality is the treatment of those who have been bitten by rabid animals. Patients come there from all parts of the world for treatment by inoculation with attenuated virus.

We were shown the laboratories, operating rooms, lecture theatres, etc. We also visited the buildings where the experimental animals are kept; rabbits, guinea pigs, dogs, cattle, calves, etc., and were shown animals which had been inoculated and which were undergoing experiments for research purposes, those inoculated with rabies virus being kept in strong iron cages carefully locked and marked "dangerous."

ALFORD VETERINARY COLLEGE, PARIS—PROF. NOCARD.

We were shown over this institution by Prof. Liautard. It was founded by Bourgelat in 1766, is richly endowed by the Government and is replete in all requisites for thorough veterinary tuition.

We sent in our cards and were not kept long waiting to accomplish the object of our visit, viz.: to meet Prof. Nocard, who is the head of the Government Veterinary Staff, and considered to be one of the highest authorities, if not the highest authority on animal diseases in Europe. He had taken part in the discussion of the question as to whether or not the British Veterinary Staff were correct in asserting that the form of pneumonia discovered in some Canadian cattle was contagious pleuro-pneumonia. I found him, in consequence, well informed on live stock matters in Canada. His views of contagious diseases are given under that heading.

We also paid a short visit to Prof. Cadiot, Professor of Veterinary Medicine and Surgery and author of Exercises in Equine Surgery.

We also visited the abattoir and the Zoological Garden, Le Jardin d'Acclimatation, which is a most extensive and valuable collection of animals of all kinds, the numbers and varieties of dogs being very large and specimens exceptionally good.

INSTITUTIONS OF GERMANY.

BERLIN.

Through the courtesy of His Excellency the British Ambassador, who sent the Commercial Attaché to introduce me to Professor Dickerhoff, who is Dean of the Veterinary College, Berlin, he arranged for our meeting with Professor Ostertag, who is bacteriologist and is the highest authority in Germany on meat and milk inspection and diseases of animals generally.

We first spent some time visiting the various departments of this great Veterinary College, the external and internal Cliniques for all animals, but chiefly horses and dogs. The large number of lame and sick animals treated almost free, being charged for medicines only, which are daily brought there affords ample material for clinical instruction. The large well arranged and fully equipped stables filled with patients kept and treated for merely the cost of the food. The Dog hospital is always full; here all diseases, injuries and surgical operations can be thoroughly studied. In the shoeing forge, is a large collection of shoes of all kinds; that most in use being hollow and filled with tarry rope which is found to prevent slipping on the asphalt pavements. We were shown the practical application of the X Ray photographs in discovering fractures and foreign bodies, especially in dogs and other small animals. We were shown the museum and took special interest in the collection of Entozoa, which is probably the most complete in Europe.

Specimens of preserved grasses were shown in a half per cent solution of Formalin as fresh as when cut.

Professor Ostertag next conducted us to his laboratory, where we were entertained and instructed, Mr. Leroy M. Land, D.V.S., of Lexington, Kentucky, U.S., acting as interpreter. The Professor showed us cultures of various micro-

organisms of Tetanus, Swine Plague and Hog Cholera, Glanders, Strangles, Actinomycosis, Typhoid Fever and Tuberculosis, and illustrated his methods of examination, staining and mounting. Professor Ostertag's views on contagious diseases will be found under that head.

THE IMPERIAL HEALTH OFFICE, BERLIN.

By means of a letter of introduction from Professor Ostertag, we were cordially received at the Imperial Health Office, which is a very extensive establishment kept up by the Government specially to deal with all matters appertaining to public health.

It is most complete in all its numerous departments. Our time being limited, we took special interest in the animals department, but nowhere else in Europe, I believe, could a sanitary engineer, or civic medical health officer seeking up-to-date information find such a concentration of everything connected with sanitation as in this establishment.

We were shown various methods of sterilization and different apparatus, the simplest being an oven-shaped iron structure heated by a furnace or steampipes and fitted with shelves for receiving the trays of bottles or whatever is to be sterilized.

The experiment department is thoroughly equipped with every requisite, a very numerous collection of guinea pigs, rabbits, pigeons, rats, mice, pigs, goats, sheep and cattle are distributed in various rooms which are furnished with isolation cages, all carefully labelled, indicating the disease being investigated, and the date of inoculation. Temperature charts, clinical symptoms, etc., etc., are carefully written up. There is also a large dissecting room, a model in its way, where post-mortem examinations are held. They were experimenting with foot-and-mouth disease at the time of our visit.

After visiting the working laboratories and culture rooms, we paid a short visit to the museum, which is in fact an exhibition of every sanitary apparatus known, with models, drawings, etc. After a hurried glance at the library, etc., we terminated a most instructive and enjoyable visit.

VETERINARY COLLEGE AT DRESDEN.

We paid a short visit to the Veterinary College at Dresden, which is a commodious establishment, well equipped and liberally supported by the Government of Saxony. It is presided over by Professor Johnne, who is recognized as a reliable authority, and trusted investigator. He is an active middle-aged man.

LEIPSIK.

At Leipzig we had the pleasure of meeting Professor Mills of McGill University, Montreal, who is prosecuting studies in the laboratory of the great teacher of anatomy and physiology, Professor His. He accompanied us to the various scientific institutions.

We spent some hours at the Veterinary College, which is in reality a department of the Agricultural College. We were very kindly received by the Director, Professor Zurn, who from being somewhat advanced in years, and infirm, was unable to accompany us. He sent with us his assistant, Professor Richard Kantbrorricz, a young man with lots of go in him.

He showed us the large operating room and the controlling apparatus, the stables and patients under surgical and medical treatment, and dog rooms—in the latter they have two cells built of stone with iron door and fronts for rabid dogs. Rabies is not infrequently met with here. The dog cages are all made of strong wrought iron. Outside of the stable we were shown a special building, hexagonal in form, thoroughly padded round the sloping walls and the floor covered by tan-bark, for the treatment of cerebral cases in horses.

For examining horses for lameness they have a straight run with turf on one side, stone pavement in the middle and sand and gravel on the other side, so as to afford different degrees of concussion to the feet.

The museum which contains the collection of pathological specimens made during centuries, was replete with skeletons, bones, shoes, wax models of acaræ and entozoa, generally very correct but expensive and easily injured.

The collection of horse and stable furniture, bits, saddles, harness, shoes, controlling devices, etc., in fact everything required in connection with horses, is most extensive, as are the models of the different races of horses and cattle, all of which proved most instructive.

We were conducted to the Agricultural department adjoining the veterinary, and were shown specimens of the different breeds of cattle, housed in a model byre, kept clean and neat. Here experiments are conducted for the benefit of the students to demonstrate the advantages of certain methods of feeding and treating dairy cattle. They keep a record of the weight and varieties of feed given to each animal. The milk is weighed and recorded. The milk is tested for butter fat every day, and the results of the experiments are published for the benefit of the students and farmers. We were shown a large collection of dairy utensils, centrifugal separators, etc. The Agricultural department is extensive and proves of great value to the agriculturists of the state, but as we were going to visit a still more extensive agricultural college the following day, we spent but a short time here.

We paid a visit to the University and to the College of Anatomy where we met Professor His and his assistant Held, and spent some time with Professor Mills in the laboratory examining microscopic slides of his work on the nervous system.

THE AGRICULTURAL COLLEGE AT HALLE.

Our visit to this college proved to be most interesting and instructive.

Accompanied by Professor Mills, we called on Professor Kuhn, the founder and director. As it was his lecture hour he was obliged to hand us over to his assistant, Professor Paul Holdefleiss, Ph. D., who conducted us through the chemical and bacteriological laboratories and the experimental gardens, where they are engaged in investigating different soils; the diseases of plants; the animal and vegetable enemies of plants and how to overcome them. One experiment interested us

very much, viz.: the crossing of European grape vines with American, producing a hybrid that is much less subject to the attacks of the phylloxera. The illustrations of soil formation and production of turf, etc., etc., were most interesting. We were shown a collection of rocks, minerals, sand, soil, etc., forming a wall about twenty feet square in which not only are the different strata shown, but in the exact proportions as they are found in the earth's crust in the neighbourhood. This was a presentation by a number of former students as a mark of esteem to Professor Kuhn. Practical agriculture for profit is conducted on a farm three miles from Halle. We were next conducted through the Veterinary department. The hospital accommodation is excellent and the clinique is ample for teaching agricultural students comparative medicine.

The Zoological department is a wonderful establishment which must have cost enormous sums of money to procure, and a large sum annually to maintain. It contains specimens of all breeds of horses and asses, with the result of crossing in every degree. It also contains nearly all kinds of cattle: Shorthorns, Polled Angus, Devons, Ayreshires, Kerry, etc., as well as numerous native breeds, wild breeds, Yaks, Buffalo, etc., and the crosses resulting from mating experimentally. Sterility is almost the rule in hybrid males, while the female will often breed. In twins the male is usually sterile, but the female breeds.

Pigs.—This class is very numerous, embracing specimens of every known wild pig, and every domestic breed.

Sheep.—Sheep of every known breed are there, including the fat tails and big horns (Rocky Mountain sheep), lop eared, etc., etc. There are also goats in great variety and the results of crossing them with sheep.

Poultry.—There are poultry of every kind, swans, geese, ducks, wild and domestic fowls of various breeds; pigeons, pheasants, and experimental crosses of these.

We were shown the record book of the breeding operations, which is very complete as to dates and results.

The bone room is interesting, containing specimens of all the different breeds of animals mounted from those which die. Unfortunately, the Buffalo bull died recently, his skeleton was however being prepared for mounting.

The men who attend this college are mostly young men from the farms in Saxony. They take the course at the college in scientific agriculture and may go on to the degree of Ph. D. They also take the practical course at the farm. Ninety per cent of them return to work on the farms and by practical application of the scientific knowledge thus obtained they are enabled to make farming much more profitable, and they take a high social position in their districts. The other ten per cent become teachers in agricultural schools, and managers of large estates. The course is also taken by high school teachers who must teach elementary agriculture in the public schools. The result of this education is to make the farmer feel that he is following a scientific calling which enables him to make the soil more productive and thus in no small degree adds to the general prosperity of the country—such men become prominent members of agricultural societies, contribute to the agricultural press, and many distinguish themselves as scientific agriculturists.

There is so much to see and hear at this college that is useful as furnishing information to show what can be done to elevate the work of practical agriculture to the rank of a science and thus do much to keep the farmers' sons on the farms, that I am induced to append a few extracts from the calendar of the college, for the translation of which I am indebted to Dr. Martin, of McGill University.

Should the Government or any large-hearted benefactor of our universities desire to accomplish the greatest good to Canada, which is *par excellence* an agricultural country, it could not be better effected than by establishing and endowing an agricultural-biological and veterinary college, all combined in one.

THE OPPORTUNITIES FOR STUDYING AGRICULTURE IN THE UNIVERSITY AT HALLE.

(From the Calendar of the University of Halle.)

By the foundation of the chair for agriculture in this university in 1862, and its further extension in 1863, the university of Halle has been enabled to offer practically a complete course in every department of agriculture, to suit the practical farmer, the teacher of agriculture and the student of such sciences. In this university the studies of agriculture are carried out in the buildings situated alongside of those where the other sciences and arts of the university are likewise studied. The Agricultural Institute is an integral part of the university, precisely in the same manner as is the medical or natural science department. In the faculty for agriculture the lectures are included mainly under four general sections:—

In the first, what might be called agricultural discipline, are included :

History and general methods of agriculture.

General considerations of land structures.

Special considerations of plants, fruit and garden cultivations.

General and special considerations as regards the breeding of animals.

Considerations including dairy produce, etc.

Section 2.—Technical considerations of cultivation of land; general laws of the subject.

Measurement of land: hydraulics, drainage, road and meadow building, etc.

Section 3.—Natural science, including physics, chemistry, mineralogy and geology, special botany, zoology, and comparative anatomy.

Section 4.—Political economy and legal science.

In each of these four departments not only are the theoretical lectures thoroughly carried out, but in every respect practical exercises with experiments and demonstrations form a very essential portion of the course. Facilities are given in each department for this work, and each has special laboratories.

An interesting feature of the teaching is, too, the frequent excursions which are made to outlying districts in connection with the study of agriculture in its various manifestations.

Considering the manifold features of a study such as this it will be readily seen how great is the advantage to students of having their studies carried on directly in the university buildings.

The agricultural collection is probably one of the most interesting features in the whole university. On account of the intimate association of agricultural studies with the other departments of the university, special stress is laid on the value of this collection for students in every department such as medicine, botany, zoology, etc., and not only is this collection invaluable to the students of general subjects in the university, but on the other hand small analogous collections in the university are opened up to students of agriculture, an advantage to each which is quite obvious. The students in this way obtain a broader grasp of their subjects and are enabled to study more completely any special department of the work in which they may be interested.

Among other interesting features of this collection may be mentioned incidentally the agricultural apparatus and machinery in its most complete developments with numerous models, and in many cases the apparatus is in such a condition as to be made practical use of by the students, who can thus better understand their proper work.

Further, there is a most important collection of seeds of all varieties of plants in normal conditions, with demonstrations of the tests for distinguishing the various means of detecting impurities and adulterations. The herbarium includes a large collection of most important plants, to which has been added

a valuable series illustrating pathological conditions and microscopic preparations. Various agricultural products are likewise seen in this collection, which is most worthy of interest being principally the collection of wools, woods, dairy produce, veterinary specimens, especially the collection of bones of domestic animals. The large and interesting series of insects with special reference to their bearing on agriculture, and in their various developmental conditions is shown, with annotations, explaining their harm to agriculture. A very complete technical library is added for the sake of students in any branch of agriculture.

In direct connection with the Agricultural Institute is a large garden which is kept in most excellent condition, and adding extremely to the beauty of the surroundings. It is especially constructed for the students of agriculture, and its main part is divided into two sections, one for the study of plants, and the other for that of animals. Within fifteen minutes' walk of the institute buildings, is an experimental farm, to which the students of agriculture have full access. Bordering on the district devoted to domestic animals is a large machinery hall containing among other things numerous models, and a draught room, more especially in connection with measurements and laying out of land. In the lowest flat are the larger agricultural machines, which are used particularly for demonstration purposes. Many of the machines too are sent from distant parts to this institute for the sake of being tested, and in this way has been formed a station for the testing of machinery in conjunction with the Agricultural Association at Halle. So important is it that its influence extends over a very wide area, and its benefits are recognized on all sides by the students of agriculture. Not only are the newest machines constructed in the various factories sent to this department, but further, instruments of any kind in this connection which are manufactured even by private individuals are given a fair open test. A further arrangement is so made that after testing the machine it becomes the property of the institute, and a part of its collection.

The dairy buildings were built in 1883, adjacent to the machinery hall, and contain extensive rooms for the manu-

facture of butter, cheese, cream and other dairy produce. The students here are given every opportunity for practical exercises in this technical branch.

The clinic for the care of animals is in the immediate vicinity and affords a very important opportunity for instruction in veterinary science.

Apart from the hospital itself the clinic contains operation and demonstration rooms, as well as a workroom for finer histological examination. In connection with this should be mentioned several important and quite unusual features of great advantage to the university. In the first place the experimental station of agriculture for the province of Saxony is at the service of all students attending the university here. The character of the ground everywhere in the immediate neighbourhood presents so many variations in its formation and geological structures as to give the students unusual facilities in studying this branch of science. For the special study of fruit growing industry there are gardens of great value, and presenting a large variety of the ordinary fruits.

Outside of the city itself, but still within easy access are several estates containing herds of horses and cattle, all of which by special arrangement are at the disposal of students for investigation.

There is thus combined in this one city of Halle in a most unusual manner practically every facility for the complete study of agricultural science. The general departments of the university are opened up to such students in every faculty and each laboratory can be made full use of. The arrangements for studying animals and their produce, dairy and horticulture and arboriculture are unique and the facilities are such as to render its study interesting and beneficial not only to the student but likewise to the teacher and the investigator no matter how high his station may be.

COPENHAGEN VETERINARY COLLEGE.

Having mailed my letter of introduction to Sir Charles Scott, Minister Plenipotentiary and Envoy Extraordinary for Great

Britain at the court of Denmark, several days in advance, I found that arrangements had been made previous to my arrival for my reception by the government veterinarians.

Sir Charles was extremely courteous in every way and at once gave me an introductory note to Prof. Bang whom I found pleased to receive us, and at once offered to do all he could to help us to carry out our wishes. As he speaks English fluently we soon were on terms of friendly intercourse, and we found him not only thoroughly informed on his special subject but on comparative medicine generally, and his ability to expound his theoretical and practical knowledge in our language helped us very much.

THE ROYAL VETERINARY AND AGRICULTURAL COLLEGE AT
COPENHAGEN, DENMARK.

Professor Bang very kindly invited us to visit his clinique at eleven a.m., when he conducted us through the various departments.

The stables are modern in every detail. They are thirty-six feet wide with high domed ceilings, lighted by side windows fourteen feet high; the floors are of stone flags; the stalls are nine feet wide by eleven feet long. Water is carried to the front of each stall by iron pipes, being let down behind the stall posts. Hose attachments are fitted for irrigation treatment of lame horses. There are rings in every stall for slinging horses. The ventilation and drainage are perfect.

There are surgical cases in one stable, and internal diseases in others; strangles and infectious diseases are in isolated buildings. There is a special stable for pneumonia; also a large operating room with tan bark floor, furnished with every requisite for surgical operations. There is a large riding school into which colic cases are turned when not in use for riding. There are two specially arranged boxes padded all round for cerebral cases. All these buildings are heated when necessary by furnaces, are thoroughly lighted and kept perfectly clean. The stables were well filled with patients, and clinical instructions were being given to the students.

In an independent building is a well appointed post-mortem room.

We visited with much interest the museum, of which there are several departments.

The biological department is most instructive, and the student can begin at one end with the lowest forms of animals and gradually ascend the scale till man himself is reached. The pathological section is a course of instruction in itself, and, as already referred to, contains the most complete, and most carefully prepared and preserved specimens of various animal diseases to be seen anywhere. True the museum has cost the country large sums of money to organize and to maintain, but it is money well spent, as by no other means can a lecturer so profitably instruct his pupils as by ocular demonstrations.

The anatomical museum is equally praiseworthy. There are lecture rooms, students' rooms for study, and one where they can eat their luncheons. This is a convenience as the college is some distance from town. If the students desire beer they can buy it from the porter.

We visited the shoeing forge and were shown their methods of shoeing for various purposes. It is presided over by an expert who is most enthusiastic in his work.

The dog rooms are the finest we have seen in arrangement and cleanliness.

The operating room is such as may be seen in our modern hospitals for human beings.

This college has been in existence for over a hundred years. It was commenced as a veterinary school but has since, like the colleges at Leipsic and Halle, had the science of agriculture and dairying added to its curriculum. Veterinary science continues to be the major study, but the government require and pay for teachers and professors in agriculture, dairying, stock breeding, forestry, surveying, botany, economic horticulture, anatomy, physiology, chemistry, including agricultural chemistry, physics, zoology and bacteriology.

A few years ago the government made an appropriation of about \$250,000 for the enlargement of the various branches, and \$9,000 a year is given for the payment of lecturers and assistants.

The professors are resident, have free houses, light and fuel. They are paid besides \$864 a year, and an increase of \$162 for every five years they remain in the college.

Should Canada ever be fortunate enough to have similar provision for the promotion of agriculture and the elevation and education of farmers and farmers' sons, whoever is charged with the organization cannot do better than spend a few months at the Halle and Copenhagen veterinary and agricultural colleges.

PART II.

SCHEDULING OF CANADIAN CATTLE FOR AL-
LEGED INFECTION BY CONTAGIOUS PLEURO-
PNEUMONIA.

In my interview with Sir George T. Brown, who was chief of the British Board of Agriculture when the scheduling order against Canadian cattle was enforced, I was gratified to learn from him that it never was his opinion that contagious pleuro-pneumonia existed in Canada, but that it was being brought into Canada from the United States, and that if assurances had been given that steps would be taken at once to prevent a possibility of this occurring, the schedule would not have been put on at that time. I stated that I understood that such assurances had been given and referred to my own report dated December, 1894, page 29, in which the following passages occur :—

Mr. Cope (817) being asked : "What is your explanation of the fact that notwithstanding contagious pleuro-pneumonia has existed for a good many years in Canada, there has been no spread of the disease ?" He replied : "I do not think that we have ever committed ourselves to the statement that there is contagious pleuro-pneumonia in Canada ; our general impression has been that it is very likely that animals have got across the frontier." (822.) "You have no special information about Canada, I suppose ?" "No, we have no information beyond the reports which we have received from the Canadian government in which they have stated that they cannot find any disease in Canada."

Professor Brown, in answer to the question (854) : "May I ask, whether you think that the so-called Canadian cattle came from Canada or the United States ?" says : "My first impression was that the cases which came from the frontier had in all probability been smuggled across, but the Canadian authorities state that it is absolutely impossible with their

restrictions, that anything of the kind should happen. That statement did not quite remove my impression, however, because I know the extreme difficulty which is found in European countries, even with such a short frontier as that between Poland and East Prussia in preventing smuggling of animals."

(855.) "So that the view of the Canadian veterinary authorities is, that whatever disease exists in Canadian cattle comes from Canada?" "No, their view is that it originates on the voyage; that they have no disease of the kind in Canada."

(856.) "You think, however, that that is an impossibility?" "I think it is absolutely certain that it cannot be so."

It seems extraordinary that two men occupying such important positions should have to acknowledge such want of information of the topography and internal economy of this country. Where did Professor Brown get the information of "cases which came from the frontier?" The fact is that no cattle can be said to come from the frontier for exportation. It is well known that prospect of gain would be a *sine qua non* of smuggling cattle into Canada from the United States, but thoroughbred cattle are worth more in the United States by twenty per cent to fifty per cent than in Canada. The United States is the best, and almost the only market the Canadian cattle raiser of fine stock has. The importation of cattle from the United States to Canada is almost nil. Smuggling of exportable cattle in numbers sufficient to warrant the risks incidental to such an infringement of the quarantine regulations is quite impossible. It would be impossible to drive them by the roads, as they would certainly be seized by customs officers and detectives, every one of whom is a preventive officer for quarantine as well as customs purposes. They would not be carried by railways or steamboats, for neither would venture to carry them at any price.

The penalties in addition to the confiscation and slaughtering of the animals is a fine of \$200 (£40) for each animal (section 39, Animal Contagious Diseases Act.)

"If any horses, cattle or other animals are imported or introduced, or attempted to be imported or introduced into Canada contrary to the provisions of any order or regulation

made in pursuance of this Act, the same shall be forfeited and may be forthwith destroyed or disposed of, as the Minister of Agriculture or any person employed by him in that behalf directs; and every person who imports or introduces, or attempts to import or introduce any horse or other animal into Canada, contrary to the provisions of any such order or regulation, shall incur a penalty not exceeding two hundred dollars, for every horse or other animal so imported or introduced, or attempted to be imported or introduced by him. 48-49 Vic., chapter 69, s. 39."

While the smuggling of an individual animal on such portions of the boundary line as have farms adjoining, some even "partly in Canada and partly in the States, could not be said to be impossible, although attended by much risk and difficulty, I have no hesitation in affirming that such smuggling as is indicated by Professor Brown is absolutely impossible at any part of our frontier, from ocean to ocean, and the doubts in his mind cannot alter that fact."

Professor Brown stated in reply to the above, that this report was made and assurances given after the schedule order was in force, and repeated, "had you or any authorized agent of Canada made these explanations or given before the schedule order was in force assurances that steps would be immediately taken to make it impossible for American cattle to enter Canada for export, the schedule would not at that time have been placed on Canadian cattle."

At a subsequent interview Sir George repeated the above. In talking this over with Mr. Colmer, Secretary of the High Commissioner, he assured me that such explanations and assurances were given repeatedly. Evidently Professor Brown had not understood them.

Having had the pleasure of meeting the Minister of Agriculture, Right Honourable Walter Long, on two occasions at the House of Commons, in quite an unofficial capacity, our conversation naturally turned to matters Canadian, and live stock in particular, and among other matters the embargo on Canadian cattle was referred to, during which I informed him that during the last ten years nothing had been left undone to

discover whether contagious pleuro-pneumonia existed in Canada, but without success, for the sufficient reason that such disease never did exist in the Dominion except when imported from Britain to the quarantine at Quebec.

I took occasion to explain, however, that owing to the opening of the United States markets by the removal of the international quarantine of ninety days between Canada and that country, our country was actually depleted of stockers, that market absorbing all and more than we can produce. This had tended to greatly lessen, if not quite remove the feeling of irritation among our agricultural population, caused by the injustice of the embargo on our healthy cattle, but that my recent visit to Scotland convinced me that the Scotch feeders felt keenly the injustice done them in preventing them from obtaining healthy cattle, and would welcome the day when Canadian stockers were again admitted freely to their markets. Asked if there was any prospect of this occurring now that it was clearly proven that contagious pleuro-pneumonia did not exist in the Dominion, he replied, "I fear not; the country would not stand it." He said nothing to indicate whether or not he supposed disease had existed in Canada.

I fear from all I could learn that there is no prospect whatever of this embargo being raised. Our action in removing the quarantine from the United States was not unfavourably commented upon. We are supposed to be capable of managing our own affairs, and to do so in the interest of our people.

The following table may serve to show why the Scotch feeders prefer buying Canadian cattle to using their own or purchasing Irish cattle. It is extracted from the Dundee "Courier," February 2nd, 1894 :—

GAIN IN WEIGHT OF CANADIAN STOCKERS AS COMPARED WITH SCOTCH AND IRISH CATTLE AFTER FIVE MONTHS FEEDING UNDER THE SAME FEED AND TREATMENT.

	1st Month.	2nd Month.	3rd Month.	4th Month.	5th Month.	Average Gain in Five Months.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Irish.	39 $\frac{3}{8}$	42	50	49 $\frac{1}{2}$	66 $\frac{1}{5}$	247 $\frac{1}{2}$
Home-bred	55 $\frac{3}{8}$	57 $\frac{1}{2}$	77 $\frac{1}{2}$	84 $\frac{1}{2}$	96	370 $\frac{1}{2}$
Canadian	84 $\frac{1}{2}$	87 $\frac{1}{2}$	96 $\frac{3}{8}$	96	104	468 $\frac{1}{2}$
Increase of Canadians over Home-breds	29 $\frac{1}{2}$	30	19 $\frac{1}{2}$	11 $\frac{1}{2}$	8	
Increase of Canadians over Irish..	41 $\frac{1}{2}$	45 $\frac{1}{2}$	46 $\frac{3}{8}$	46 $\frac{3}{8}$	37 $\frac{1}{2}$	

COST AND RETURNS.

	Net Average Cost per Head.	Average Length of Keep.	Average Selling Price per Head.	Average Monthly Return for Keep.
	£ s. d.	Mos. Dys.	£ s. d.	£ s. d.
Home-bred	10 0 0	5 0	18 4 0	1 12 9 $\frac{1}{2}$
Irish	10 10 0	5 24 5	17 19 0	1 6 1 $\frac{1}{2}$
Canadian	10 3 6	5 2 5	26 6 6	2 3 8

The results show that home-bred and Irish cattle were far outstripped by the Canadians, both as regards gain in weight and increase in value.

W. SUTHERLAND PEEL,
Dundee Courier, Feb. 2nd, '94.

CONTAGIOUS PLEURO-PNEUMONIA.

In conversation with Messrs. Cope and Duguid, veterinary officers of the Board of Agriculture at London, I learned that while outbreaks of contagious pleuro-pneumonia have not occurred for some time, encysted lungs were now and then met with by the inspector of the abattoirs ; one such lung was shown me by Mr. Cope in the post-mortem room of the board, which had been received that morning. The herd from which the cow had come was traced up and every animal was slaughtered, but no other case of the disease was discovered.

In my interview with Professor Nocard, of Paris, on the subject of this disease, he said : it exists in France but to a limited extent and only in the northern districts of the country. Referring to the error of the British veterinarians, he said it was very satisfactory that all our subsequent search for it in Canada failed to discover it, and proved that both he and we in Canada were right in our opinion that it was a non-contagious form of pneumonia.

In my interview with Professor Ostertag, of Berlin, he admitted that this disease exists in Germany. He does not believe in the *Bacillus Liquifaciens Bovis* which is claimed to produce the disease. Inoculation is practised in Germany, but the animals are prepared for slaughter and are not set free. The disease exists only in a small portion of the country, and it is well under control.

The Professor remarked, "some time ago a Canadian animal was landed in Scotland, said to be affected by contagious pleuro-pneumonia," and asked : "Have you contagious pleuro-pneumonia in Canada?" I answered, "no ; search had been made throughout all Canada long before the landing of this animal, and yearly since, but no contagious pleuro-pneumonia can be found. None of the pathologists in either United States or Canada ever believed the disease affecting Canadian cattle to have been contagious pleuro-pneumonia. The examination by Professor Adami and myself of a portion of lung sent to us from London satisfied us that it could not be contagious pleuro-pneumonia, differing as it did in many important points from the lesions always found in contagious pleuro-

pneumonia. The total absence of even suspected contagion in Britain, and positive knowledge of its non-existence in Canada confirms this conclusion." What, then, was it, he asked? "A pleuro-pneumonia induced by long railroad and ocean transportation which I have named transit pneumonia." Being asked what his views were; he said he had not seen any portion of the above mentioned lung and could not give an opinion.

Contagious pleuro-pneumonia is occasionally, but rarely, met with in Denmark.

TUBERCULOSIS.

FRANCE.

Professor Nocard, of Paris, in our interview, regretted having to admit the somewhat extensive prevalence of tuberculosis in France. On my stating that it existed in Canada, but as compared to other countries to a very limited extent, and when asked if he thought that I was too sanguine in believing that if the government would back me with sufficient money, I could in five years eradicate the disease from Canada he very emphatically said: "Certainly not; I have no doubt whatever that you can do so. I am certain that in eight years I could with similar assistance rid France of it completely." He highly approved of our idea of first educating the people and of our method of dealing with it in Canada which I explained to him, and he said: "I am sure you will succeed."

We then discussed tuberculin, and when asked what he thought of those cases where reaction denoted tuberculosis, yet it could not be found on post-mortem, he said if thorough search was made it can be found, often as a very few small tubercles at the bifurcation of the trachea. It may possibly be in the bone, but it can be found in all cases. He agreed that there is a stage in the period of incubation when it was too early for the tubercle to have been formed, yet the reaction showed the presence of the disease, but it is

impossible to define that stage. He then explained that in all cases of udder infection the milk was virulent, but he does not believe that milk is dangerous if the udder is not diseased, hence in dealing with creameries the only animals which need to be dealt with are those with diseased udders. He considered that if the milk before being given out from the creameries was raised to 185 degrees Fahr., it would be completely sterilized. He next stated that with regard to flesh of animals with advanced general tuberculosis if it was squeezed, and the juice injected into the peritoneal cavity of the guinea pig, it would invariably produce tuberculosis, yet the animal might be fed for a long time on the muscle and no tubercle would result; hence there was no danger to be apprehended from the ingestion of tuberculous flesh no matter how advanced the disease might be. He remarked the condition as being an extraordinary fact, which is difficult to explain (Pænthesis).

On being asked to make some suggestions as to what experiments we might make at the experimental station at Montreal, he suggested that we might dry sputum or tuberculous matter and pulverize it, then cause an animal to inhale it and tuberculosis would follow; for another animal mix the tuberculous matter with the food and determine the result. The contagiousness of tuberculosis was proved by the spread of the disease from cohabitation in buildings. It was, of course, less easily contracted in the fields.

In Professor Nocard's opinion, thirty days should be allowed between tuberculin tests and re-tests.

He did not care to speak of his new tuberculin which was really a secret belonging to the government.

GERMANY.

Professor Ostertag, of Berlin, is a firm believer in tuberculin as a reliable test for tuberculosis.

At present the German government can buy tuberculin cheaper than they can make it—but an extension of the Professor's laboratories is contemplated and when this is completed, it is the intention of the government to manufacture their own tuberculin.

The Professor is not conducting any experiments on tuberculosis at present.

The government do not condemn the meat of all reacting animals, only when the disease is generalized, but they cause it all to be boiled and sold as tuberculous meat, and we were shown a photograph of crowds of people waiting the opening of the store to buy it. There is a good deal of testing done in Germany. It is not, however, obligatory, but voluntary.

In Saxony a law has just been passed making testing compulsory and providing for $\frac{3}{4}$ indemnity.

On my visit to the Imperial Health Office at Berlin, the Bacteriologist informed me that he had inoculated 250 guinea pigs by peritoneal injections with butter bacilli, cultivated from butter made from the milk of tuberculous cows, without any knowledge as to the clinical condition of the cattle; with positive results in every one of them. The Bacteriologist was not prepared to say whether or not milk from tuberculous cows in which the udder was healthy, was infective.

Asked his opinion of the relation of chicken tuberculosis to bovine and human, he replied that he thought they were kindred but not identical, though intercommunicable; for instance, he said, in Boerland, South Africa, tuberculosis is very common in chickens, but rare in cattle, in fact till two tuberculosis bulls were imported some years ago, they knew nothing practically of this disease in cattle: they actually have no name for it.

He had heard of *oxituberculin*, but could not say anything about it.

Observing the large number of guinea pigs, young and old, which seemed in thriving condition, I inquired as to whether or not they had any trouble in rearing and keeping them. He replied that they have no difficulty whatever. They have never seen them die from infective diarrhoea or tuberculosis, as is often seen in laboratories elsewhere.

They keep them somewhat crowded in cages. They are fed on cabbage, turnips, carrots or any fresh vegetables in the

morning. They get no water. In the afternoon they get oats and hay, and are kept warm with lots of straw, No feeding troughs are used in the cages, their food being simply placed on the bottoms of the cages.

The rabbits are fed in the same manner.

The rats and mice get water till they are inoculated, but none after.

DENMARK.

(Professor Bang's views on Tuberculosis.)

In my interview with Professor Bang, referred to in the first portion of this pamphlet, I explained to him that, having studied his methods of dealing with tuberculosis, by which he had accomplished so much for his native country, I was travelling in quest of information about animal diseases generally, but tuberculosis in particular.

I explained to him that live stock and their products were being rapidly developed in Canada, and were now very important branches of the commerce of the country. That we had watched with great interest his method of dealing with tuberculosis, and I wished to discuss it with him so as to gain the fullest information to enable me in my report to make suggestions to the government that would be practicable in Canada.

I beg to explain for the benefit of those who may read this report who are not familiar with Professor Bang's method of eradicating tuberculosis from the herds in Denmark, that it is briefly as follows :

Supposing a herd to have been bred up by judicious crossing to a high state of improvement and increased value, should it be found to be tuberculous, and the slaughtering out method be employed, serious loss would be entailed of valuable improved cattle, the result of generations bred in lines of pure blood.

To obviate this and preserve the benefits of improvement Professor Bang causes the herd to be tested with tuberculin,

and all animals reacting are isolated in a separate building—all showing clinical symptoms are killed—the others are bred from, and their calves as soon as born, are removed before they suck the diseased mothers or are licked by them. The calves are placed in uninfected buildings and fed either on milk from tested cows or sterilized milk and not exposed in any way to direct or immediate contagion. It has been found that with few exceptions they grow up healthy. They are, however, tested twice a year and the reacting ones are removed. The cows are killed off as they show clinical symptoms or become fat.

I stated that while I was a firm believer in his method, I found practical obstacles from the fact that farmers have often not sufficient means of isolation. He said that as our buildings in Canada were built mostly of wood, they could be divided by close board partitions. He used them in Denmark. In some he even had doors in them, but there was a risk in that, and it was better to have separate buildings if possible. He had encountered the same difficulty that I mentioned.

Tuberculin testing is not compulsory but government supply tuberculin and furnish inspectors for the testing free of charge. Professor Bang makes all the tuberculin used in Denmark in his laboratory and it is supplied free to any applying for it.

The government kill all cattle showing clinical symptoms, but do not prevent the farmers from disposing of reacting cattle which show no observable symptoms, and butter is permitted to be made from their milk.

Many pasteurize the cream without lessening the quality or saleableness of the butter.

Cows with diseased udders are infective and dangerous, so are those with nasal, uterine or intestinal discharges.

Pleuritic or mesenteric tuberculosis may not be dangerous.

Symptoms of diseased udder.—He explained that the symptoms were first hard swellings, especially in the posterior part of the quarter; at first there was no change in the milk, except perhaps a few flakes, yet, if examined the bacillus would be found, and the milk would be thin and watery.

Asked if he didn't think milk was sometimes infective without the udder being diseased? He replied, no doubt occasionally bacilli would find their way into the blood stream and thence into the milk in the udder, but such cases were rare.

Asked if butter did not sometimes contain living bacilli and was infective? He replied, yes; but he does not agree with some persons who claim to find butter often infective. He had caused butter to be made from milk obtained from cows with diseased udders which he fed to rabbits and it produced intestinal tuberculosis. Asked how long he thought tub-bacilli would live in cheese? He answered, for many months. He referred to a Russian lady who was working in Germany, who had published an article in which she claimed that the bacillus found in butter was different from tubercle-bacillus. He said he could not agree with her on this point.

Referring to the Massachusetts stamping out method, he considered it unnecessarily severe and it had in consequence to be given up in Denmark.

In Belgium they adopted a similarly severe method, but had to retract considerably. They enforced testing and killed all showing clinical symptoms, and gave the owner one year to kill the remaining ones that had reacted. He considered this too severe, and many well bred valuable animals were thus sacrificed.

With regard to heredity, he stated that while evidences of hereditary transmission are not often met with, yet in ten years he had met with eighty-five calves born with tubercle. The returns of the German inspectors who reported finding so few diseased calves were not accurate, as they examine so many that they become indifferent; whereas in Danish abat-toirs the inspectors had less to do and by his instructions they looked specially for such cases.

Going to the post-mortem room he showed us two calves which the inspectors had just sent in as affected at birth by tubercle. We at once made a post-mortem examination and discovered in both small tubercles in the bronchial glands and liver. He explained that in a cow with advanced tuberculosis

the bacilli could easily pass to the placenta, thence to the liver of the fœtus and so into the general circulation. He stated that he had on several occasions seen tuberculosis of the placenta and often of the uterus. These were dangerous infective cases, the bacilli escaping in the uterine discharges.

As was to be expected, the museum contained a complete collection of specimens of tuberculosis of nearly every organ in the bodies of different animals—cattle, horses, dogs, pigs and sheep. The udder specimens interested us especially.

He believes that the tubercle bacillus dies if simply raised to 85° C., and that it is not necessary to keep it for any length of time at that temperature.

Having submitted a copy of our "Farmers' Bulletin" on tuberculosis, for his consideration, we met again in the evening to discuss it.

He took exception to the statement that calves reared from tuberculous cows are predisposed to tubercle. "If this," he said, "were true, it would upset my whole work." He was quite emphatic on this and said that unless exposed to contagion after birth they were no more predisposed to tubercle than to broken legs or other accidents. Referring to testing, he believes that for practical purposes and saving of time, consequently expense, one or at most two temperatures taken previous to injection would be sufficient.

He thinks it is too much to claim that in ninety-eight cases out of 100 the showing of the tuberculin test is absolutely reliable. He puts the maximum at eighty-seven per cent.

He does not agree with Nocard who claims that tuberculin does not lie, and that in every case when tuberculin indicates undoubtedly tuberculosis it can be found if looked for with sufficient care.

With these exceptions he endorses our bulletin.

TUBERCULIN.

All the tuberculin used in Denmark is prepared by Professor Bang and his assistant in his laboratory, to which we paid a visit. The culture room is separate from the laboratory

proper. He showed us his apparatus for crushing the bacilli (Koch's newest method), by its means the micro-organisms are crushed and destroyed—true, the spores and toxins escape, but are largely destroyed by sterilization.

The culture room is automatically heated by gas; two jets of which are passed about four inches into the open mouth of a four-inch iron pipe which is carried through the room to the chimney. Like similar rooms it is fitted up with numerous shelves with bottles of tuberculin in various stages and ages. The whole of the details were explained to us by the Professor and his assistant.

Being asked if he considered that tuberculin deteriorated or became inert with age—he stated that he does not find that its value is affected by age in the least, provided it is kept in a cool dark place and air carefully excluded; he has used it with good results when five years old. He said, however, he at one time thought otherwise.

GLANDERS.

GREAT BRITAIN.

Glanders, including Farcy, continues to occur. During the month ending 19th February, 1898, there occurred in England and Wales seventy-one outbreaks, ninety-six horses being attacked, in Scotland one outbreak, thirteen horses being attacked.

The disease is said to be occasionally discovered in horses from the United States, but so far no authentic case has been found in Canadian horses.

Since the port inspection of horses previous to shipment from Canada has been inaugurated, they have arrived in Great Britain in very much better condition than previously. Occasionally ship fever of a non-specific character, with sore throat and nasal discharges, and sometimes cutaneous eruptions develop on the voyage, and give rise to suspicion of glanders.

By your instructions I have arranged with William Hunting, F.R.C.V.S., that should the disease be suspected in any horse from Canada he will, in addition to clinical examination, test the animal with mallein, and have cultures made from the discharges and inoculate guinea pigs to prove or disprove definitely whether or not it is glanders. Shippers of horses should not buy for export suspicious horses, or horses from any place where this disease is known to exist.

FRANCE.

Professor Nocard, of Paris, has great faith in mallein as a means of diagnosing glanders, and regards it as almost infallible, relating to us his experience with 12,000 horses, from which he had cleared out glanders by killing the reacting ones, isolating the others and working them in pairs—killing them as soon as clinical symptoms developed.

It is his opinion that glanders in certain stages and conditions may be cured by the use of mallein. He has published a paper on this subject which has provoked much discussion and difference of opinion among veterinarians.

DENMARK.

Professor Bang, of Copenhagen, believes in mallein as he does in tuberculin, but does not go as far as M. Nocard in thinking it curative.

GERMANY.

(Professor Ostertag's views on Glanders.)

He does not agree with M. Nocard in believing glanders curable by mallein injections—nor has he implicit confidence in mallein. In support of his views he produced for examination the septum nasi of a horse with unquestionable glander chancres, as bad a case as I had ever seen; yet he assured us that no reaction followed mallein injection. Being asked what he would do in dealing with an outbreak of this disease in a stable, he replied that he would kill all the horses giving reaction combined with clinical symptoms, the others he would isolate, but let them go on with their work, examine them once a week and destroy all showing symptoms.

SWINE FEVER (HOG CHOLERA AND SWINE PLAGUE).

GREAT BRITAIN.

This disease, under the system followed by the officers of the Board of Agriculture, decreased steadily from 1894 till the end of 1897, as will be seen from the report of the chief veterinary officer, the number of outbreaks confirmed during 1897 being 2,155 as against 5,166 in 1896 and 6,305 in 1895.

During the early months of the present year, however, the number of outbreaks have rapidly increased. Considering the previous successful management and large sums spent annually by the Board of Agriculture in their efforts to get rid of the disease, the results are very disappointing. This is due to several causes, among them the density of the population and the mildness and humidity of the climate which favours the existence of the bacilli of this disease. In the towns, villages, and suburbs of cities large numbers of people occupy cheap houses with old stone outbuildings, many of the latter having been used as piggeries for a long period of time. Few of the people occupying such houses and keeping pigs understand or take any trouble about disinfection. As a consequence the work of the officers of the Board is surrounded by difficulties.

Published reports show that in Great Britain, during the month of February last alone, 4,327 swine were killed on account of this disease out of a total number of about 2,342-302, while in Canada only 3,395 were killed in the last twelve months out of about an equal number. In Great Britain the disease is extending, while in Canada it is rapidly decreasing.

This is to be accounted for by our dry atmosphere, our bright sunlight (the best of all disinfectants), our more scattered population; and also probably by our more energetic methods, especially the slaughtering of all exposed swine, leaving none of the chronic infective animals which cause so many unexpected outbreaks.

(Professor Bang's views on Hog Cholera.)

This disease, he said, existed in Denmark but not extensively.

He believed in Salmon's and Smith's views and endorses Welch as to the bacillus of swine plague being found in the throats and nostrils of pigs and calves.

He did not consider it necessary to slaughter adult pigs which had recovered. Asked how he explained the reappearance of the disease on farms where such sows or boars were kept over, soon after young pigs were born, or when restocking was attempted, he said "it was probably due to imperfect disinfection."

In this our experience in Canada does not coincide. It is also the experience of others with whom I have discussed this subject that where the intestinal ulcers have formed, complete recovery very rarely does take place although cicatrization is often observed. The intestinal discharges continue to be more or less infective, and in the case of breeding sows, the disease attacks their young pigs as soon as they are old enough to root among the litter.

The following extract from the report of the Departmental Committee of the Board of Agriculture of Great Britain appointed to inquire into the etiology, pathology and morbid anatomy of swine fever, 1895, points to this chronic infective form as of frequent occurrence:—"There are also, and always have been, many cases of the obscure or chronic form of the disease, in which the morbid changes go on slowly for many weeks or months and finally attain an excessive state of development without being attended by any of the symptoms which are usually accepted as diagnostic of swine fever.

"Some very important information in regard to the obscure form of swine fever was obtained by the committee by the examination of swine which had been isolated for a period of two months on infected premises, at the end of the time they had been certified by a veterinary surgeon to be free from

swine fever, and would in the ordinary course have been released. In several of these instances instead of being released the swine were, at the request of the committee, slaughtered and the organs sent for examination. In each set of specimens characteristic lesions of swine fever were detected." This view is also supported by the following extract from the *Reports of the Bureau of Animal Industry, U.S. Department of Agriculture, 1895 and 1896, page 165.* "The chief carriers of the infection are the swine themselves. The disease having its chief seat in the intestines, a discharge of bacilli from the ulcers of chronic cases or of such as have survived an attack may take place long after the subsidence of an outbreak or after they have changed hands. *Infection may thus be carried over in the herd till a new susceptible generation of young swine appears to continue the losses.*

"Outbreaks occurring without any traceable importation of infection from without are very probably due to latent infection in the herd itself."

ACTINOMYCOSIS.

GERMANY.

(Views of Professor Ostertag.)

He differs in his views on this disease from most pathologists. He has never succeeded in reproducing it by inoculation, nor by feeding with diseased tissues. He questions its contagiousness; the omycets he says are on the grasses, hay or straw and he states that in every case which he examined he found a spear or vegetable substance in the focus of infection. He instanced its occurrence on the udders of swine from specules of straw penetrating the abdominal skin and in this way introducing the omycets; also its occurrence in horses' shoulders, and showed a photograph of a tumor caused by the botryomyces. He called our attention to the transverse crevice in the tongues of cattle in which sharp pointed spears of grass or straw will readily lodge and may be the means of introducing the fungi. Asked how he explained the frequency of this disease in cattle fed on

distillery swill which had been sterilized by boiling, he could only account for it by the cattle eating the hay or straw used for their bedding, and thus getting the spores introduced into the mouth.

TEXAS FEVER.

(Views of Professor Ostertag.)

He mentioned that Texas fever was introduced into Hamburg from the United States, and they feared its introduction into Germany. I gave my opinion that it was very improbable that it would cross the ocean, that the ticks died if exposed to a low temperature; frost kills the ticks. Apart from these considerations the quarantine of the United States is so efficient under Dr. Salmon's administration, that it is not in the least likely that cattle suffering from this disease will be exported, and even if the disease should be introduced into Germany, I believe the ticks would not live in the northern climate during winter. The Professor's idea, however, was that as the cattle would be kept in warm stables, the ticks might live and the germ would do so too.

I replied that considering that such importations would be made for immediate slaughter the risks were very slight; that in fact although Canada is separated only by an imaginary line from the United States, yet the full knowledge we have secured of the disease prevents our having the least fear of its introduction into Canada. Our cold winters and the admirable quarantine measures by which southern cattle are controlled in the United States minimize the danger.

RABIES.

GREAT BRITAIN.

This disease is reported to occur occasionally in dogs and other animals. As will be seen by reference to the official report for the month ending February 19th, 1898, there occurred in England and Wales two outbreaks in which sixty animals were destroyed.

In Scotland there were none. In Ireland two outbreaks in dogs, two in other animals, and four were destroyed.

GERMANY.

Hydrophobia is rarely met with in Germany, and is chiefly found on the frontier of Russia and France. Professor Ostertag said that he never saw a case of rabies, although he had occupied his present position for many years.

I never saw one in Canada—my only acquaintance with it being in laboratories in Europe during this visit. This is a curious coincidence.

The Professor asked me what I thought of reports of rabies in cattle. I said "I believe that when it does occur in bovines it is from their having been bitten by dogs"—exactly my opinion, he replied.

I asked him what risk we ran in Canada by allowing the importation of dogs from northern Europe to the Klondike gold mines? He didn't think that there was much risk. The disease would be discovered en route in all probability.

In this I could not concur as the period of incubation in dogs is variable, and it might not develop till long after their arrival at their destination.

DENMARK.

Rabies is unknown in this country.

Professor Bang being asked if we were justified in allowing the importation of dogs from northern Europe to the Klondike advised strongly against it: "the risk," he said, "is too great."

SUMMARY.

In concluding this report, I beg to submit the following summary deduced from observations and information obtained during my hurried visit to Great Britain, France, Germany and Denmark with special reference to contagious and intercommunicable diseases of animals.

GREAT BRITAIN.

Contagious pleuro-pneumonia still lingers as is shown by the discovery now and again of encysted lungs, although no outbreaks have been reported recently.

Foot-and-mouth disease does not at present exist there.

Tuberculosis exists extensively.

Swine fever (hog cholera and swine plague) not only exists but is increasing.

Glanders and farcy continues to exist, especially in the larger cities.

Rabies (hydrophobia) exists in England and Ireland but not in Scotland.

Scab in sheep exists but in limited areas.

FRANCE.

Contagious pleuro-pneumonia exists in certain parts of France.

Foot-and-mouth disease exists to a considerable extent.

Tuberculosis prevails extensively.

Glanders and farcy also exists somewhat extensively in the large cities and suburban towns.

GERMANY.

Contagious pleuro-pneumonia continues to exist.

Foot-and-mouth disease is prevalent.

Tuberculosis prevails extensively.

Glanders exists also.

Rabies is rarely met with except on the frontier.

DENMARK.

Contagious pleuro-pneumonia is occasionally met with.

Foot-and-mouth disease does not exist.

Rabies (hydrophobia) does not exist.

Hog cholera exists but not extensively.

Glanders exists but not extensively.

It is evident therefore that it is necessary to maintain a strict quarantine for all classes of animals imported from Great Britain, France and Germany. For all except rabies in dogs the present quarantine regulations are sufficient.

It is evident that our live stock are degenerating for want of change of blood, and something ought to be done to encourage importation of pure bred bulls.

There is no hope of the imperial embargo on Canadian stockers being removed.

If we compare the state of health of animals in Canada and the United States with these European countries, we will find matter for congratulation.

Thus—

	Canada.	United States.
Contagious pleuro-pneumonia....	None	None.
Foot and mouth disease.....	None	None.
Rabies.....	None	Doubtful.
Tuberculosis.....	Limited.....	Extensive in certain states.
Glanders.....	Limited.....	Not extensive.
Hog cholera.....	Limited.....	Extensive.

Rabies does not exist in Canada so far as is officially known, and when the importance of dogs to the inhabitants of the far north and North-west for travelling and freighting through the wilds is considered the question suggests itself, ought we to take any risk of importing dogs from countries where this horrible disease exists? Professor Bang says emphatically that we should not, he considers the risk very great. In this I concur and would respectfully submit the point for your consideration.

Foot-and-mouth disease which is very subtle and the infection easily carried, existing as it does extensively in northern Europe, calls for consideration. I beg to point out the risk we run in allowing the importation of reindeer or other ruminants from infected countries, for even should the animals themselves be free from the disease, there is a risk that the infection may be conveyed in the clothing or other articles imported by the attendants.

I have the honour to be, sir,

Your obedient servant,

DUNCAN McEACHRAN,
F.R.C.V.S., V.S., Edin., D.V.S., McGill,
Chief Inspector for Canada.

PART III.

REPORT ON THE METHODS OF PRESERVING AND
STERILIZING MILK IN GERMANY AND
DENMARK.

Believing that a short account of my observations of how the milk supplies of Berlin and Copenhagen are managed may prove interesting, and may be suggestive of much needed improvements in our system of handling city milk supplies—I am induced to curtail in some respects this report so as to enable me to include a brief description of what I witnessed when visiting milk establishments in those cities to which I have added a few details gleaned from published bulletins; for the translation of which I am indebted to Dr. C. F. Martin, McGill University, Montreal.

The indifference and want of method exhibited by those charged with public health in Canada, more especially in relation to that very important article of human food, milk, contrast very strikingly with European punctiliousness in every detail; the weekly inspection of the cattle, the giving of exact directions for feeding them, the drainage, ventilation and sanitary environment of the animals supplying the milk; the precautions enforced to prevent extraneous matters getting into it, such as the clipping of the quarters and udders, washing of the teats, the cleanliness of the dress (white linen) of the milkers and every one handling the milk, the low temperature at which the milk is kept, the weighing, tasting and testing in the laboratories, filtration, sterilization and care in bottling, all for the purpose of furnishing the consumers of milk with an absolutely pure article unadulterated, free from germs of disease and, so prepared for sale that it will keep for an indefinite period of time without deteriorating. These establishments not only sell milk to the general consumer, but prepare and furnish it ready for the immediate use of infants and invalids.

The whole system of such establishments displays a combination of philanthropy and shrewd business sense.

THE MILK INSTITUTION, VICTORIA PARK, BERLIN.

Presenting a letter of introduction from Professor Ostertag we were admitted to this splendid dairy establishment.

Before we were allowed to inspect the byres and cattle we had to give assurances that we had not been near any cattle affected by foot and mouth disease. Having given these assurances, we were permitted to enter the premises. First we visited the bottling room which is at one end of the byre, separated from it by a glass partition, through which a view of the whole of the ground flat (there being two flats) can be obtained. Usually it is only through this partition visitors are allowed to see the cattle. This is necessary as a precaution against intermediate infection, especially with foot-and-mouth disease, which exists somewhat extensively in Germany.

The bottles are white glass with porcelain stoppers and rubber washers, fastened by wire. They are washed and brushed in a soda solution. They are then inverted over a pipe with a strong stream of water, after which they are sterilized by heat and are ready for receiving the milk. The milk is strained through three very fine brass wire cloth sieves; thus freeing it from all extraneous matter. It is then allowed to cool and is bottled, and the stoppers loosely placed, it is then put into the sterilizer which is raised to the temperature of 190° F., it remains here for an hour, when it is cooled to 40° F. and the stoppers put tightly on, it is then labelled and boxed for export. We were informed that it has been sent around the world and brought back as sweet and good as when it was bottled. He attributes his success to heating and cooling. The sterilizer is simply an iron box with a close fitting iron door, fitted inside with shelves which slide to receive the bottles. It is heated by coils of steam pipes. Notwithstanding that other companies and scientific experts consider it unnecessary to keep the milk heated for more than a minute, the manager still continues his original plan of keeping it for an hour on the sterilizer, not wishing to change a system which he has found to be very successful.

160 cows are kept in the byres which are beautifully fitted up, the walls being covered by glazed white tiles, the feed boxes and hay benches are made of cement, the fittings of iron. The bedding is peat moss, and the whole place is kept scrupulously clean.

The cattle are large, well formed stock very much like grade shorthorns. They are all in fattening condition, being fed on chopped hay and meal, as much as they will eat so as to fatten them. They are kept as long as they are profitable for milking, when they stop milking they go to the butcher.

The institution also handles the milk from a large number of cows in the country which is brought in by train twice a day. The country byres are under veterinary inspection which is paid for by the company. If disease is found in a herd, the animals must be got rid of, or otherwise the institution refuses to handle the milk. This milk is sold by the institution at a cheaper rate than the milk from its own cows. It is all sterilized before being sent out.

The following is translated by Dr. C. F. Martin, from the pamphlet of this institution :—

“The special object of this institution is to supply Berlin with a milk of such a character that its nutrient qualities, its taste and its durability will supply all the necessaries required for milk given to children and invalids. In the arrangements of this large institution, the most scrupulous care is taken to provide an institution which will in every respect be a model. In the selection of their animals the greatest care is taken not only in the quality of the cattle, but likewise in the constant attention to the food supplied them both as regards its source and quality. Experienced veterinarians are placed in responsible situations to control these important factors.

“So satisfactory has this milk supply been for children that it has been a constant experience to find children so fed, developing into healthy individuals in almost every case, and it is further noticed that where unsatisfactory results are found that the cause nearly always lies in carelessness in the households where the milk is employed—carelessness either in the

keeping of the milk or its improper dilution. But not only is the milk of use for children, but most satisfactory results are attributed to it in the treatment of invalids and convalescents. The milk is borne with astonishing ease by the stomach and even when taken for a long time rarely causes nausea.

“The fact too that the milk is used purely as such and that no further effort is made to produce other dairy products renders it possible almost to procure the best kind of article ; this fact in itself being a guarantee for the quality of the milk. The milk is delivered according to order either as pure milk, unsterilized or sterilized in various sized bottles, and not only is it supplied to the city itself, but likewise to the suburbs. The advances which have been made in the sterilization of milk render it easy at the present time to supply a milk which will keep pure for a great length of time and can therefore be sent by railway or post to almost any distance. That the sending of this milk may be done without danger to the quality, is proven by the following interesting experiment made some time ago. Their sterilized milk was sent on a five months' journey to Australia and thence back to Hamburg, and on being examined, its quality was found to be excellent at the end of that period.”

THE BOLLE MILK COMPANY, BERLIN.

This is probably the largest creamery in Europe. It commenced on a small scale seventeen years ago, and has grown to be a mammoth institution having a town within its walls ; its employees numbering 1,200 people. They require 230 horses and 160 wagons to deliver the dairy products to their customers in Berlin.

We were received by the general manager who first showed us the extensive offices—then conducted us to the magnificent church capable of seating 1,000 people. The organ is said to be a very good one ; the stained glass windows and the appointments show every evidence of wealth and refined taste. From here we passed to the theatre immediately in rear of the church and about the same size, furnished with all necessary paraphernalia, and in rear of this we were shown a lecture room, recreation hall and meeting room ; we now passed into

the large sterilizing room where among a crowd of operatives, men and women, the men dressed in white overalls, sleeves and caps, the women in white aprons, sleeves and caps, not unlike those of nurses, we were shown the milk flowing in a steady stream from the receiving vats, passing on its way through the gravel filters, thence through the sterilizer and now before our eyes it poured over coils of pipes through which circulated ice water. By this process it is cooled and subsequently bottled by rows of neatly dressed women; the bottling process is similar to what is to be seen in any ginger ale or soda water factory.

It is not all bottled here; a large quantity is put into cans which are locked, placed in ice water vats which come at four o'clock in the morning ready for the delivery wagons; the cans are so constructed that while the driver can take milk out he can put nothing into them.

We were shown the rooms for sterilizing, bottling, bottle washing, etc. The Bacteriological department is thoroughly equipped. Several experts are always at work here. They had a very large number of experimental animals, guinea pigs, rabbits, mice, rats, etc., etc. We looked in at the large school room where the more advanced children were at their lessons under competent teachers.

At the Kindergarten we heard the juveniles sing.

A laundry, steam drying room, carpenters' shop, paint shop, blacksmiths' shop, harness makers' shop, etc., are all on the premises. The stable is large and a model in its way, the walls are of white tiles, the floors of cement covered by peat moss and straw; space, light and ventilation are all carefully provided for.

The following description extracted from a pamphlet with which we were presented on leaving will furnish details which will impress the reader with the magnitude of this institution.

The German measure litre is quoted, it is less than our quart—thus 1 quart = 40 fluid ounces.

1 litre = 35 " and 2 drachms.

It may be roughly taken as a quart.

A kilogramme = about 2 pounds avoirdupois.

Milk Institution, Berlin.

(Translated by Dr. C. F. Martin.)

"In 1881 the first steps were taken to provide Berlin with pure and cheap milk as well as good dairy produce and a small building was opened for that purpose with three sale wagons. In less than two years this was found quite inadequate, the public sympathy being so fully offered to the enterprise that it became necessary to construct at once a central dairy on much larger dimensions. These buildings were gradually increased in size and the business done became so extensive that in 1897 instead of three sale wagons being employed as at first, there were 159.

"Regarding the distribution of milk itself at the end of the first year's enterprise nearly two millions and a half litres were supplied to the city, and in 1896 nearly twenty-six million litres. At present the daily quantity, viz., 75,000 litres meets the needs of some 45,000 householders, and is obtained from dairies containing in all 14,000 cows.

"In connection with the production of this milk the following statistics may be of some interest. For the proper working of the apparatus necessary for the cleansing of the vessels containing the milk a daily quantity of from 12,000 to 14,000 kilograms of coal is employed. The place is lighted by 1,600 incandescent and fifty-two arc lamps, and the power required includes three dynamos of over 1,000 amperes.

"In connection with the institution, there are 1,200 workmen, many of them specially employed and retained in special houses, such for example as locksmiths, tinsmiths, saddlers, etc., and a special printing house has likewise been built. 180 wagons and about 240 horses are required in order to carry on the work as at present.

"Not only do the wagons carry ordinary milk, but likewise whey; the best fresh milk for children, sterilized milk for children, cream, skimmed milk, buttermilk, butter and various kinds of cheese, and arrangements are made whereby various kinds of fresh fruit are carried about on the same wagons.

“Having collected the milk from about 130 different sources, there are daily brought to the dairy about 75,000 litres. This having been tested as to its good condition, it is then for the most part filtered through gravel, and in this way is freed from the presence of a large number of micro-organisms, and is then rapidly cooled and brought to the consumers in this form. The second portion is centrifuged, thoroughly cleansed and divided into cream and skimmed milk. In this way cream is reduced to two different qualities, or is used for the manufacture of butter (the yearly production of butter is 250,000 kilograms). The skim milk produced is very much favoured and is a cheap form of nutrition. About 10,000 litres of this are sent out daily. A third portion serves for the manufacture of cheese in which the soft cheese of the French variety occupies the most prominent place (Roquefort, Camembert, etc.). Two million litres of milk are employed in this way every year. This cheese is sent throughout Germany to all the larger cities of the Empire where it is in great demand.

“What is called children’s milk, is that obtained from farms whose cattle have the whole year been fed on dry food. The strictness with which Berlin has thus provided for unadulterated milk has had most favourable results in the quality of the milk, and the improvement of the milk in general has been most marked, and has resulted in the diminution of the adulteration with water of from 14·1 per thousand in 1879 down to 3·6 per thousand in 1886, as testified to by the official inspection.

“There is undoubtedly too another evidence of this benefit in the diminution of mortality in children, whereas during the years of 1871 to 1880 thirty per cent of children died in the first year. In 1881 it was lowered to twenty-seven per cent, and in the present year down to 28·8 per cent.

“While of course, undoubtedly, other factors have played an important part in the improvement of mortality, such as improved dwelling places, sewers, etc., nevertheless the improvement of the milk, which is almost the only nourishment for children under one year, must be recognized as having the greatest influence in this respect.

“From the small developments mentioned above up to the great increase in milk supply and analogous products, there has been a further development as a result of this same enterprise. The by-products in the manufacture of cheese, etc., must be mentioned, such articles as lactic acid, salts of lactic acid, lactose and various preparations of casein, all of which find a market in various parts of the country, as well as being exported for use in pharmacy, dye factories, paper, textile industries, etc. So much has this become an essential feature of the dairy that special technical laboratories have been constructed.

“The bacteriological study of milk and its products has become so important in Berlin that it has been found necessary to establish a special experimental station in which all the essential scientific questions concerning milk infection can be thoroughly worked out. Such, for example, is the effort to obtain in pure culture the various bacteria which render milk infectious, and in the same place inoculation experiments upon the smaller domestic animals, as well as feeding experiments both upon the small and the larger animals, can be thoroughly carried out.

“A special laboratory for the chemical analysis of milk has likewise been erected. In 1896, 26,480 analyses were made. In consideration of these various features the existing conditions of milk supply are the most favourable that can possibly be obtained; formerly the various suppliers of milk carried on a wholesale milk adulteration, at the present time as seen by analyses, this has been reduced to a minimum. To illustrate the importance of this analytical work it may be interesting to know that in 1881, 328 analyses were made; in 1891 over 16,000, and in 1896 nearly 27,000. All in all up to the end of the year 1896, there have been 202,533 analyses carried out. Such a quantity of material as this and such a multitude of analyses is unknown in any other institution in the world. In the various departments of this work which concerns the purity of the milk there are various officers in control. The superintending of the health of all the cows concerned in the milk supply is allotted to two veterinarians approved of by the state.

"In testimony of the excellence of this management, one sees medals of all kinds, the results of exhibitions both at home and abroad.

"Space will not permit to dilate here in this report on the special arrangements which the management makes for its employees. Suffice it to say, that for those engaged in the work every assurance is offered for their well-being.

"Special savings banks, restaurants and schools are arranged in connection with the institution, as well as smaller and larger societies of one kind or another, and every care is taken for the welfare of employees when taken sick and for the families of those who die during their term of service in this institution."

THE MILK SUPPLY COMPANY OF COPENHAGEN.

In accordance with a suggestion made by Sir Charles Scott, when I visited him at the Embassy, I arranged with Professor Bang to accompany us to see the operations of the Milk Supply Company. The milk arrives about ten o'clock at night, so that was the hour at which we made our visit.

The company, while a private one, is operated on philanthropic principles, not for profit—all earnings over five per cent are applied to reducing the price of milk, butter and cheese to poor people and supplying its patrons with absolutely pure, sterilized milk at a slight advance, merely enough to cover the cost, as compared with other sources of supply. It is sold for six cents per litre. The following are the conditions which each farmer must not only agree to, but must carry out to the letter :—

"(1.) The feed must be such that it does not affect the taste or character of the milk injuriously. The use of distillery slop and like substances for feed is absolutely prohibited, as well as the use of all feed that has been injured or is not well preserved. The use of turnips, kohlrabi, rutabagas, and the leaves of all kinds of root crops as food for the cattle is also prohibited. Carrots and mangels may be used to the extent of half a bushel per day for each cow, but only when the grain feed given amounts to seven pounds per day. Cows

which supply milk for the use of children must not be fed mangels and carrots beyond the extent of one peck per day. Oil cake (rape-seed) may be fed to the extent of but one and one-half pounds per day, and this only in connection with at least five pounds of grain feed. Cows supplying milk for the use of children must not be fed oil cake of any kind. For other cows the grain mixture used shall receive the company's approval before delivery of milk can begin.

"(2.) In the summer time the cows must not be fed in the barn under any conditions. They must be pastured on clover and grass. Vetches must not be used for their food. When necessary, arrangements may be made with the company for the use of grain or green grain crops during the summer.

"(3.) The cows must be clipped on the udder, tail, and hind quarters in the fall before they are put in the barn.

"(4.) The time of calving of cows in the herd must be distributed as evenly as possible through the year, so that the amount of milk delivered, especially during September and October, shall not be less than two-thirds of the greatest amount delivered in any month.

"(5.) Fresh milk up to twelve days after calving must not be delivered, nor will the company receive milk from cows which give less than six pounds per day.

"(6.) The utmost cleanliness must be observed in milking, and the milk must be strained through a metal strainer covered with a clean woollen cloth.

"(7.) There must be at the disposal of the dairy at least thirty pounds of ice for every 100 pounds of milk produced on the farm.

"(8.) Every dairy must be supplied with a Lawrence milk-cooler. This may be rented from the company if desired.

"(9.) As soon as the milk is drawn from the cow, it must be cooled by the use of ice water on the milk-cooler, and this at all seasons of the year. This cooling should reduce the temperature of the milk to at least 4° Reaumur (41° F.) before it is shipped.

"(10.) The milk must be delivered at the railway station once or twice daily, as the company may desire, either as sweet milk or as half-skimmed milk and cream. It must not be sent from the dairy farm sooner than necessary to make the train, and in summer the delivery wagon must be covered so as to shade the cans.

"(11.) The company will supply the cans used for transportation, and they will be cleaned before they are shipped to the dairy farm.

"(12.) The cans must be rinsed in cold water immediately on their arrival at the dairy. They must be kept in an airy place, protected from all dirt, with the lids removed and opening downward, but so that the air has free access to the interior, until they are used.

"(13.) The can must under no circumstances be used for anything else than the transportation of milk.

"(14.) The dairy farmer must agree to answer all questions which the company may put to him concerning the milk.

"(15.) The dairy farmer must permit one of the company's veterinarians to examine his cattle whenever he chooses, and must carry out the directions which the latter may give him. He must also agree to furnish transportation for the veterinarian to and from the railroad station.

"(16.) Cows which the veterinarian finds have tuberculosis, must be removed from the herd at once and disposed of as soon as possible.

"(17.) Cows which are taken with any suspicious disease must be removed from the herd at once and the company informed of the fact, and, if necessary, the delivery of milk may be stopped until the veterinarian has had an opportunity to examine the case. But in such cases the company will pay for the milk at the same rate as though it were delivered.

"(18.) If any contagious disease occurs among the persons who live on the farm, or at the homes of the labourers who work on the farm, it shall be the duty of the dairyman to

inform the company of the fact at once. The milk will, in such cases, be paid for at the usual rate.

“(19.) This contract may be terminated either by the company or the dairyman on the first day of any year, but with at least six months’ notice.

“(20.) Should the milk be found to be of such an inferior quality as to be unfit for sale, the company reserves the right to stop its delivery without remuneration.

“(21.) If the sale of milk in Copenhagen should be stopped by reason of an epidemic or other non-preventable cause, the delivery must be stopped for a shorter or longer period without remuneration.”

(Anyone interested in the details of this most valuable establishment or the dairy industry in Denmark will find a most interesting report by Professor C. C. Georgeson, published by the Bureau of Animal Industry at Washington, 1893).

They deliver milk in bottles at the houses and have shops for its sale. They sell pasteurized, non-pasteurized and infants’ milk.

Infants’ milk is obtained from cows specially fed—it is sterilized, diluted with water and sweetened with sugar, is sent out in Rhine wine shaped bottles ready to raise to the proper temperature, apply the nipple and give to the child—a great comfort truly to many a poor mother to know that she is giving her baby milk pure, wholesome and sweet.

While waiting the arrival of the train conveying the milk, we were shown over the establishment. We were impressed with the absolute cleanliness of the whole place. Floors, walls, everything in fact about the place was absolutely clean. Water is freely used on floors and walls. The employees are mostly women. They do the bottling, bottle washing, and all the lighter details. They are neatly dressed in white aprons, sleeves and caps. The men, who do the heavier lifting, are dressed in white overalls, jackets and caps. The bottling is done by a special but simple machine; the corking by a corking machine; the tying is done by women, and each bottle is sealed with a leaden button which is stamped.

Everything used about the milk is sterilized after being washed first with a soda solution, then with hot water, then with steam.

On arrival of the train we witnessed the process from the initial stage. The milk cans are large, being made of block tin, with lids which are locked or sealed. Each is labelled with the name of the farmer who sends it, and in most instances the weight capacity is entered in a book. It is then weighed and the weight recorded. It must be reduced to 5°C. before leaving the farm and must not be over 10°C. when received.

A portion is now dipped out of the can, and part is poured into a vial which is labelled with the name of the farmer, and part into a tumbler; the latter is tasted by one of two women who are expert tasters, who look out for dilution, sourness, bad flavours, etc. If they discover anything amiss, the sample goes to the bacteriologist and it is examined and reported on, and the farmer is informed at once.

The accepted milk is poured into the receiving vat, and flows towards the sterilizer, in its course it rises up through gravel filters of three degrees of fineness, and through three plies of fine gauze. (The gravel is frequently washed and sterilized by heat.) The filtered stream then passes on to the sterilizer through pipes raised to 85° C. or 90° C. by steam or hot water, it merely passes through them and being raised to this temperature is at once cooled by passing through cold pipes to the bottling machines; or, if to be delivered in cans, to the canning place. The sealed cans are then placed in large vats of iced water where they remain till early morning when they are placed in delivery wagons for distribution.

From the milk left unsold they make excellent butter on the premises which they put up neatly in crockery-ware jars and sell cheaply.

The farms are all under strict veterinary supervision, a sick animal is at once withdrawn, but the farmer is paid for the milk as if delivered, till the veterinarian makes his report. In addition to veterinarians there are a number of trained dairymen and men employed in travelling from farm to farm.

My attention was called to a very simple device in the construction of the delivery cans which ensures at least a fair distribution of the milk. The cans are long, consequently, if left standing, the cream rises to the top and those who are served from the tap near the bottom would receive almost skim milk; to obviate this, the pipe to which the tap is attached is perforated and reaches to the top so that in a sample drawn, the milk flows through the holes in the tube from the whole of the side of the can from top to bottom.

The following day we visited another large Milk Pasteurizing Company in Copenhagen under the guidance of Prof. Bang's assistant, the details of which though different in some particulars resemble the above described one. I cannot, however, close this report on dairying in Denmark without referring to an admirable institution which Prof. Bang showed us. It may be called a Permanent Butter and Cheese Exhibition. It is held in a large special building built and endowed by a wealthy citizen who took an active interest in promoting the dairy interests of his native country.

It contains laboratories and a museum of dairy utensils. The officers are experts in all matters connected with butter and cheese-making. Weekly exhibitions are held of samples of butter and cheese sent in by farmers on receipt of a circular requesting them to do so, so that the samples are not selected, but are an average of what they produce. Three different sets of judges examine them and give them awards of merit independently. These judgments are then considered by the committee of experts, and prizes are awarded. The names of the successful competitors are published and their butter or cheese receives the official approval of this college of dairying which helps them greatly in finding a market.

The unsuccessful exhibitors receive a report explaining the defects of their products and giving them directions how to prevent them and rectify errors—and as a result they may be prize winners at a subsequent exhibition. This butter is all made from sterilized milk, the cream is raised to 85° C., without in any way injuring it for butter-making or altering its taste. After the competition the butter is sold by the college and returns made to the maker.

DAIRY BACTERIOLOGY.

The subject of Dairy Bacteriology was so frequently brought before my notice in Germany, especially in Saxony and in Denmark, that I regretted very much my want of time to give it sufficient attention to enable me to report on it. I have, therefore, been obliged to append the following extract from the report of Prof. Georgeson already referred to, which I hope will serve to create an interest in this subject which is one of the essentials of successful dairying:—

“It is only between two and three years since the use of pure cultures of bacteria were introduced into the creameries of Denmark, and as a means of improving the butter, but the results have been so uniformly successful that they are now used in all dairies whenever there is necessity for them. The honour of the introduction of this improvement in creamery methods does not belong to any one man, though, perhaps Prof. V. Storch, director of the experimental laboratory at Copenhagen, deserves the ‘lion’s share’ of the credit. He has been at work on the problem for some six or eight years, and from time to time has published the results of his researches. Other bacteriologists took up the same line of work, and the result was that pure cultures of the beneficial bacteria were put upon the market by the three different laboratories at about the same time. Prof. Storch had already then isolated and cultivated several forms of these bacteria, but he has not put any of them on the market.

“As the several investigators worked independently of each other, each can be credited with an original discovery, especially since the bacteria employed are not the same in all cases. From the investigations by Prof. Storch, Prof. Fjord, and others, it soon became evident that the quality of butter depended, at least in a large degree, on the presence or absence of certain minute organisms. It was found that in faulty butter certain forms were present which, when isolated and cultivated, produced the characteristics which were objectionable. In like manner it was found that in high-class butter certain other forms were present, which would similarly produce the characteristic aroma and flavour when cultivated by themselves. This led to the natural recognition of two general classes of bacteria, one of which was injurious to the interests of the dairy, and the other one beneficial. When this fact

had been settled, the practical question before the investigators was how it would be possible to repress one class and encourage the other. Prof. Fjord had, in the meantime, perfected his pasteurizing apparatus, which has been figured and described elsewhere. This was invented chiefly with a view to improve the keeping qualities of skim milk so that it might reach the patrons and other consumers in a fresh and sweet condition. This was accomplished by heating it to a temperature of upwards of 150° F. It was found that this temperature destroyed enough of the bacteria which caused the milk to change to make it possible to keep it sweet from twelve to twenty-four hours longer than when it is not thus heated. The next step was to apply the same treatment to the cream, or to the sweet milk before it was separated, with the same results. Heated to a temperature of 160° F., it was found that the most active forms of the bacteria were killed, and that by again cooling the cream to about 75° or 80° F., at which bacterial life becomes active, the cream could be inoculated by any desirable form of bacteria if these could be obtained from pure cultures, and that the forms with which the cream was thus impregnated, meeting with no opposition from other forms, would develop rapidly in enormous numbers and give their peculiar characteristics to the butter. This is exactly what is now done in practice. The cream is not always pasteurized, because if there are no injurious bacteria present, or at least such numbers as to cause a deterioration of the product, there is no necessity for attempting to kill them, and the addition in sufficient quantity of a pure culture would at once give the latter the upper hand, and their peculiarities would become prominent. A rather more thorough sterilization would be effected if the milk were raised to the boiling point; but a temperature of much over 160° F. gives the characteristic boiled taste to both milk and cream, which is objectionable and must be avoided. It is found in practice that this temperature destroys nearly all the organisms in active growth. The spores will survive this temperature, but it takes them longer to develop and by the time they become ready the pure culture has the mastery.

“As a higher degree of heat than that required for their normal development is destructive to the bacteria, so in like manner a reduction of the temperature retards their growth. It does not destroy them, if not below the freezing point, but it stops their

development and renders them inactive. It is for this reason that pains should always be taken to reduce the temperature of the milk, by means of ice water, to a point as near the freezing point as practicable. Heat and cold, relatively speaking, are therefore effective means in controlling bacterial life in the creamery."