

A Report

ON

THE MILK SUPPLY OF LARGE TOWNS: ITS DEFECTS AND THEIR REMEDY.

V.

THE MILK COMPANIES OF COPENHAGEN.

DR. HENRI DE ROTHSCHILD has recently published¹ an abstract of the report of a mission with which he was charged by the French Minister of Agriculture last summer to study the conditions under which the milk trade is carried on in Denmark. The interest which M. de Rothschild has taken in the question of the supply of milk for infants is well known, and at the polyclinic which he established seven years ago and which is now carried on in a special building attached to the Hôpital Rothschild in Paris, not only is ordinary treatment given to infants, but sterilized milk is issued for their use free or at a low price and they are regularly weighed so that the effects may be registered. He therefore approached his investigations in Denmark with a full knowledge of the importance of the questions involved. He expresses the opinion that among all the cities in Europe, Copenhagen is best provided with milk, the trade being mainly in the hands of two companies which carry on their work in a scientific manner, and take the greatest pains to ensure not only that the quality of the milk be excellent, but that it shall be retailed under conditions which must prevent fraud, and at a reasonable price. The two chief companies are the Kjobenhavns Moelkeforsyning (The Dairy Supply Society of Copenhagen) and the Danske Moelke-Compagni (Danish Milk Company). Both Companies do a large business; the latter, though more recently established, handles a somewhat larger quantity of milk. The first named Company works upon the principle of furnishing milk preserved fresh by keeping it at a low temperature by means of ice, the second pasteurizes its milk.

THE KJOBENHAVNS MOELKEFORSYNING.

The distinctive character of this Company is that it sends out fresh milk, that is to say, milk which has neither been pasteurized nor sterilized. In order that fresh milk may not produce effects due to the presence of pathogenic microorganisms, it must fulfil three essential conditions:

1. It must be obtained from cows ascertained to be healthy by veterinary examination and fed in a proper manner.
2. It must be manipulated from the time of milking until it is sold in a rigorously aseptic manner.

¹ *Revue d'Hygiène et de Médecine Infantile*, Tome 1, No. 6.

3. It must be kept during the same period, by some method which shall render the development of the bacteria which it may contain impossible.

Contracts with Farmers.

The Company does not itself own any farms or dairies; all its milk comes from large or small farms within a radius of a few miles of Copenhagen. It accepts milk from any farmer or owner of cows subject to certain conditions laid down in a contract by which, on pain of fine or the cancelling of the contract, the farmer must rigorously abide.

As to the feeding and general hygiene, the contract provides that: (1) On no account must the cows live in the byres during the summer; (2) they must remain at grass as long as the weather permits; (3) if in summer it becomes necessary to use dry forage, it must be given in the open, and the Company must be notified; (4) before the cows are housed in the autumn their entire hindquarters shall be closely clipped. Their nourishment is to be wholesome and free from substances which might communicate to the milk any abnormal colours or flavour. Residues from distilleries of any kind, as well as turnips, turnip leaves, swedes, and vetches, are rigorously excluded. Carrots and beetroots are only permitted in the proportion of at most 1½ bushel to 5 lb. of corn, bran, and oil-cake. The only cake allowed is colza or sunflower, in the proportion of 1½ lb. at the most to 5 lb. of corn and bran. Cows kept to supply milk for infants must never receive cake, and carrots and beetroots are allowed only at the rate of ¼ bushel a head. The contract lays down the hygienic conditions which must be followed to safeguard the milk from contamination or infection.

Since the milk is not pasteurized, it must leave the farm chemically and bacteriologically pure. As it may be the channel through which typhoid fever, aphthous fever, diphtheria, and more particularly tuberculosis, be conveyed, it is essential that it should come from absolutely healthy animals. To ensure this, the contract provides that the farmer shall allow the inspection of his cows by the Veterinary Inspectors of the Company, and shall strictly obey their instructions. Thus a farmer must immediately remove and isolate any cow declared by the Veterinary Inspector to be suffering from tuberculosis, and get rid of it as soon as possible. He must report any case of illness occurring between the visits of the veterinary inspector, and keep back the milk of the sick beast until further orders. The health of the farmer's family, and that of his labourers and their families, is under special supervision, and the Company must immediately receive notice of the occurrence of an infectious disease. The Company employs seven Veterinary Surgeons. Each visits the farms in the districts allotted to him every fortnight, and makes a report of his inspection to the Company. They note their observations on a printed form (see Form No. 1). On no

FORM NO. 1 TO BE FILLED IN BY VETERINARY INSPECTOR.

Name of Farm Number of Cows Number of Young Cows

Month.	Date.	Kept for the Company.		Cows Rejected for				Suspect Cows put in Reserve for Inspection.		Cows in Reserve who, since the last Report, are		What Quantity of Milk do the Cows in Reserve Give? What is Done with this Milk?	General Conditions of the Cows.	Is the Stable Kept Perfectly Clean?	Is the same true of the Cows, and especially their Udders?	Observations.
		Cows in Milk.	Cows not in milk.	Tuberculosis of Udder.	Tuberculosis of Other Organs.	Other Illnesses.	Suspicion of Tuberculosis.	Number.	Cause.	Cured.	Left the Farm.					

FORM NO. 2, TO BE FILLED IN BY THE FARMER.

Name of the Farm

Month.	Date.	Dry Fodder.				Roots.			Hay.	Number of Cows.	Number of Cows in Milk.	Date of last Calving.	Observations.
		Barley and Oats.	Bran of Wheat.	Sunflower Oil-cake.	Colza Oil-cake.	Total.	Beetroot.	Carrots.					
		lb.	lb.	lb.	lb.	lb.	Bushels.	Bushels.	lb.				

pretext must access to the farm be refused to the Veterinary Inspectors, who are required to report whether the rules specified in the contracts are carried out, and to give notice to the farmers of the defects they are reporting to the Company. A form showing the food given to the cows is filled in by the farmer (see Form No. 2). The regulations to which the farmer is required to subscribe are as follows :

REGULATIONS SIGNED BY A FARMER UNDERTAKING TO SUPPLY MILK TO "THE KJØBENHAVNS MØLKEFORSYNING."
A.—Feeding and Management of the Cows.

1. The food of the cows must be fresh, and in a good state of preservation. It must also be free from elements which might give to the milk an abnormal flavour or colour.
2. In summer the cows must be put out to grass, and be fed only with grass or clover. In case of necessity it is permissible to give them—but always out in the open—some dry forage and cut corn. It is forbidden to leave them in their sheds at this time of the year.
3. The farmer must arrange beforehand with the Company what food he proposes to give his cows during the winter.
4. He is under any circumstances bound to conform to the following rules :
 - (a) *Roots.*—Carrots and beetroots shall be given in the proportion of one bushel and a-half per cow, but conditionally on their being mixed with at least five pounds of corn, bran, and oil-cake. Cows supplying milk for infants to receive them only in the proportion of half a bushel. Turnips, rape, coleworts, swedes, turnip or beetroot leaves are excluded from the food.
 - (b) *Oil cake.*—Colza oil-cake and sunflower oil-cake may only be employed in the proportion of at most 1 lb. mixed with at least 5 lb. of corn and bran. It is forbidden to give cake to cows supplying infants' milk.
 - (c) All distillery refuse, etc., is forbidden.
5. Before housing the cows in the autumn, the tails, hindquarters, and udders must be clipped.
6. The periods of calving must be so regulated that the quantity of milk sent to the Society during the months of September and October, shall not be less than the average quantity delivered during the first four months of the year. A farmer desirous of delivering a greater quantity than he is in the habit of supplying, must previously arrange with the Society to do so.
7. The milk of cows after calving must not be supplied during the first fifteen days of lactation; the Society also refuses to receive milk from sick cows, or from cows which yield a maximum of not more than 6 litres a day.

B.—Milking.

8. Milking must be done with the greatest care and cleanliness, and should normally take place under the following conditions :
 - (a) Milkers must wear, while milking, a special dress, and be supplied with a towel in case they require to wash their hands.
 - (b) During milking-time the shed should be well lighted, especially behind the cow, so that the operator may milk in an orderly and cleanly manner.
 - (c) Immediately after milking, the milk must be passed through a metal sieve covered with a fine clean cloth.
 - (d) The milk must then, in all seasons, be passed through a refrigerator, which should lower its temperature to 4° R. (5° C., or 37° F.). It must be kept at this temperature until the time of dispatch.
 - (e) Manure must be removed in the morning after milking, and the removal must cease in the afternoon, at least one hour before the evening milking.
 - (f) Milk coming from cows beginning lactation, that coming from cows declared sick, as also that of cows giving less than 6 litres a day, must be collected separately, to prevent its being mistaken for, and mixed with the normal milk destined for the Company.
9. The farmer is required to keep a stock of fresh ice of at least 30 lb. to 100 litres of milk.

FORM NO. 3, TO BE FILLED IN BY THE WOMAN INSPECTOR.

Month.	Date.	Name of the Farm.	In what Conditions of Cleanliness is the Milking Done?	What Defects must be Remedied most Promptly?	How is the Ice for Refrigerating Used?	Where, and in what State, are the Refrigerating Apparatus? In what State is the Flooring or Paving?	General Observations.

11. To cool the milk he must use the Lawrence apparatus, which he can hire from the Society.

C.—Delivery of the Milk.

12. Milk is to be delivered once or twice a day, according to the requirements of the Company, at the nearest railway station, whether full, "half-skimmed" milk, or cream. It should only leave the farm in time to arrive at the station at the given time. In summer the milk wagons must have an awning to shade the milk from the sun.
13. The Society supplies the cans for the transport of the milk.
14. On arrival at the farm the cans must be carefully rinsed in cold water, to free them from the dust or dirt that they may have picked up on the way from the factory, then placed upside down in an airy place, where they must remain until required.
15. The use of the cans for any other purpose than milk transport is absolutely forbidden.

D. Various Obligations.

16. The suppliers are held, by their word of honour, to answer all inquiries made by the Society respecting the furnishing of milk.
 17. They are bound to permit their cowsheds to be inspected by the Veterinary Surgeon of the Company whenever he thinks it necessary. They must fetch the Veterinary Surgeon from the station on arrival, and take him back there on departure, and they must carry out his instructions faithfully.
 18. Cows declared tuberculous by the Veterinary Surgeon must be isolated immediately, and sold or destroyed as soon as possible.
 19. All calves brought up with the object of yielding milk must have been, since 1896, submitted to the tuberculin test, and the injections must be repeated at least once a year in those which have not reacted to the test. [Since January 1st, 1898, the tuberculin test has been made obligatory for those cows or young cattle put in reserve on suspicion of sickness.]
 20. If, in the interval between two of the veterinary surgeon's visits, signs of illness be noticed in the cattle, the farmer must at once inform the Company, and keep back the milk until the Veterinary Surgeon has investigated the case and sent in his report. Meanwhile, in the interval the milk is paid for by the Society, as though it had been delivered.
 21. Suppliers are bound to watch with the keenest attention the sanitary state of all persons employed by or resident on the farms, as also that of their families. They are required if any case of infectious illness occur to notify the fact immediately to the Company, who at once take steps to check the evil. In this case the Society refuses to receive the milk, until such time as all traces of illness shall have disappeared, but it pays for it as if it were receiving it.
 22. If the Company finds the milk of a quality inferior to the standard, and therefore unsuitable for sale, it reserves the right to reject it without paying any compensation to the farmer.
 23. Either of the contracting parties can, on giving six months' notice terminate the contract from January 1st of each year.
 24. If owing to an epidemic, or some cause impossible to foresee, the sale of milk at Copenhagen should be suspended, the supplier must keep his milk for a longer or shorter period, and shall not have in this case a claim to any compensation from the Company.
- I accept the above-mentioned conditions.

(Signature of the Farmer.)

Production of Milk.

The farmer can engage to supply milk from some of his cows only, and reserve for himself the milk of the others. The cows certified to be healthy are milked morning and evening by milkers who wear special costumes, and are supplied with a towel, so that they may wash and dry their hands whenever necessary. The milking must be done with great care and cleanliness, and in a good light. The Company requires that cows which have recently calved, as well as those pronounced unfit in any way by the Veterinary Inspector, be isolated in a separate part of the byre, in order to avoid mixing the milk. The milk is drawn into pails, and immediately strained through a clean woollen cloth into a refrigerating apparatus, which lowers its temperature to +4° R. (+5° C. or 41° F.). The farmer can buy this apparatus (Lawrence's) or hire it from the Company. In every case, at all seasons of the year, he must keep the milk in boxes, in which it is maintained at this temperature until it is dispatched, and he must keep a reserve of ice in the proportion of 30 lb. to 100 litres of milk. Women inspectors are employed to overlook the production of the milk in all its details, and they report to the Company at least twice a year as to the state of cleanliness and hygiene of each farm. They have to fill in the results of their inspection visits on Form No. 3.

Transport of the Milk.

After having been cooled to +4° R. (41° F.) immediately after milking, the milk is put into cans supplied by the Company, and sent to the station in time to catch a particular train. During the short time they are at the station, the cans must not be exposed to the sun, and during the heat of summer must be covered by an awning. The journey is short, and the special wagons are well ventilated—the empty cans, having first been cleaned by the Company, are returned to the farmers, who rinse them with cold water to remove dust or other dirt which may have accumulated on the return journey; they are kept, upside down in a cool airy place and solely used for milk.

Price of the Milk.

The Society buys the milk at the rate of $14\frac{1}{2}$ centimes the litre (about $6\frac{1}{2}$ d. a gallon), but the Company reserves the right to refuse any milk which appears to it to be of inferior quality; on the other hand, it undertakes to pay for, without receiving, the milk of any cows which the farmer has, of his own accord, declared to be ill, or suspected of illness.

The City Factory.

The visitor enters a large courtyard, having the sheds and stables at one end, the offices on one side, and the premises used in the manipulation of the milk on the other. The surface of the yard is macadam, frequently washed for cleanliness and coolness. There are 180 employes, divided into two shifts: one shift begins work at 3 a.m. and leaves off at 3 p.m., having, in the interval taken three hours' rest; the other set is on duty from 1.30 p.m. to 2 a.m., taking four hours rest (from 6 to 10 p.m.). They wear white linen suits, supplied and washed by the Company; the men wear a jacket, apron and cap; the women a blouse, an apron and a cap. All wear sabots, and smoking or spitting on the ground is absolutely forbidden.

A steam engine supplies the motor power; the steam is used for the pasteurization of infants' milk, and for the cleansing and sterilization of the utensils, and supplies also any apparatus for washing, sterilizing, and drying the sand used for filtering the milk. To preserve the milk at a low temperature during the different processes, no less than 2,000,000 kilos of ice are used yearly. There is also a special station for the receipt and dispatch of the milk.

Arrival and Reception of the Milk.—The night's milk is delivered in Copenhagen as it is yielded; the morning's, having been kept on ice all day, is skimmed at the farm and sent with the evening's milk, as cream, and as half-skimmed milk, containing still about 1 per cent. of fatty matter. Both sorts of milk, skimmed and unskimmed, are sold as such at different prices. The wagons and milk cans belong to the Society; both are sealed, and must arrive at the factory station with their seals unbroken. The 600 cans thus received daily contain on the average 30,000 litres, the contents of each can being 50 litres. They are taken on barrows into the reception hall, where an employe unseals them one by one, and takes the temperature, which should not exceed 11° R. (14° C. or 57° F.). An assistant weighs each can, and its weight and the number of the farm it comes from are recorded; while another takes, with a tube, a specimen of the milk, which is tasted in a spoon by a special woman taster. All details regarding the number, weight, temperature, and flavour of each can are entered by an inspector, who also takes specimens from odd cans for chemical and bacteriological examination.

Filtration of the Milk.

The milk cans are then carried into a large hall, where they are kept in vats, packed with ice, until the milk is filtered. The system of filtration is M. Busch's invention. The apparatus is made of enamelled sheet iron, and consists of a round vessel like a wash-hand basin and a small vat. The basin is at a higher level, and from its bottom a wide tub descends vertically, and is then bent at a right angle to enter the side of the small vat near the bottom. The small vat has two overflow pipes, through which the filtered milk flows into a reservoir placed immediately below. Formerly the milk was filtered through sponges. In 1890 a more practical and economical system was introduced. The milk descending from the upper basin rises in the small vat through three layers of gravel and sand, the lowest composed of gravel as big as peas, the middle of finer gravel, and the third of very fine sand; the layers are separated from each other by plates of perforated tin; on the upper plate are four layers of fine linen. The whole is kept in position by pressure exercised on the edges of the tin plates by a special arrangement. The filter is cleaned daily by forcing through it a boiling solution of sodium carbonate, and sterilized by passing steam through it at about 302° F. Cream, skimmed milk, non-skimmed milk, and infants' milk are filtered in different apparatus to avoid mixing; 4,000 litres of milk can be filtered in three hours. The reservoir, into which the milk runs from the filter, is of enamelled sheet iron; it is pierced at the bottom by a horizontal draw-off pipe, which is bent at right angles and rises vertically in the middle of the reservoir. The part of this pipe in the reservoir, is pierced by many small holes, and thus collects the milk from the different layers and conducts

it—mixed so as to preserve a mean average—through the horizontal tube, whence it flows into the cans.

Filling the Cans with Full or Skimmed Milk.—The cans are filled with full or half-skimmed milk, weighed, and labels indicating the quality of milk contained in them affixed; the lid is fastened by a wire, the two extremities of which are sealed by a leaden disc, stamped with the date on one side, and the name of the Society on the other. The cans are kept packed in ice tanks until wanted for the town.

Bottling the Cream.—The cream is first weighed, tasted, and pronounced either No. 1 or No. 2 quality. Both qualities are then filtered separately, and placed in bottles containing 50 and 25 centilitres, labelled and marked. They are closed by a patent cork, surrounded by a wire, ending in a leaden label, which is dated and marked. Whipped cream is also supplied in bottles.

Infants' Milk.—This milk is yielded by chosen cows, specially looked after, and fed in winter on hay, corn, bran, straw, oats, barley, and at most a quarter of a bushel of carrots; cakes are absolutely forbidden. The price paid is higher. The milk is treated in exactly the same manner as the other milk: it is sold unprepared, or modified, or pasteurized. The milk is drawn from a reservoir under pressure, into bottles holding a litre. The corking is done mechanically; and the bottles are labelled with a guarantee and the date. The bottles are then placed in baskets and covered cases, and kept in ice, until they are sold in the street or delivered to customers. To the modified milk $\frac{1}{3}$, $\frac{2}{3}$, or $\frac{1}{4}$ of water is added, as also a certain quantity of sugar in proportion to the degree of dilution; the proteid contents are thus lowered, and the sugar increased in order to make it resemble human milk. The proportions can be altered to suit the digestion of the infant.

The preparation of pasteurized milk is controlled by a special committee, consisting of a municipal councillor and a professor of the school of medicine. After the filtration, a part of the special milk for infants is placed in four receptacles, and sugar and water added in different proportions. No. 1 contains 2 parts of water to 1 of milk; No. 2, 1 part water to 1 part milk; No. 3, 1 part water to 2 parts milk; No. 4, 1 part water to 3 parts milk. These four mixtures are drawn into bottles containing 135, 150, 175, and 180 grams respectively. The undiluted pasteurized milk is put up in bottles of 210 grams. When hermetically sealed, they are placed in a pasteurizing machine, at a temperature of 85° C., for half an hour. Breakages during the process are about 3 per cent. When ready for delivery the bottles are placed in iron wire circular baskets with a central handle, having seven, eight, nine, or ten compartments. The bottles are kept in place by a ring with a corresponding number of openings which fits over the necks of the bottles and is secured by a wire, the two ends of which are sealed with a lead seal, bearing the date of pasteurization and mark of the Society. Each basket has also a label, indicating the nature of the mixture. Each bottle contains enough for one meal, and each basket enough bottles for the number of daily meals of the infant. Mixture No. 1 is delivered in baskets containing ten bottles of 135 grams each; No. 2, nine bottles of 150 grams; No. 3, eight bottles of 175 grams; No. 4, eight bottles of 180 grams. The unmodified pasteurized milk is sold in baskets of seven bottles of 210 grams and in half-litre bottles. With the basket is a notice, to the effect that the pasteurized milk may be kept in the sealed bottles twenty-four hours in a cool place in the shade; that before being used it must be warmed for five minutes in water of a temperature of 50° C., that the neck of the bottle is to be wiped and the bottle opened, and that the infant must never be given any of the milk left over from a feeding. The baskets are sold as follows: Nos. 1 and 2 at 0.49 centimes, Nos. 3 and 4 at 0.56 centimes, and the non-modified pasteurized milk at 0.63 centimes. A deposit is paid on the baskets or bottles as the case may be.

Sale of Milk.—Milk is retailed in special horsed vans and in hand carts; both kinds are closed and have three doors on each side. The milk cans are placed so that their taps project through an opening at the bottom of each door, while over each tap is inscribed the quality of the milk and price. A door at the back opens into a compartment reserved for milk and cream sold in bottles. The wagon is numbered, and bears the name of the Society. When the wagon is loaded the doors of the compartments containing the retail milk are sealed, and two men accompany the cart to given points in the street, where they stand or go into the neighbouring districts until the milk is all sold. The delivery employs 200 men,

50 wagons, and 68 horses. All sealed cans must be delivered with the seals intact, and the seals must be still affixed to the doors of the wagons employed in the sale of milk in the streets when they return to the manufactory. No tampering can thus take place. Fraud is further prevented by the quality of the milk being clearly described above the taps, and each buyer receives a different-coloured ticket for each measure of full or skimmed milk that he buys. On these tickets is described the quantity and price, and a number and a mark of the Society. The special milk for infants must be delivered with unbroken seals. In summer all bottles and cans in the wagon are packed in ice. The sale of full, and skimmed milk accounts for the major portion of the 30,000 litres received daily by the Company, while the infants' milk whether full and fresh, modified or pasteurized, averages 4,000 litres per diem.

Cleansing of the Cans and Bottles.—The cans used in conveying milk from the farms to the manufactory are washed in the morning, those brought back in the retail carts in the evening empty. A man turns them upside down on the spokes of a large wooden wheel, which is placed in a vat filled with carbonated water, in which it revolves, immersing in succession each can for a few moments. Another assistant then receives and washes them in hot water; while a third sterilizes them by jets of steam under pressure, and a fourth rinses them in filtered water. They are then removed to a drying room, where they remain upside down, until such time as they are sent to the farm, or are required for use in the town. The bottles are dealt with in another place in the same manner. On being removed from the carbonated water they are washed by a revolving bottle brush with a hollow stem pierced with small holes, through which boiling or cold water can be injected at will; they are then rinsed in filtered water and put to dry in a special drier.

Butter, Skim Milk, etc.—The whole milk and the cream returned unsold to the dairy are immediately made into butter, which is sold at a slightly lower price than butter of first quality. The residues and the half-skimmed milk not sold, are pasteurized and sold at very low prices to the farmers, for feeding young pigs.

The Staff.—The staff, men and women, comprise clerks, coachmen, salesmen, errand boys, workmen for rough work and women for lighter work (tasting the milk, bottling the milk, washing the glass utensils, making butter, etc.) Each set has a fixed task at fixed hours and, thanks to the judicious distribution of work, the operations are carried out with remarkable rapidity and method. A white linen suit is given free to the workers, and the coachmen, and salesmen in addition to a fixed salary, receive a percentage on the sales. All employés are entitled to drink as much milk as they like in the factory. The discipline imposed by the Company on its staff is rigorous in the extreme, any infringement of rules being severely punished; on the other hand prizes are offered to those who distinguish themselves by their strict observance of orders and by their industry. The care the Company takes with regard to the animals on the farms, has already been mentioned; the constant watchfulness of their health and that of their owners, and the rigorous way in which all suspected animals are isolated. The same rules apply to the entire staff of the Company, its motto "Pure cows' milk" might well be read "Pure milk coming from healthy cows and manipulated by a healthy staff." The employé who of his own accord notifies to the Company and to his doctor a case of illness in his family or surroundings, is assisted until the danger is past, and during this enforced stoppage he receives his full salary. His interest is thus to act honestly, more especially as, if he omits to make this declaration, he runs the risk of immediate dismissal.

DANSKE MOELKE-COMPAGNI.

The company was founded about six years ago to work the Casse system in which the milk is partially congealed immediately after milking, so that it may be kept fresh for several days. When it started, the Company only sold wholesale the fresh milk, treated as above and sold in cans. But after the acquisition in 1900 of the site and the buildings of the "Pasteur" Dairy, it modified its system of sale so that it now sells, wholesale and retail, milk which is kept fresh during its transport to Copenhagen by partial congelation, and submitted to pasteurization on arrival at the manufactory. The Company now employs 250 workmen and trades in 50,000 to 60,000 litres of milk a day. The Company does not draw its supplies of milk from the immediate neighbourhood of Copenhagen. It owns co-operative dairies in various places, all more or less dis-

tant, the co-operators being bound by the same rules of hygiene, system of feeding, etc., as those laid down by the "Kjobenhavns Moelkeforsyning." The milk collected at the dairies is poured into large cans holding 500 kilos, and therein submitted to a very low temperature which partially congeals it. The cans are conveyed to Copenhagen in cold-storage wagons, and on arrival there, one-third of the total milk is congealed in a block which floats in the liquid. When unloaded the cans are weighed and wheeled to great reservoirs into which the contents are tilted, a specimen for analysis having first been taken. In these reservoirs the milk is liquified by a mechanical agitator, an operation which lasts forty-five minutes, but does not affect the flavour of the milk. It is filtered, pasteurized, and cooled, in apparatus capable of manipulating as much as 8,000 kilos of milk an hour. The three processes—filtering, pasturization, and cooling only take a quarter of an hour.

In the new pasteurizing apparatus, constructed recently from designs, prepared in the laboratory of experimental agriculture in Copenhagen, the milk or cream can be heated to 100° C., without affecting the flavour: as a rule 85° C. or 90° C. is thought sufficient. A man is told off to watch the whole process of pasteurization, and never allows the temperature to be lower than 85° C., while another assistant from time to time takes samples, which are examined by the Company's chemist to ascertain that it has actually been pasteurized. The apparatus pasteurizes, filters, and cools the milk automatically. It is easily taken to pieces, and is first cleansed in hot water, then sterilized by steam.

On leaving the pasteurizers the milk is at once cooled and bottled. The bottles, which are of two sizes—a litre and half a litre—are spindle-shaped for retail sale and cylindrical for wholesale. Once filled and corked, they are exposed and kept in ice rooms, at a temperature of 4° C. (39.2° F.) until they are sent out. The bottles reach the hands of customers without their contents having, after their entry into the pasteurizer, come into contact with the outer air. A red label bears the mark of the Company, the date of pasteurization, and a short notice about pasteurized milk. The milk is delivered wholesale in jars or in baskets of twenty bottles; it is retailed in litres or half-litres. Of the 50,000 to 60,000 litres of milk received by the Company daily, it sells as (a) pasteurized from 30,000 to 35,000 litres; as (b) cream about 3,000 litres; as (c) half-skimmed milk the milk from which the cream has been taken; and as (d) pasteurized milk for infants, some thousands of pints from selected cows.

Dispatch and delivery are carried out on the same lines as by the "Kjobenhavns Moelkeforsyning," that is to say, with the same precautions to ensure that the products reach its customers fresh and intact. The system of cleansing utensils, bottles, etc., is practically similar, but the sale of bottles being greater, the cleansing hall is much larger. In it are two immense wheels with compartments for the bottles; the wheels turn slowly in a vat filled with carbonated water, and the bottles, after passing through the water, are washed with bottle-brushes as already described, and finally rinsed and placed upside down on drainers.

The establishment also possesses a dairy for the manufacture of butter from the unsold milk and cream. The milk is skimmed mechanically by means of Laval's turbines. The butter-milk is sterilized afresh, and sold cheaply to the farmers for their pigs.

CERTIFIED MILK IN NEW YORK.

A brief account of the system under which certified milk is sold in New York was given in the course of a review of Dr. Henry Dwight Chapin's book on the *Theory and Practice of Infant Feeding*.¹ That reference gave rise to a correspondence in the BRITISH MEDICAL JOURNAL, which showed that a good deal of practical interest was taken in the subject. We now propose to give some details of the inquiries and negotiations which resulted in the establishment of this system, and of the manner in which it is worked.

Preliminary Measures.

Dr. Chapin had studied for several years the milk supply of New York in connexion with the subject of home modification of milk for infant feeding. To get an idea of how the milk business of the city was conducted, a business directory was taken and the financial rating of each milkman looked up. The bulk of the business was found to be in the hands of a few dealers—about fifty—some of whom were estimated by the commercial agencies as having over 1,000,000 dols.

¹ BRITISH MEDICAL JOURNAL, January 17th, 1903, p. 140.

invested. These dealers handled about 1,250,000 quarts of milk daily.

A list of questions was sent to each of them, asking, among other things, if they sold milk in bottles or not, and at what price; under what conditions their milk was produced, and what percentage of fat it contained. From these answers and talks with the milk dealers who called, the condition of the milk trade was easily discovered.

It appears that very few of the dealers have their own cows, the majority buy their milk from farmers. Milk-receiving stations, called creameries, are established at the railroad stations in dairy sections, and a number of farmers bring their milk to these stations, where it is mixed and prepared for shipment.

The milk business is divided sharply into two branches: (1) One selling milk in forty-quart cans to grocery stores, restaurants, etc.; and (2) the other in bottles to families direct.

(1) Price is the first consideration in "grocery milk," and the milk is bought of the farmers at prices that barely pay for the cow's feed. The milk is there standardized—that is, adjusted so that it will contain as nearly as possible 3 per cent. of fat and 12 per cent. of total solids (the minimum quantities allowed by law), any excess of fat being removed and sold as cream. Grocery milk in New York is retailed at from 3 to 4 cents. per quart.

(2) For the milk intended for family trade, the farmers receive better prices and more care is expended on it. Some dealers filter it; others allow the cream to rise and draw off some of the under milk, so that the remaining milk will show more cream when delivered to families in bottles. The milk is then bottled by machinery and packed in cases containing cracked ice. Much of the milk is good; some of it all that could be desired. The average retail price charged is 8 cents. per quart.

Dr. Chapin read a paper on How the Milk Supply of New York may be Improved, at a meeting of the Medical Society of the County of New York, to which the milkmen were invited. At this meeting each side presented its views on the subject. A Committee, with Dr. Chapin as chairman, was appointed, to look into the milk-supply question, and the present Milk Commission resulted. The milk dealers were invited to meet, and the Committee asked them how the problem could best be solved. The dealers finding that they were to be helped, did their best to assist the Committee, with the result that the standard determined on for milk certification was—not over 30,000 bacteria per c.c.m., acidity not over 2 per cent., and at least 3.5 per cent. of butter fat. At first none of the dealers could produce milk up to this standard, but by visiting the farmers, showing them how to arrange their stables, clean their cows, hands, and dairy utensils, it was found that milk well within the standard could be produced in abundance, and at a small advance in price over that of the ordinary bottled milk. It was found necessary to cool the milk soon after milking, by running it over the surface of a cooler containing well or spring water; no milk was to be received from farmers at a temperature above 60° F. Those conditions imposed by the Milk Commission upon dealers, in any way differing from the system employed by the Copenhagen Milk Companies, are singled out in order that the two systems may be compared, and so as to avoid repetition. Dealers complying with the rules were authorized to use caps on their milk jars stamped: "Certified by the Commission of the Medical Society of the County of New York."

I.—Certified Milk.

1. *The Barnyard* must be free from manure and well drained; manure which collects each day must be taken several hundred feet away; thus not only will the barnyard be free from smell, but the number of flies in summer will be reduced. Flies are an element of danger, being fond of both filth and milk, and liable to get into the milk after having soiled their bodies in the manure. They also irritate the cows, making them nervous and reducing the amount of milk yielded.

2. *The Stable*.—The place in which cows are milked should have no storage loft above it, or the floor of the loft should be tight to prevent the filtering of dust into the stable beneath. The floors of the stables should have tight floors, preferably of cement, and be well drained. They should be whitewashed at least twice a year, and the air should always be fresh and without bad odour. A sufficient number of lanterns should be provided to enable the necessary work to

be done during the dark hours. There should be an adequate water supply, with wash-basins, soap, and towels.

3. *Water Supply*.—The whole premises used for dairy purposes, as well as the barn, must have a supply of water absolutely free from any danger of pollution with animal matter, sufficiently abundant for all purposes and easy of access.

4. *The Cows*.—An animal must never be added to the herd until it has been tested with tuberculin and certified free from disease. No cow is to be excited by hard driving, abuse, loud talking, or any unnecessary disturbance. No strongly-flavoured food, like garlic, which will affect the flavour of the milk, is to be eaten by the cows. The entire body of the cow is to be groomed daily, and before each milking the udder is wiped with a clean damp cloth, or washed with soap and clean water and wiped dry with a clean towel. The udder must never be left wet, and the water and towel used must be clean. The cows must not be allowed to lie down after they are prepared for milking, and a chain or rope must be stretched under the neck to prevent this. All milk from cows sixty days before and ten days after calving must be rejected.

5. *The Milkers*.—Before milking, the milker must wash his hands in warm water with soap and a nail-brush, drying well on a clean towel; on no account should the hands be wet during the milking. Garments used for milking should be kept in a place protected from dust. Iron stools painted white are recommended.

6. *Helpers other than Milkers*.—All children under twelve must be excluded during milking, since from liability to contagious diseases they are more apt than older persons to transmit them through the milk.

7. *Small Animals*.—Cats and dogs must be excluded from the stables during milking.

8. *The Milk*.—The first few streams from each teat should be discarded, in order to free the milk ducts from milk that has remained in them for some time, and in which bacteria are sure to have multiplied greatly. If in any milking a part of the milk is bloody or stringy or unnatural in appearance, the whole quantity of milk yielded by that animal must be rejected. If any accident occurs by which the milk in a pail becomes dirty, no attempt must be made to remove the dirt by straining, but all the milk must be rejected and the pail cleansed. The milk-pails used should have an opening not exceeding 8 in. in diameter. The milk of each cow must be removed from the stable to a clean room directly after it is obtained, and strained through a sterilized strainer.

9. *The Dairy*.—The rooms where the bottles, milk pails and other utensils are cleaned and sterilized should be away from the house, or at least have a separate entrance and be used only for dairy purposes. Bottles after filling must be closed with sterilized discs, and capped so as to keep all dirt and dust from the inner surface of the neck and mouth of the bottle.

10. *Examination of the Milk and Dairy Inspection*.—In order that the dealers and the Commission shall be kept informed of the character of the milk, specimens taken at random from the day's supply must be sent weekly to the Research Laboratory of the Health Department, where examinations are made by experts for the Commission; the Health Department having given the use of its laboratories for this purpose. The Commission reserves to itself the right to change its standards in any reasonable manner upon due notice being given to the dealers.

II.—Inspected Milk.

A circular of information concerning the requirements of the Milk Commission of the Medical Society of New York for "inspected" milk, states that those dealers complying with the requirements of the Commission, will be authorized to use caps on their milk bottles stamped "Inspected. Milk Commission Medical Society, County of New York." The requirements are as follows:

1. *The Barnyard*.—(a) It must contain no manure in summer, and none in contact with the stable in winter; (b) it must be well drained, and kept reasonably clean.

2. *The Stables*.—(a) The ventilation and light must be sufficient for the number of cows stabled, so that the barn shall be light and the air never close; (b) the floor shall be of wood or cement; (c) the ceiling shall be tight if a loft above is used; (d) basins, handbrushes, clean water, soap, and clean towels shall be provided in the barn or adjacent dairy room; (e) the stable shall be whitewashed in the fall, and in the spring if necessary; (f) a sufficient number of lanterns shall be provided to allow the milking to be carried on properly; (g) clean the ceiling and sidings once a month; (h) the bedding shall be shavings, sawdust, dried leaves, cut straw, or other material that meets with the approval of the Commission; (i) the

soiled bedding must be removed daily; (k) the application of land-plaster or lime on the floor daily is recommended.

3. *Water Supply.*—Pure water must be used for all purposes. It must be accessible and abundant.

4. *The Cows.*—(a) Discard milk containing mucus or blood, and that from any diseased cow; (b) reject milk from any animal forty-five days before and six days after calving; (c) the cows must be kept from lying down between cleaning and milking. This can be done by means of throat latches.

5. *The Milkers.*—(b) Thoroughly wash the hands with soap, water, and brush before milking; (c) the hands, and also the cow's teats, must be kept dry during milking. If they become moistened with milk they must be wiped dry with a clean towel.

6. *Utensils.*—(b) All airy utensils must be absolutely clean and free from dust.

7. *The Milk.*—(b) Must average 4 per cent. of butter fat; (c) cooling must be done within thirty minutes after milking. Temperature of milk must be reduced to 55° F. within two hours of milking, and to 50° F. within three hours, and kept below that temperature until delivered to the consumer. (d) When delivered to the consumer the milk must not average over 100,000 bacteria per cubic centimetre from May 1st to September 30th, and not over 60,000 bacteria per cubic centimetre from October 1st to April 30th. If the Commission's requirements are fulfilled the bacteria will not be in excess of the number permitted.

8. *Inspection.*—(a) The firms which furnish "inspected" milk must always be open to inspection by the Commission; (b) samples of milk must be submitted for bacteriological examination once a month.

For cooling milk to the best advantage, straining through a cheese cloth or Turkish towel into a can placed in ice water is better than the commercial coolers. All utensils should be simple, with tight seams, and steamed, if possible, before using. Dr. Chapin expresses the opinion that the necessity of rejecting a cow from a herd simply because she reacts to the tuberculin test is open to doubt. A distinction is now being drawn between tuberculin tuberculosis and clinical tuberculosis. If only a small gland is affected, the cow will respond to the tuberculin test; the disease may not spread in the body, and the cow's milk will not contain tubercle bacilli. When clinical symptoms of tuberculosis appear the cow's milk should not be used as food.

Bacterial Standard for Certified Milk.

In Dr. Chapin's opinion, 30,000 bacteria to the cubic centimetre is a small enough number to merit certification of milk. If enough care is taken to keep the number as low as this, most putrefactive bacteria will be kept out. The precautions necessary to keep below this number greatly increase the cost of milk and defeat the object in view—namely, to place within the reach of all wholesome milk at a moderate price; few milkmen can keep up to a higher standard, no matter what price they obtain, and the high price will curtail consumption. The standard therefore required by the Medical Society of the State of New York, before they will certify the milk, is that there shall not be more than 30,000 bacteria per cubic centimetre; that, when it arrives in the nursery for use, the milk shall not contain less than 3.5 per cent. of milk fat, and shall not exceed 0.2 per cent. in acidity.

Pasteurization is considered in this system unnecessary if precautions before and after milking are taken for the absolute cleanliness of the milk; and if, after milking, it is immediately cooled and kept at temperatures below 45° F. If the milk was originally dirty, or contained as much as 2 per cent. acid produced by the growth of bacteria, it will not pasteurize satisfactorily, as many spore-bearing bacteria will be present. The heat destroys the active bacteria, most of which produce souring, but spores are not destroyed. Home pasteurization of milk is of great value, as the milk is usually consumed before the spores have time to germinate and affect the milk.

Filtration and Clarification of Milk.

Some milk dealers endeavour to improve their milk by filtration to remove the dirt. This has little or no effect in reducing the bacterial count, although the appearance of the milk is improved. The process of clearing or clarifying milk by passing it through a separator improves milk in cleanliness, but breaks up the natural emulsion of the fat, interferes with cream rising, and changes the physical character of the milk. Filtered and clarified milk must be kept cool, or it will spoil as well as uncleaned milk.

By free use of ice it is possible to keep clean milk for several weeks in good condition. Without the use of ice even pasteurized milk will soon change. Thus, as far as keeping qualities go, this natural milk is as good as the pasteurized milk, while it is much better, in that no changes have been produced by heating.

Milk containing large numbers of ordinary dairy bacteria will keep better and be better if ice is used than if pasteur-

ized and no ice is used to keep it cool afterwards; but will spoil sooner than pasteurized milk if neither is iced.

For milk to be used in butter making, farmers who possess separators at home may deliver cream to creamery companies, which after being tested is bought just as other raw material is bought by mills. The separated cream is conveyed by rail and wagon to a central factory, where all the butter is made—a single churning place probably for a whole county.

In many places in America the milk trade is regulated and supervised by excellent municipal ordinances, which have done much to prevent adulteration and improve the average quality. But it is certain that much more real good is being done by private enterprise through large milk companies, well organized, who make a speciality of serving milk and cream which reaches a particular standard of purity and good quality. The effort to supply "certified" milk is doing more than all the legal measures. The basis of this system is care, cleanliness, and sanitary conditions.

Power and Duties of Sanitary Authorities.

Any person carrying on the trade of cowkeeper, dairyman, or purveyor of milk must be registered as such, and every local authority must keep a register of persons carrying on such trade. It would appear that the regulation is not held to apply to wholesale dealers in milk who do not retail milk direct to the public.

A great responsibility rests with the country sanitary authorities, for in our opinion until proper management of dairy farms and a high standard of cleanliness are insisted upon, the practical value of precautions taken in large cities will be small. Clean stables, clean healthy animals, clean milkers, and dairy utensils should be insisted upon; the water supply and the drainage should be certified by the medical officer of health, as also the health of all those employed on the farm. If it were realized that from a single cow's hair hundreds of bacteria can be imparted to the milk, and that a gram of fresh cow's manure contains and many as 375,000,000 bacteria, the authorities would insist upon the cows' hind-quarters being clipped, and their udders washed with clean water and dried with a clean towel before the operation of milking commenced. In fact, the Model Regulations for Dairies, Cowsheds, and Milkshops issued by the Local Government Board for England contains the following:—

17. (5) He shall not cause or suffer any cow belonging to him, or under his care or control, to be milked for the purpose of obtaining milk for sale:

(a) Unless at the time of milking the udders and teats of such cow are thoroughly clean; and

(b) Unless the hands of the person milking such cow, also, are thoroughly clean and free from all infection and contamination.

If the farmer knew that should he refuse to take sanitary precautions his milk would not find a market, he would very quickly accustom himself to comply with the rules laid down by the medical officer of health, with the approval of the local sanitary authority.

The sanitary authorities in London and other large towns have power to take samples of milk arriving from the country at the railway termini within their respective districts. Such samples are taken, but under existing conditions they are necessarily few in number. The local sanitary authorities can also, by their inspectors, take samples from the wholesale and retail dealers, and may prosecute them when adulterated milk is discovered. On inquiry we have found that in most districts the medical officer of health is satisfied to prosecute the small retail dealers, on the grounds that they have adulterated milk on their premises, and without sifting the matter, in order to ascertain whether the milk was supplied adulterated by the wholesale dealers or by the farmers. While it is doubtless useful to prosecute small dealers this system does not go to the root of the mischief, and it is even known that in some cases the wholesale dealers pay the fines of those retail sellers who happen to be caught selling milk "faked" by them. The wholesale dealers are the people who should be dealt with if the mischief is to be really remedied instead of ameliorated. They should be prevented from manipulating the milk dishonestly, as by the addition of water, or, as is said to happen when a sudden demand arises for a larger quantity of milk than they can supply, the addition of diluted tinned unsweetened condensed milk, not to speak of foreign milk preserved by a process which consists in the injection of gases. They in their turn should insist upon a good quality of fresh milk being supplied to them by the farmers. One of the large milk factories in London which we

visited appeared to us to have an excellent system. The farmers who supply this factory take a sample from each churn before it leaves the farm. On arrival at the factory two samples are taken out of each churn; one of these is kept by the wholesale dealer, the other is sent back sealed with the empty churns to the farmer, who can thus prove whether the milk has been tampered with after leaving his farm. The samples are put in small tin cans sealed, these being packed in a box made to hold a dozen or two dozen samples, each small can bearing a number corresponding to the churn from which it is taken. This system not only protects the farmer but enables the wholesale dealer to see that his supply of milk is up to the required standard.

The dealers, as a rule, do not take samples at the railway termini on arrival of the milk; they depend upon the sanitary authorities to do so at their request (a) to save expense, (b) so that if a case goes into court representatives of the sanitary authority may be called as witnesses. On the other hand, it is said that some wholesale dealers make a practice of taking samples for the purpose of estimating the amount of butter fat. In this way they are able to keep a check upon the farmers, and to ensure that the contract to supply whole milk is fulfilled. But it is alleged that the taking of samples has another object. Should the wholesale dealer desire to dilute his milk, he would run serious risk of reducing the percentage of butter fat below the official standard of 3 per cent., did he not previously ascertain the percentage in the milk supplied to him by the farmers. If, however, he knows that he is dealing with a milk which contains, say 4 per cent. of butter fat, the calculation of the amount of water or separated milk which may be safely added, without producing a mixture having a proportion of fat below 3 per cent., is a simple matter of rule of three.

The sanitary department of a metropolitan borough can take samples of milk on arrival at a terminus within the borough. If milk arrived at that terminus destined for another borough, the officers of that borough have no power to take a sample at the terminus. The inspector would have to follow the cart until it reached his own borough, and then only could he stop the cart and take a sample. This rule has been established by a recent legal decision. Matters are thus seriously complicated, and the wholesale dealers are helped, while the hands of the sanitary authorities are tied.

To prevent dealers and farmers from manipulating the milk dishonestly and dirtily, it seems to us that for the milk to be up to a certain standard of butter fat is not sufficient. In order to bring pressure upon the farmers to be clean, it would be essential to have a bacterial standard of purity for the milk (to vary, perhaps, according to the season of the year), but which should be insisted upon by the dealers to whom the milk is supplied.

THE EPIDEMIC OF SMALL-POX.

THE small-pox reports to hand this week tend, on the whole, to give a somewhat favourable impression, but one bad feature still remains. This is that outbreaks continue to occur among groups of workmen employed on railways, water and other similar works, and in workhouse receiving-wards and common lodging-houses.

ENGLAND AND WALES.

In Northumberland, there have been some fresh cases at Wallsend and Blyth, but none apparently at Newcastle. At this place the medical officer of health, Dr. Armstrong, has caused to be issued a little tract on the subject of small-pox, its early recognition and efficient treatment, which should prove very useful.

In County Durham there have been some fresh cases in Durham itself, and others at South Shields and Darlington. At the latter place the recrudescence is rather sharp, 5 cases having occurred in one household. At Felling no case has yet occurred. The medical officer, Dr. Peacock, has persuaded the Sanitary Council to make all preparation in advance, and is having a short pamphlet issued of the same character as the one referred to in Newcastle.

In Yorkshire, there have been several fresh cases at Sheffield and 3 at Fir Vale, which appears to be a new focus.

At Leeds it is considered that things are taking a favourable turn, but 51 cases still remain under treatment.

In Lancashire the Liverpool Sanitary Council is also inclined to take a cheerful view of things, since the decline in the number of cases has been fairly constant, though not very marked. At the last meeting it was stated that the number of fresh cases reported was only 62 against 68 at the previous meeting. There still however remain 303 cases under treatment in the various special hospitals.

In Nottingham things are not going very well. There are new foci at Long Eaton and Sutton-in-Ashfield, while at Hucknall Torkard the disease

is as prevalent as before. In Nottingham the Council is complaining of the expense of vaccination, and the Clerk has assured it that the Government also considers the fees paid too high, and intends to reduce them. Does it? Of course, if towns persistently neglect vaccination for years, the amount that has eventually to be paid for it mounts up, but this is the fault of the towns themselves.

In Staffordshire there is little to note. At Burslem things seem to be improved, but the useful measure of making all cases of chicken-pox notifiable for six months has been adopted by way of precaution.

In Leicestershire there are new centres at Syston and Barrow-on-Soar; while in Shropshire Whitchurch is also a new focus.

In Warwickshire there have been one or two more cases at Warwick; while what appear to be new centres have arisen at Longford and Foleshill.

In Lincolnshire Grantham is not yet clear, and a case from it has been imported into Barrowby.

From Derbyshire only one report comes, of another case at Ripley.

In Buckinghamshire fresh centres exist at Haddenham and Slough.

In Surrey, at Croydon no fresh developments are reported, but it is far too early to anticipate what may occur.

In London itself cases have been removed from the boroughs of Southwark, Stepney, Whitechapel, Paddington, and Bermondsey.

In Wales things appear to be quiet; nearly all sanitary councils appear to be alive to the necessity of being prepared, and the only fresh places where cases have occurred appear to be Cricklewell and Mold.

SCOTLAND.

In Scotland active prophylactic measures are being generally adopted, and, except one case at Brechin, no further developments are reported.

IRELAND.

Nearly 80 cases of small-pox have occurred in Dublin, but there is no general spread of the disease, and most of the patients are now convalescent, while many have been discharged. At the South Dublin Union the other day Dr. Dunne reported that one of the men working at the new isolation hospital had been admitted suffering from scabies. The man had not been vaccinated, although working for the Corporation in close proximity to cases of virulent infectious disease, and he, in common with twenty-two other workmen, were permitted to go backward and forward to their houses in the city. Now the man was allowed to present himself at the workhouse, and perchance bring small-pox to the 4,000 inmates. Sir Charles Cameron, in reply, states that the contractor was told to have his men vaccinated, but he did not know whether any one inspected them to see whether the instructions had been complied with. We think that in such a case the inspection ought to have been carried out by a properly qualified person.

LITERARY NOTES.

MESSRS. BLACKIE AND SON, LIMITED, will shortly issue *Elementary Ophthalmic Optics*, by Dr. Freeland Fergus, Surgeon to the Glasgow Eye Infirmary, and Examiner in Physics to the Faculty of Physicians and Surgeons of Glasgow. The book deals mathematically with the fundamental principles of elementary physical and geometrical optics.

Messrs. Thacker, Spink and Co. have recently published a book on *Indian Anopheles*, by Captain S. P. James and Captain W. G. Liston, and one on *Infants and their Ailments*, by Major D. Simpson. All three officers belong to the Indian Medical Service.

The *Health Resort and Journal of Spas and Sanatoria* is the title of a new monthly periodical, the character and scope of which are indicated by its title. In the editorial remarks with which it is introduced it is stated that "its appeal is to the large and ever-growing public" which is in want of information about health resorts. This want is to be supplied by means of special articles from the pens of leading writers on climatology, aërotherapy, balneology, and all subjects connected with hygiene, and by regular monthly letters from specially-appointed correspondents. As far as can be judged from the first number, the *Health Resort* is likely to fulfil the object of its creation.

In a sermon on "Sin," the Rev. Dr. Parkhurst is quoted by *American Medicine* as having used the following language with reference to devotees of Mrs. Eddy:

I should not want to stand sponsor for all the methods and teachings of Jonathan Edwards, but if there could sweep over this city that same tidal wave of heart searching and intense moral self-conviction such as was started by his handling of the Bible and his address to the conscience, there would not be left a Christian Science edifice in the city. They would all be built over into apartment houses, or more likely into Christian churches, for the promulgation of God's truth, and the priest and priestesses of this unctuous fantasy would fall upon their knees alongside of the poor publican, and cry, "God be merciful to me, a sinner."

We are glad to note increasing evidence that the clergy are becoming awakened to the fact that it is not only the doctors who are attacked by Mrs. Eddy. They have grasped the significance of the statement that *proximus ardet Ucalegon*,