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METROPOLITAN BOROUGH OF FINSBURY.

A

SPECIAL REPORT

ON AN

INFANTS' MILK DEPOT.

Established under the auspices of the Finsbury Social Workers' Association.

BY

GEORGE NEWMAN, M.D., D.P.H., F.R.S.E.

Medical Officer of Health of the Metropolitan Borough of Finsbury.



LONDON :

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1905.

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METROPOLITAN BOROUGH OF HINSDALE

SPECIAL REPORT

INFANTS' MILK DEPOT



METROPOLITAN BOROUGH OF FINSBURY.

*To the Public Health Committee of the
Metropolitan Borough of Finsbury.*

GENTLEMEN,—

I beg to submit herewith, in accordance with your instructions, a special report on the Finsbury Infants' Milk Depot, which was established a year ago (November, 1904) under the auspices of the Social Workers' Association. The Chairman of the Council of that Association is Euos Howes, Esq., J.P., the first Mayor of Finsbury, and the Hon. Secretaries are the Lady Mary Forbes-Trefusis and the Hon. Violet Douglas-Pennant. The work of the Association is concerned with the co-ordination of various social agencies in the Borough, and with the teaching of thrift and hygiene. For the purposes of the last-named, a Health Committee was appointed, which resolved to establish an Infants' Milk Depot, for reasons stated in the Report.

The actual management of the Depot was placed in the hands of the following Committee of medical men connected with the Borough, and those marked with an asterisk have acted throughout the year as an honorary medical staff of the Depot: *Evan Jones, M.R.C.S., D.P.H. (Chairman), E. N. Féré, M.D., *Lewis A. Hawkes, M.D., W. F. Roe, L.R.C.S.I., *J. E. Sandilands, M.D., *F. Wallace Wilson, M.R.C.S., and *George Newman, M.D. (Hon. Sec.). The Committee have had the hearty co-operation of Mr. Carson, of Theydon Bois, without whose good offices indeed it would have been impossible to do the work on the lines which have been adopted. Much of the thought and labour necessary for the daily working of the Depot has fallen upon him, upon the lady visitors, upon the Hon. Secretary of the Committee, and upon Chief Inspector Green.

I desire to express my obligations to Mr. Carson for the excellent plates illustrating this Report, and to Miss Frith for much assistance and information.

I am, Gentlemen,

Your obedient servant,

GEORGE NEWMAN,

PUBLIC HEALTH DEPARTMENT,

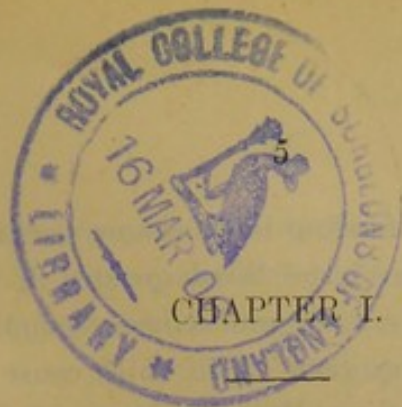
Medical Officer of Health.

TOWN HALL, ROSEBURY AVENUE, E.C.

December, 1905.

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GENERAL PRINCIPLES.

The primary fact which has led to the establishment of milk depots for the supply of milk suitable for infants has been a high infant mortality. Broadly, it may be said that in civilized States the general death rates show a marked and steady reduction during the last half century. The infant mortality rates * on the other hand show no marked reduction. Advancement of preventive medicine and improved sanitation and social environment have effected the reduction in the total death rate, but have not lowered the infant death rate at all in the same degree. A continued high death rate among infants still remains.

When this fact is carefully examined it will be found that (a) the infant death rate whilst much the same in total has in recent years undergone a change in age incidence of death, and (b) that the causes of fatality are mainly two, *prematurity* and similar conditions and *epidemic diarrhæa*. The change in age incidence of death is that infants die younger than formerly, the highest fatality being within the first few weeks of life. Neither this matter nor the cause of death can be discussed in detail here, but it may be remarked that these two facts guide us in some measure as to preventive methods. It is no doubt the case that infant mortality is due to many different causes, but there is now substantial evidence to show that ante-natal conditions and lack of maternal care, combined with bad artificial feeding, are among the chief. The evidence as to the former is of a general character and is of common knowledge. Badly reared or neglected infants have a tendency to die, and it cannot be doubted that a considerable number of deaths of infants, especially those due to prematurity and debility, are brought about by such factors. The evidence

* The infant mortality rate is the number of deaths of children under one year of age to every 1,000 births.

in regard to bad artificial feeding is of a more particular character. The infant mortality rate of the third quarter of the year (July, August and September) is, it is well known, usually higher than at any other time in the year. The chief cause is the disease known as *epidemic diarrhœa*, the occurrence of which depends, wholly or partly, upon a high surrounding temperature and a deficiency of rainfall. When these conditions prevail, as in hot, dry summers, food—especially milk—becomes polluted with dust, and possibly with some infective germ, that appears to set up the disease.* During the last five years the following numbers of infants have died in Finsbury from this disease in the third quarter only :—

| Months. | 0- | 1- | 2- | 3- | 4- | 5- | 6- | 7- | 8- | 9- | 10- | 11- | 12- | Total. |
|---------|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|--------|
| 1901 | 4 | 4 | 7 | 10 | 9 | 13 | 10 | 7 | 4 | 11 | 9 | 0 | 5 | 93 |
| 1902 | 5 | 2 | 4 | 11 | 4 | 3 | 10 | 3 | 2 | 3 | 3 | 6 | 5 | 61 |
| 1903 | 2 | 4 | 4 | 1 | 6 | 4 | 5 | 8 | 1 | 3 | 1 | 5 | 3 | 47 |
| 1904 | 2 | 9 | 11 | 16 | 9 | 12 | 6 | 12 | 4 | 3 | 3 | 5 | 3 | 95 |
| 1905 | 4 | 3 | 8 | 5 | 10 | 4 | 6 | 8 | 4 | 6 | 4 | 1 | 8 | 71 |
| Totals | 17 | 22 | 34 | 43 | 38 | 36 | 37 | 38 | 15 | 26 | 20 | 17 | 24 | 367 |

Enquiries have been instituted during the last two years into the methods of feeding of these children who died, and all other children dying under the age of twelve months, and it has been proved that the deaths amongst the artificially fed are nearly four times more numerous than among the breast-fed. Further, in Finsbury, the mortality from epidemic diarrhœa amongst infants fed on condensed milk is nearly three times the average mortality in the first six months of life, whilst the mortality amongst those fed on cow's milk is nearly twice the average (Sandilands). From these facts

* This subject is discussed, as regards Finsbury, in my Annual Report for 1904, pp. 55-63 and 82-86.

it is clear that condensed milk becomes (through contamination, &c.), on the whole, the worst form of food for infants, that unclean cow's milk, though possibly a stage better, greatly increases liability to death, and that all artificial feeding as practised in tenement homes is attended by a high mortality.

The great requirement then is *the breast-feeding of infants*. But this unfortunately is not always possible. A mother may be unable from one cause or another to furnish a natural supply of milk for her child. Some mothers may be unwilling to nurse their children, and others, though desiring to do so, may find it impracticable, owing to the fact that they may have to act as the bread winner of a family and go out to work. But if all these cases be deducted from the total there yet remains in large communities a considerable number of mothers incapable of nursing their children. It is for such cases that Infants' Milk Depots have been established, to supply a *pure* milk, suitably modified to make it as much like human milk as possible. It is clear that such a specialised milk supply does not meet the whole problem of infant mortality, the solution of which depends, on the whole, ultimately, not upon the State, nor yet upon this or that system of milk feeding, but upon the intelligence, the devotion, and the maternal instinct of the mother. Nevertheless it is true that a *properly equipped and controlled* Infants' Milk Depot is part of the solution at the present time and under present conditions, and is a practical step in the right direction.

Infants' Milk Depots are of French origin, and are generally speaking of two kinds—namely, the “*consultation de nourrissons*” and the “*goutte de lait*.”*

In 1892 Budin founded one of the former at the Charité Hospital in Paris, and in the same year Variot established another one in connection with the Belleville Dispensary. There are two

* For particulars as to the history and equipment of Infants' Milk Depots see *Infantile Mortality and Infants' Milk Depôts*, by G. F. McCleary, M.D., 1905; also *Journ. of Hygiene*, vol. iv., 1904, pp. 329-368; and *Practitioner*, 1905 (October).

types of "consultations de nourrissons"—the one is a kind of lying-in institution in which women are admitted for confinement free of charge, and the children born in the hospital are kept as out-patients under regular medical supervision for the first two years. Breast feeding is encouraged, but where impracticable sterilized milk is supplied in bottles containing sufficient for one meal only. The child is weighed and examined periodically. In the second type the "consultation" is not attached to a hospital, but is otherwise similar. The "goutte de lait" (or drop of milk) is a sort of milk dispensary from which infants are fed, under medical supervision, upon sterilised milk, with or without modification. The first institution of this kind to exist separately was established at Fécamp in 1894 by Dr. Leon Dufoar. Most of these Infants' Milk Depots in France are conducted on a philanthropic basis, and are financed by voluntary subscriptions. There are now upwards of 90 "gouttes de lait" in France, and in other countries they are also being established. A somewhat similar movement was started in New York by Strauss in 1893. The first Infants' Milk Depot in England was opened in 1899 at St. Helens, in Lancashire, and since that date Depots have been established at Liverpool, 1901 (the largest in this country),* Battersea, 1902, and in half-a-dozen other places. They have not all followed the French type, particularly in respect of the medical supervision of the children, and the discriminating distribution of the milk. Indeed, there is a somewhat unsatisfactory variety of method and purpose adopted, which has no doubt somewhat hindered a steady advance such as has occurred in France. Further, in this country the chief Depots are carried on by the municipalities, and are larger and therefore more expensive as to plant than the ordinary French model. On the whole, however, satisfaction is generally expressed with the results up to the present.†

* Since its establishment early in 1901 to end of 1904, 8,481 infants had been fed through the Liverpool Depots.

† See Special Report on "Infantile Milk Depots," 1905 (Nov.), by Dr. Sidney Davies, of Woolwich.

The commencement of the Social Workers' Association furnished the occasion for the establishment of the Finsbury Depot, and the pages which follow record the main facts respecting the practical working of it. Here it is only necessary to say that the work entailed was undertaken by a voluntary Committee of medical men, assisted by some lady visitors, and that the object was to establish a Depot on a small scale, under proper control and on satisfactory lines, for a few children, rather than to work a larger institution for a considerable number. The whole of the necessary funds were subscribed by a few friends of the enterprise. The principles by which the Medical Committee wished to be guided were—(a) absolute control of the milk, and the avoidance of the serious fallacy of sterilising unclean milk; (b) medical supervision of the entire management of the Depot, and of the infants using the milk; (c) a discriminating and careful distribution of the milk only to infants who could not be breast-fed; and (d) the systematic study of the effect of the milk on the children.* The Committee desired to make the method as *individual* as possible, and in no way to lessen the responsibility of the mother. It is evident that these are not easy principles to carry out, and many difficulties have been encountered.

On the whole, however, the results of the year's working have been satisfactory. In concluding this Introductory Note, it may be said that the Finsbury Depot follows more closely the French model than any English Depot at present established in that there is medical supervision, and the Depot has been carried on as a voluntary Society. Further, the milk is prepared, and, if necessary sterilised *on the farm*. This latter point and medical supervision seem to be of essential importance.

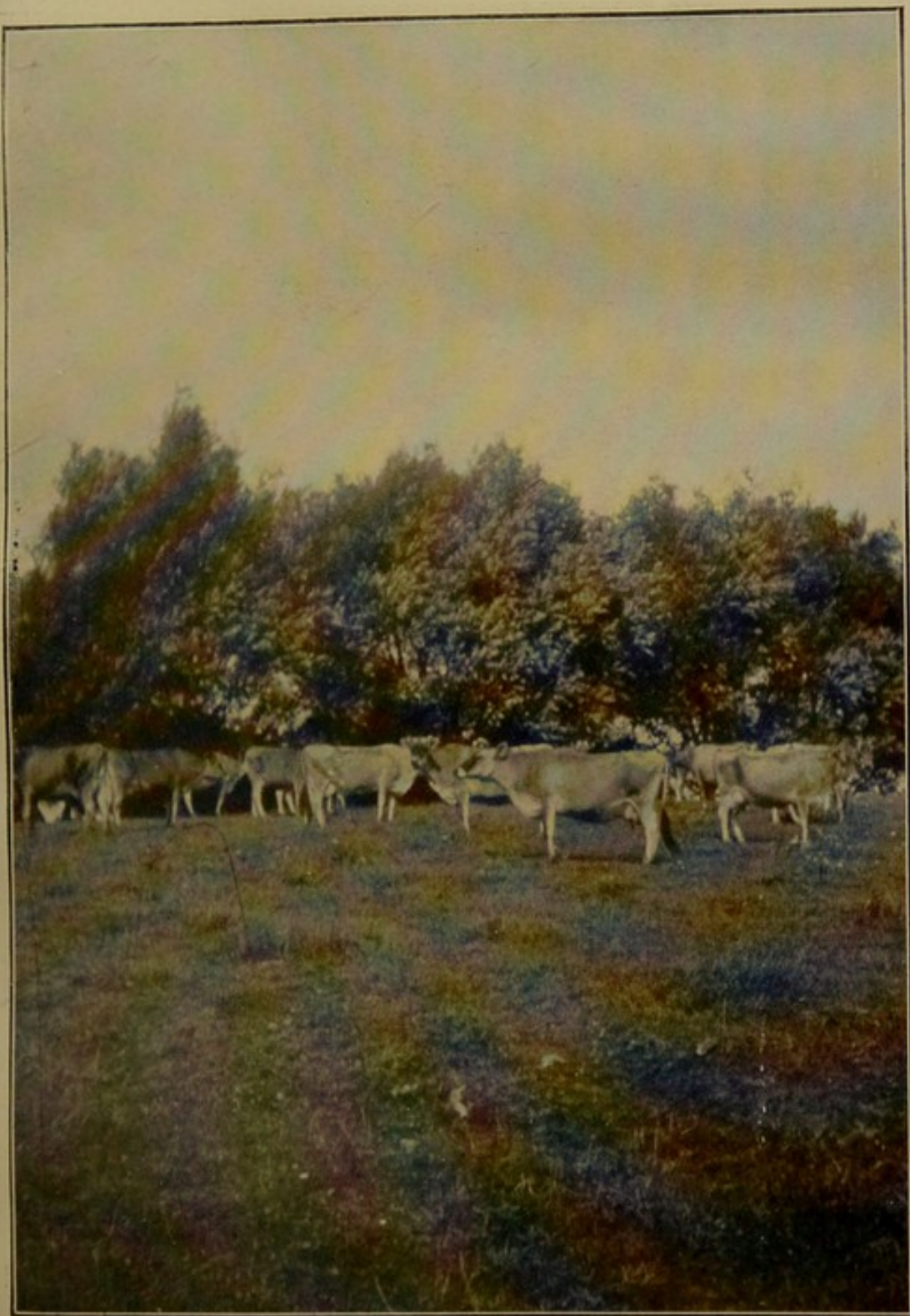
* The writer may perhaps be allowed to admit that his early belief in the efficacy of Infants' Milk Depots did not receive much encouragement from the simple fact that these four principles, among others, did not appear to be practised in the Depots of which he had knowledge.

CHAPTER II.

PREPARATION OF THE MILK.

The first essential in the establishment of an Infants' Milk Depot is *a pure milk*. It is idle to attempt to work on the basis of obtaining ordinary unclean milk and trusting to sterilisation for the removal of any unsatisfactory characters. It cannot be too clearly understood that sterilisation does not make bad milk good, or dirty milk clean. Nor is it sufficient merely to contract for a supply to the Depot from some dairyman of good standing. As far as possible, complete control from the very beginning is necessary to ensure purity. The Depot and the milk farm must in some way be directly connected with and under the control of those responsible for the working of the Depot. Great harm has been done to the whole cause of milk reform by duality of responsibility and by attempting to meet all difficulties by sterilisation. Milk is a favourable nidus for microbes. A pint of apparently good milk may contain millions. Most of them are fortunately harmless; but some are not, and all of them begin to produce in an hour or two toxicity or staleness in the milk. Sterilised milk may be free from living germs, but it is not on that account free from the toxicity produced in it before the organisms were killed by heat. If it was, in short, a dirty milk before sterilisation, it is also a dirty milk afterwards, although the actual microbes may have been killed. It is, then, necessary that milk should be absolutely pure before any modification is undertaken.

A second requirement is that any treatment of the milk—refrigeration, sterilisation, or modification—should be carried out *immediately after milking and at the farm*. The treatment of a stale milk or of a milk which has spent many hours on the railway is not at all the same thing as its treatment when fresh and just drawn from the udder.



SOME OF THE JERSEY HERD AT THE FARM.



"BLUE-VIOLET" COMPLETES IN BACKGROUND

By the kind offices and co-operation of J. Carson, Esq., of Theydon Bois, the milk used at the Finsbury Depot is obtained from his farm in Essex, and is modified according to the Committee's prescription at the farm immediately after milking. Mr. Carson's farm consists of 82 acres near Epping, and it is managed on scientific and business principles. The dairy herd consists of about 70 thoroughbred Jersey cows and is specially selected for milking purposes. As is well known this breed of dairy cow yields a high quality milk, richer in cream than the milk of the ordinary short-horn or their cross. It is also rich in colour, and liberal in quantity. The average yield per cow at Crystalbrook Farm is about 600-700 gallons per annum, as compared with a general average of about 420 gallons per annum.* Each cow in the herd is tested once a year with the tuberculin test, and any cow reacting to the test is at once eliminated from the herd. During the last six years, of all the milch cows tested at this farm only 4 have reacted, which gives a percentage of 0.6.† A number of animals leave, and others join, the herd every year, which is thus continually reinforced and refreshed. The quality and quantity of each cow's milk is tested monthly and recorded. The feeding of the cows is kept under strict control. No brewers' grains are used. In summer the cows feed on fresh grass, the grazing land being limed every other year; they also have linseed oil cake, and a small quantity of cotton seed cake and bran. In winter they have hay, mangolds, crushed oats, maize, germ meal, and linseed and cotton seed cake. The cows are groomed daily. In the summer they are out day and night and even in winter spend the day in the open air. They are milked twice daily (6 a.m. and 5 p.m.) in the byre adjoining the milk laboratory. No cow is milked for the Depot within a week of calving. The udders of the cows are cleaned before milking, and the milkers themselves are required to be clean in person and milking. Clean white overalls are used, and all utensils, cans and churns are kept scrupulously clean and regularly sterilised by steam.

* "Blue Violet" one of the Crystalbrook herd yielded last year 1,100 gallons of milk.

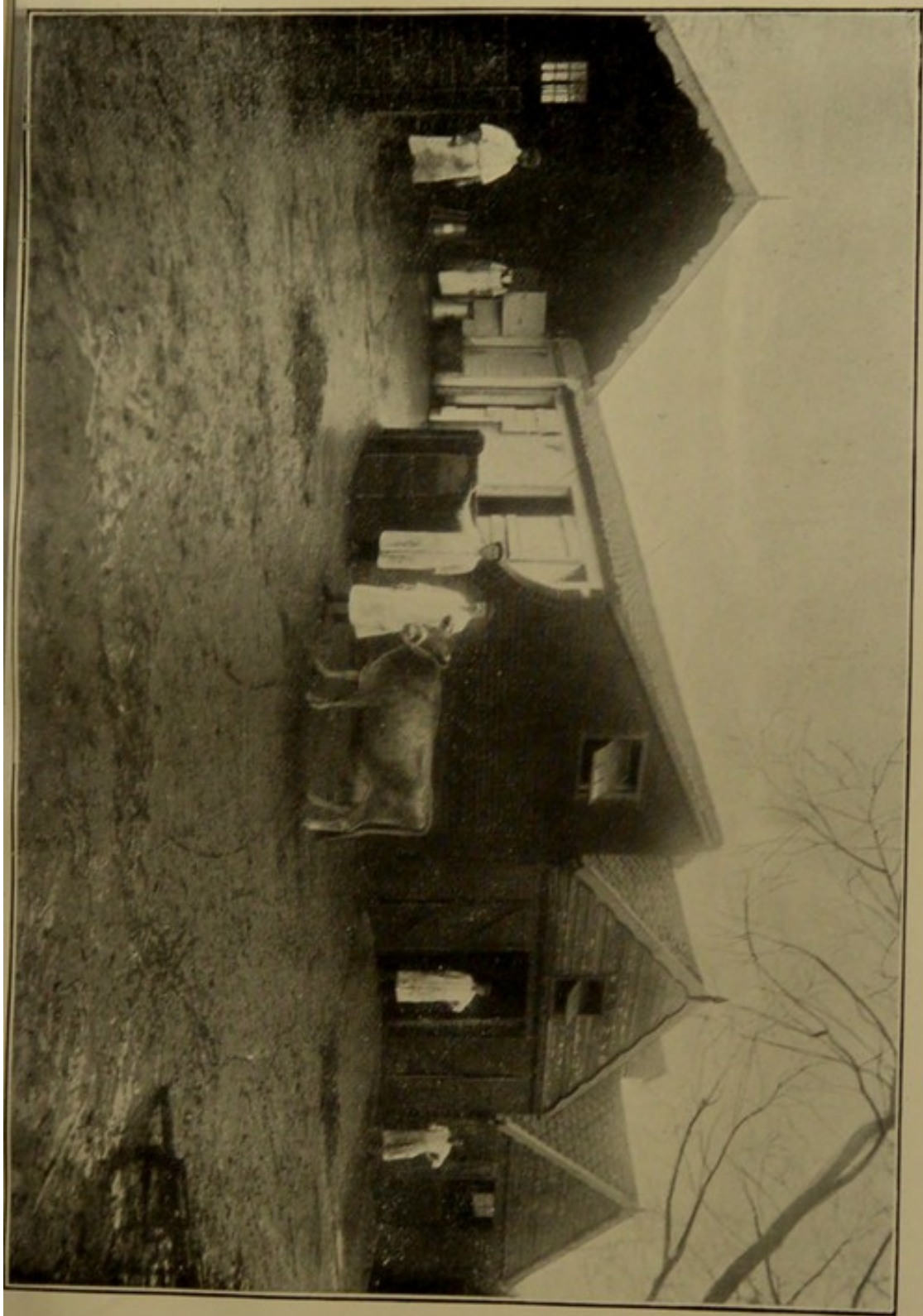
† In 1902, Geddes showed that Jersey cattle on the Island of Jersey gave a percentage of 0.31, whereas those tested on the mainland gave a much higher percentage of reaction.

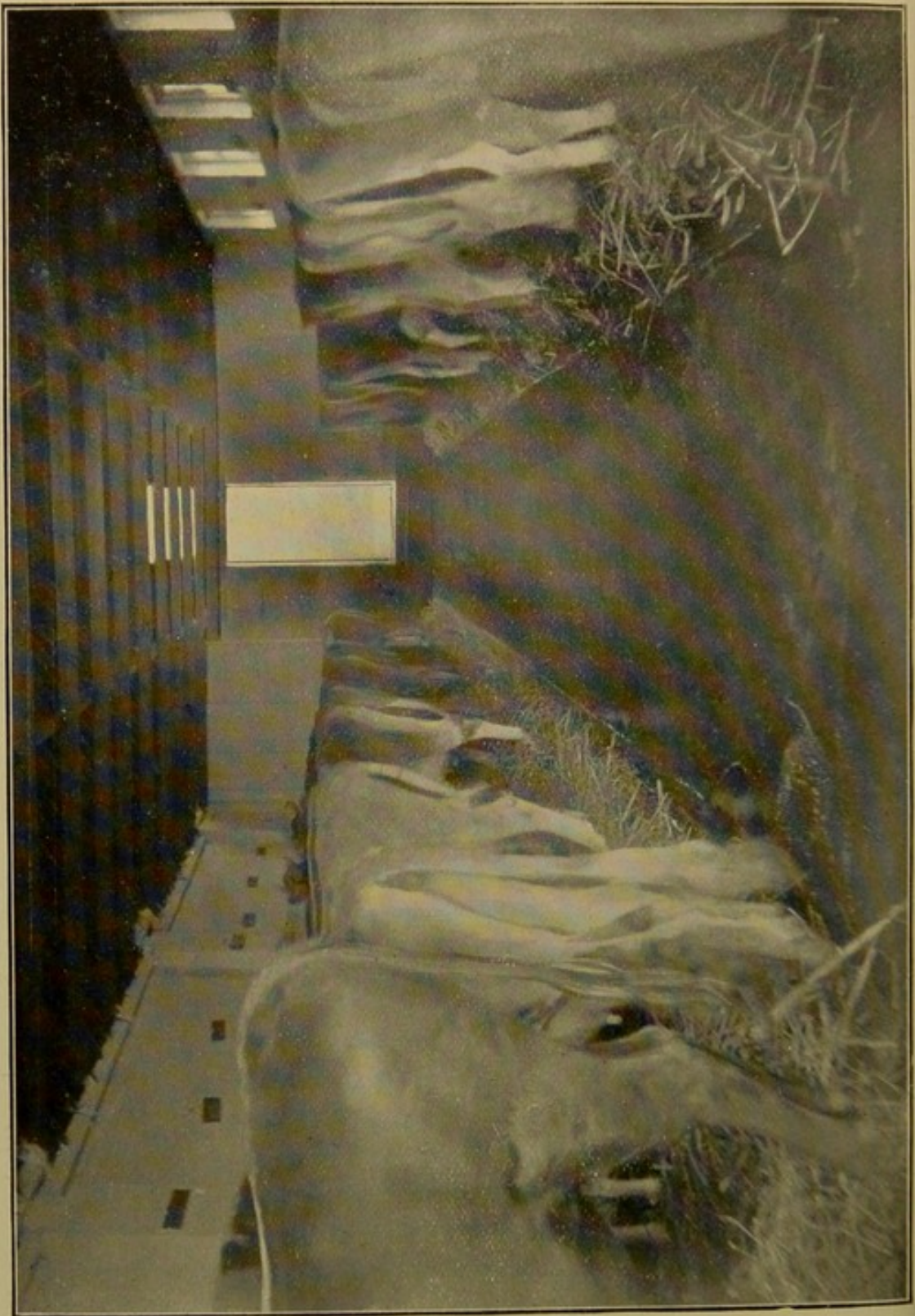
The farm itself is well kept, and has an abundant water supply from the Herts and Essex Water Works Co., Ltd.* There are 4 cowsheds (for 28, 24, 12 and 4 cows respectively), built of brick and having tiled roofs. There is abundant window space and means of ventilation. The floors are concreted and channelled. The manure is removed from the sheds at once, stacked 200 yards away and placed on the fields. The liquid refuse runs into a cemented tank and from this is forced by windmill pump on to the arable land. The buildings and arrangements are very simple, but the conditions obtaining reach a very high standard of excellence.

These details have been mentioned as they have everything to do with the efficiency of the whole dairy farm. Poor cows giving a small yield of milk and kept amidst much insanitation and filth—and these are conditions prevailing all over England—not only result in poor, unclean milk, but are a poor investment. A large and rich yield of milk per cow is necessary in order to make a dairy farm pay. And the other matters named are each and all important in their way as leading to efficiency and a pure supply of milk. Generally speaking, however, Mr. Carson does nothing on his farm that could not be done on almost every dairy farm in the kingdom with care, attention to detail, and the training of the staff. His cowsheds are of the simplest construction, and there is no elaboration or unnecessary expense. *Economy with cleanliness and efficiency* might well be his guiding principle.

Immediately after milking the milk is removed and strained through a metal screen. It is then cooled over a Lawrence refrigerator in the open air under cover, and at once taken into the adjoining laboratory and separated in an ordinary Laval Separator, which acts, of course, in part as a method of purifying the milk. The separated milk is then modified as described below and poured by means of a mechanical automatic bottle-filler into bottles which have been previously sterilised at 212° F. for 60 minutes. In winter the bottled milk is then pasteurised at 140° or 150° F. for

* The Medical Committee had a bacteriological examination made of the water as supplied at the farm and found it of an exceptionally high standard of purity.





20 minutes, and in summer it is sterilised at 212° F. for 20 minutes. In mid-winter for a period of some weeks no pasteurisation or heating of any kind was done. After pasteurisation the milk is cooled to 53° F. by admitting cold water into the steriliser, and kept at that temperature until the time has arrived for transmission by rail in cases (holding 100 bottles each) to the Distributing Depot at 264, Goswell Road, Finsbury. The milk for the Infants' Depot is milked in the evening, modified and bottled within a few minutes of leaving the udder, kept on ice or in cold water, and delivered in Finsbury the next day, where in the summer it is kept on ice till distribution.

Modification of the Milk.—The Medical Committee, with the assistance of Mr. J. Kear Colwell, F.I.C., Public Analyst, carefully considered the subject of standards of modification, and finally decided to commence with the three following degrees:—

A.—One part separated milk, two parts water + 8 ozs. cream + 7 ozs. milk sugar to the gallon.

B.—One part separated milk, one part water + 11 ozs. cream + 5 ozs. milk sugar to the gallon.

C.—Two parts separated milk, one part water + 12 ozs. cream + 5 ozs. milk sugar to the gallon.

Various degrees of modification were made with the average milk supplied by Mr. Carson's herd, and the above were found on analysis to yield desirable milks, and approximately comparable to human milk:—

| | | | Human Milk. | Modification A. | Modification B. | Modification C. |
|--------------|-----|-----|-------------|-----------------|-----------------|-----------------|
| Total Solids | ... | ... | 12.50 | 9.53 | 11.05 | 12.49 |
| Fat | ... | ... | 3.70 | 2.51 | 3.28 | 3.86 |
| Proteids | ... | ... | 2.30 | 1.24 | 1.91 | 2.48 |
| Lactose | ... | ... | 6.20 | 5.49 | 5.45 | 5.56 |
| Ash | ... | ... | 0.30 | 0.29 | 0.41 | 0.59 |

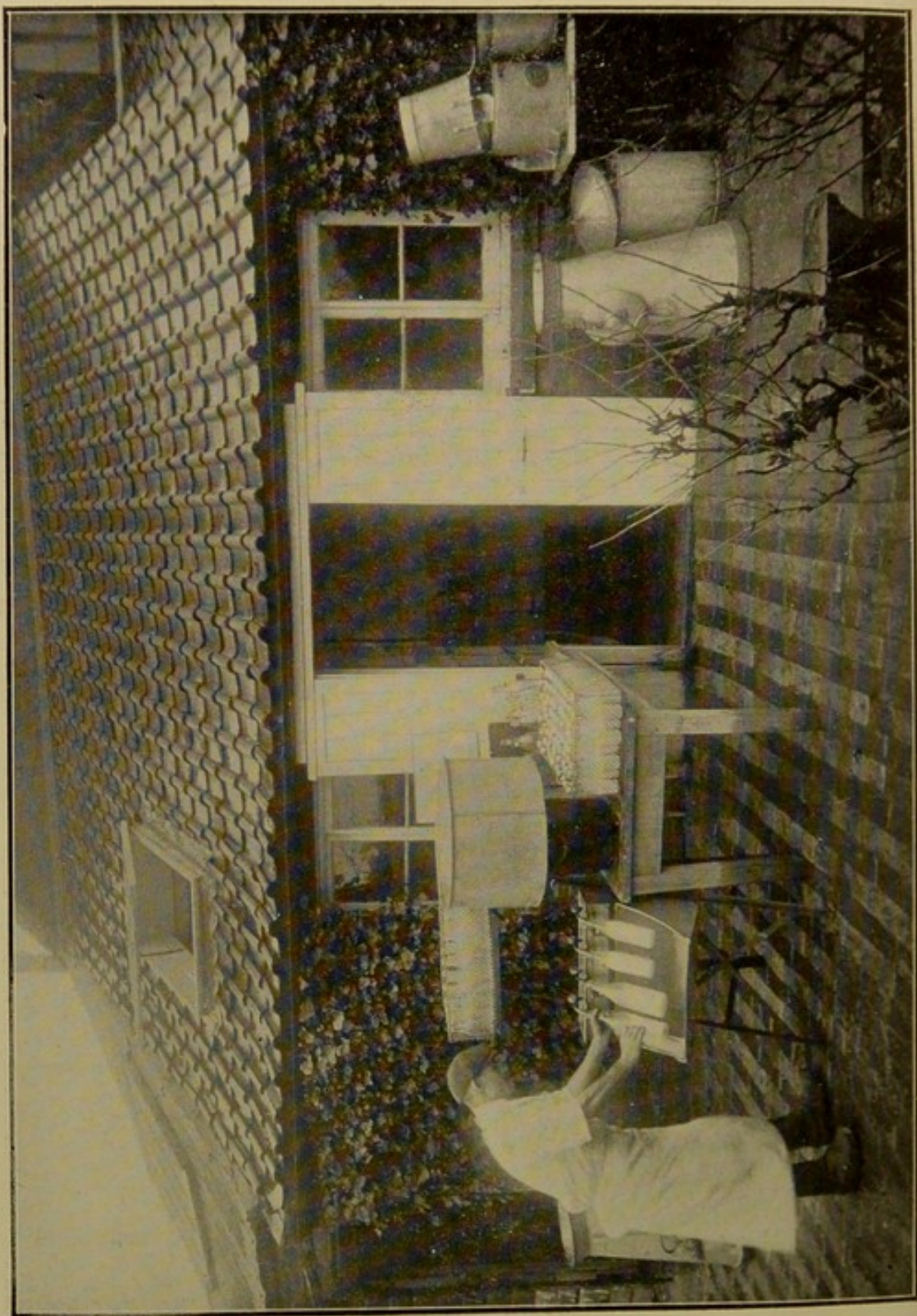
These three modifications are used as follows :—

| Standard of Modification. | Age of Infant. | No. of Bottles. per day. | Amount per bottle in ounces. | Amount per day in ounces. |
|---------------------------|-------------------|--------------------------|------------------------------|---------------------------|
| A | Under 1 month old | 9 | 2 | 18 |
| | 1—2 months o'd | 9 | 3 | 27 |
| | 2—3 months old | 8 | 4 | 32 |
| B | 3—6 months old | 7 | 5 | 35 |
| C | 6—9 months old | 6 | 6 | 36 |
| | 9—12 months old | 6 | 7 | 42 |

Variations in quantity are made from time to time, and the modification is not applied in any hard and fast manner. The particular milk for each child, whatever its age, is carefully considered after the first medical examination. Generally, however, it may be said that children receiving A modification consume from 6–10 ozs. of pure milk daily, those receiving B between 15 and 20 ozs., and those receiving C from 20–30 ozs. of pure milk daily.

Chemical and bacteriological examinations of the milk have been made at intervals in order to check the process. The examinations made in London without any notice to the farm workers have shown a steady quality of milk approximating as nearly to the standard set out above as the natural variations in cows' milk will permit. From a bacteriological point of view, the milk has been found to be sterile, or, when pasteurised only, containing a few lactic acid organisms per cubic centimetre.





CHAPTER III.

THE METHOD OF WORKING THE DEPOT.

It has been intended that the Depot should be both a remedy and a school—a remedy by supplying suitable nourishment to infants debarred from natural mother's milk, and where necessary a school of infant management. It is not a milk shop where any person can obtain milk, and care has been taken in no way to injure the ordinary milk trade carried on in the borough. It is a specialized milk supply for special circumstances which cannot be met by the trade.

The daily stock of milk is sent up by rail every night in sealed bottles packed in specially prepared cases. On arrival at the distributing centre, 264, Goswell Road, it is placed in a cool room, and in summer in a refrigerator. The Depot, or distributing centre, consists of two rooms on the first floor of a large tenement house. They form part of the offices of the Social Workers' Association. One room is a waiting and dressing room, the other is the weighing room. In the latter room there is a refrigerator and shelves and cupboards for storing milk if necessary. There is also the weighing balance (a Walker-Gordon cradle balance), and record and register books. The rooms are heated by gas stoves. All unnecessary expense has been avoided. It is not so much upon apparatus as upon methods that a distributing centre depends for success.

Infants requiring the milk are introduced to the Depot by medical practitioners, hospitals, nurses, sanitary inspectors, birth registrars, and others. The parents or guardians must pay the necessary price of the milk in advance, and must be residents of Finsbury. The price charged is the ordinary market price of milk in the district—namely, 4d. per quart. On the Wednesday following the date of application the infant is brought to the Depot, medically examined by a member of the Medical Committee, and weighed. Particulars respecting the child are entered in the Record Book (*see next page*), and a second page is devoted to fortnightly entries as

FINSBURY MILK DEPÔT.

NAME.

DATE OF BIRTH.

Whether illegitimate

Date of Admission

Whether insured or in benefit

Name of parents

Occupation

Address

General Surroundings—

Number of rooms occupied

Rent

Sanitary condition of house (light, ventilation,
cleanliness of house, bedding, etc., drainage,
yard, dust bins, sanitary accommodation)

Overcrowding

Wages of parents

No. of brothers and sisters living
or deceased, and their ages

Causes of deaths in family

Condition of Child—

General Health

Reported weight at birth

Measurements—Height, etc.

Weight at first attendance

Weight at subsequent attendances

(entered with clinical notes on opposite page of Record Book)

Health of Mother (Especially during and since pregnancy)—**Feeding of Infant—**

Breast alone

Breast and artificial

Artificial alone

Reasons for artificial feeding

Age at weaning

to progress, increase or otherwise of weight, and general physical condition. It is obligatory that the child shall be brought once a fortnight to be weighed, and, if necessary, examined. The milk is only supplied on this condition. No medicine is given, and if medical advice is required the mother is instructed to consult a medical man or go to hospital. The Depot is not a "consultation de nourrissons" but a "goutte de lait." After medical examination the suitable degree of modification is ordered from the farm, and the mother sends for the milk daily.

Measured bottles of varying size are used with a patent removable stopper, which comes clear away from the bottle. When required for use the bottle is placed in a jug of hot water to bring the temperature of the milk up to blood heat. The stopper is then removed and a clean teat placed *on the bottle*—from which the child can then be fed. Each day a thoroughly clean and sterile teat is issued in place of the teat provided the day before, which is returned to the Depot, washed in warm boracic lotion, soaked all night in boracic lotion, and in the morning washed under the tap.

The bottles are carried in wire baskets, and at the time of each day's delivery the empty bottles and unclean india-rubber teats are returned. Full instructions are given to the mother as follows:—

Social Workers' Association for the Borough of Finsbury.

INFANTS' MILK DEPÔT.

DEPOT - - - 264, GOSWELL ROAD, E.C.

1. All charges for a supply of Modified Milk are payable in advance:—

| | | Per day. | | Per week. |
|----------------------------|-----|----------|-----|--------------------|
| For infants under 6 months | ... | 3d. | ... | 1/6 |
| " " from 6 to 9 months | | 3½d. | ... | 1/9 6 oz. bottles. |
| " " over 9 months | ... | 4d. | ... | 2/- 7 oz. bottles. |

The Depot is opened from 12 to 1 p.m. on weekdays, and from 12:30 to 1:30 p.m. on Sundays in the summer.

2. The milk will be supplied in bottles in a basket. Each bottle contains sufficient milk for one meal, the amount varying with the age of the child. Infants under two months receive nine bottles per day; older children receive fewer bottles, as they should be fed less frequently.

3. If children are sent for the milk, they must be warned not to tamper with the stoppers of the bottles. On no account must a bottle be opened until the infant is ready to be fed.

4. Teats can be bought for 2d. each. The teats must be kept **scrupulously clean**; after use, they should be thoroughly washed in soda and hot water, then rinsed in cold water, and afterwards placed in a jar of clean cold water, where they should be kept until required for the next feed. The teat must be returned each day with the empty bottles.

5. Just before use each bottle should be placed **unopened** in a basin or jug of hot water for about five minutes, and warmed. The bottle should then be opened and the teat put on. The child must be fed at regular intervals, and fed from these bottles only. On no account should any other feeding bottle be used.

6. When all the milk in one bottle is not used, the remainder must not be warmed up again, but a fresh bottle opened for the next meal.

7. On no account should bread or other food be given with the milk. The milk will be found to be quite sufficient if given regularly.

8. Immediately after use, the bottle should be well rinsed in cold water.

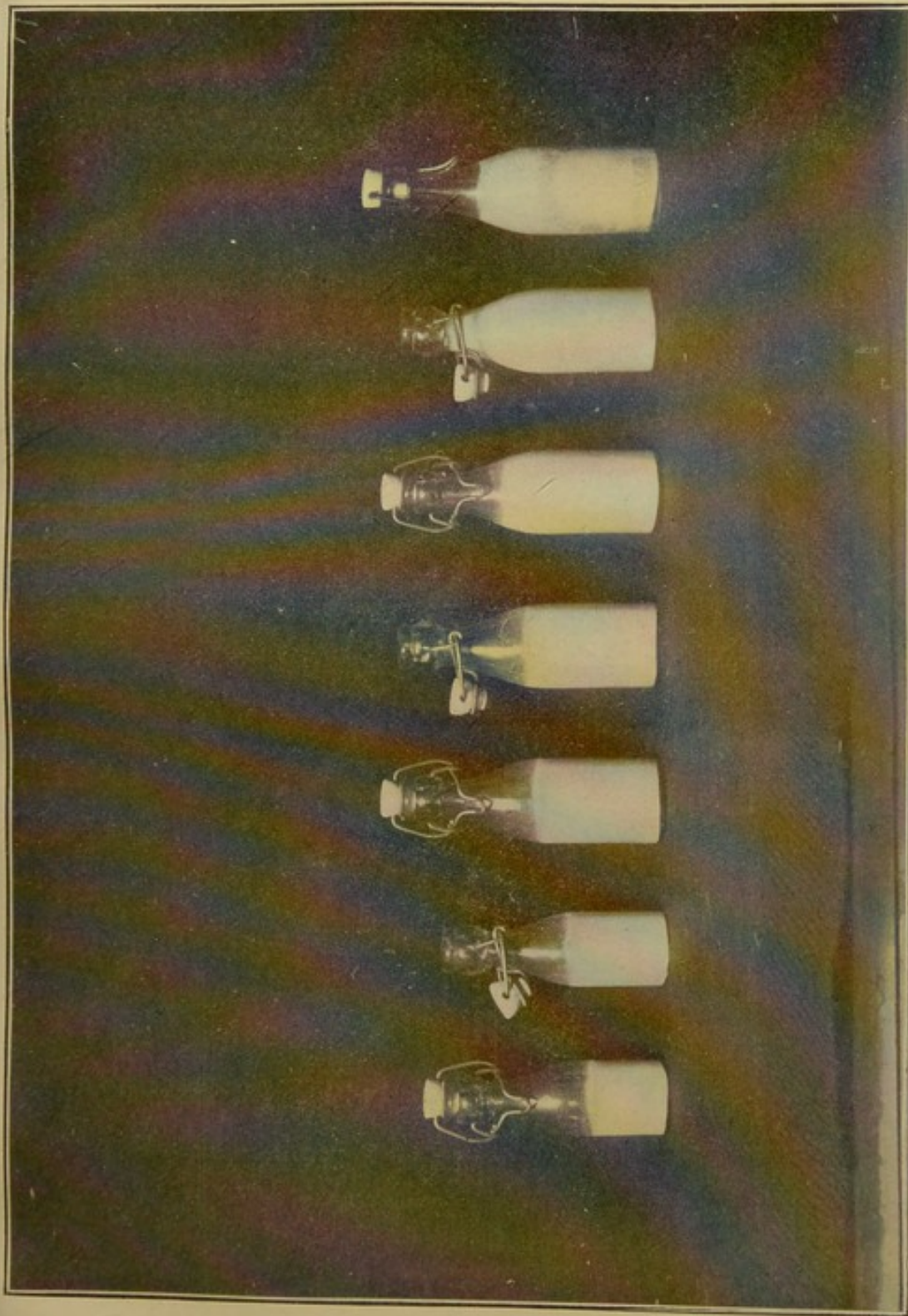
9. Full value will be charged for all bottles, baskets, stoppers, &c., not returned to the Depot.

10. The child must be brought once a fortnight to be weighed, on Wednesdays at 2.30 p.m.

11. The presence of infectious disease (including whooping cough, measles and chicken-pox) in a house must be at once notified at the Depot.

12. Names of applicants for the milk will be received at the Depot daily at 12 noon.

N.B.—The Milk must never be used in preference to mother's milk, which is the best of all foods for young infants.



PREPARED BOTTLES OF MILK AT EACH AGE PERIOD READY FOR DELIVERY. Note Stopper Patterns



A. *Babies—from Birth up to the age of Three Months.*

A baby should have its meals, from the first, as regularly as a sick person, whether it is breast fed or bottle fed. This is of great importance to the baby's health, and if carefully carried out does much to "free" the mother's time.

A baby under a *fortnight* old may be fed every two hours by day, and not oftener than *every four hours at night*. The baby should be awakened for food in the daytime, but not at night.

A baby a *month* old should not be fed oftener than every $2\frac{1}{2}$ hours by day. Gradually extend the time between each feed, and by the time the child is *three months* old it should be fed only every three hours by day, and every five hours during the night if awake. Give the baby its last feed about 10 o'clock at night. Change it, and make it comfortable, and it will probably sleep until four o'clock in the morning.

Be sure the milk is not given too hot. Just before use, the bottle should be placed *unopened* in a basin or jug of hot water for about five minutes.

Give the food very slowly and train the child not to suck quickly.

General Advice.—Never give the baby *Tea, Coffee, or Cocoa*. The longer a child is kept from their use the better.

It is very important to wash out the baby's mouth night and morning. Take a piece of clean rag, fix it firmly round the finger, dip it into clean water, and thoroughly wash the roof and gums of the child's mouth. Then burn the rag. A fresh piece must be used each time.

You are strongly advised *not* to use a "*comforter*." Their use is often the cause of "*thrush*," and other diseases, and when the baby is constantly sucking them the *digestive system* gets no rest. This often causes *wind* and *indigestion*, and makes the baby cross and irritable.

A healthy baby should gain from four to six ounces in weight every week. On an average a baby should double its weight in the first *five months*. A knowledge of a baby's gain or loss in weight gives the readiest indication of its health. So be sure and bring your baby to 264, Goswell Road, once a fortnight to be weighed.

B. Babies—from Three to Six Months Old.

A baby, *four months old*, should be fed every three hours by day and once in the night if it wakes, but if it is healthy and well it will probably sleep until about 6 in the morning, when it should be given its first feed. The next feed should be given about 9.30, as the feeds should be given three hours after the last feed is finished. It will now be having about $31\frac{1}{2}$ oz. or $1\frac{1}{2}$ pints of milk per day.

C. Babies—from Six Months to One Year Old.

A baby, *six months old*, should be fed every three hours by day and once during the night if awake. The time between the feeds should be gradually extended, so that by the time the child is 12 months old it should be fed every four hours by day and not at all during the night.

[After the child is 10 months old and has cut several teeth it may be given milk pudding at dinner time in addition to its bottle, if medically advised. At 11 months old it may have rusks or a little toasted bread soaked in milk, and at 12 months old some bread crumbs and gravy, but *do not reduce the quantity of milk* that it gets each day, and *do not be in a hurry to leave off "bottles."* A "weaned" baby often suffers from lack of nourishment.]

Each child fed on the Depot milk is visited in its own home once a week, and in some cases more frequently. In this way a direct personal influence is brought to bear on the mother, and homely advice is given and precautions taken as to the management of the infant. Sanitary conditions and their effect on the health of the child are noted. Moreover, it has been found in practice that printed instructions as to the way in which the milk is to be used are not properly understood by the mother apart from personal advice or actual demonstration. Preparation and bottling at the farm protect the milk from *home contamination*, but it is necessary that the infant should take the milk direct from the bottle in the proper way if such contamination is to be absolutely avoided. Good practice in this respect is obtained by personal visits. I attribute much of the success of the Depot to these personal visits and assistance. They have been of the greatest value to both mothers and infants. The Medical Committee were fortunate in securing the voluntary services of Miss Alice Elliott (of the C.O.S.), for the first part of the year, and of Miss S. Helen Frith for the latter part. Miss Elliott was also assisted

by several lady visitors who most kindly aided the Committee in the early days of the Depot. Since July the whole of this part of the work has been done by Miss Frith, who is a certificated hospital nurse (St. Bartholomew's Hospital) and certified under the Midwives Act, 1902. She instructs the mothers as to points needing their attention, and visits each home at least once a week to see that the instructions are being properly carried out. She keeps a visiting diary in which periodical notes respecting each child's progress are kept; she also keeps a register and account book of payments for the milk. Miss Frith has devoted practically the whole of her time to the work of the Depot.

The Depot has not been generally advertised in any way. Circulars have been sent to the medical practitioners in the district, the neighbouring hospitals, the clergy, etc. Notices have also been affixed in the birth-register offices by the courteous consent of the Registrars. But it will be understood that not all mothers unable to feed their infants are willing to conform to the somewhat stringent conditions of the Depot, and the Committee have been in no hurry to admit large numbers of infants. They have been satisfied to deal with a few cases in a thorough and scientific manner rather than work a general sort of depot for all who chose to apply. The reasons for which Mothers sought the Depot were as follows:—

| | | | |
|--|-----|-----|-------|
| Mothers who had no breast milk... | ... | ... | 74 |
| Mothers who had an insufficiency of milk | ... | ... | 24 |
| Abscess of the breast, &c.... | ... | ... | 13 |
| The breast milk not agreeing with the Infant | ... | ... | 10 |
| Infants unable to suckle or otherwise defective... | ... | ... | 6 |
| The Mother at work | ... | ... | 2 |
| | | | <hr/> |
| | | | 129 |

It may be said that 37 per cent. of the children on the Depot were introduced by the Lady Sanitary Inspectors of the Borough Council, 33 per cent. were introduced by medical practitioners in the Borough, and 23 per cent. of the cases were sent to the Depot by St. Bartholomew's Hospital. It should be added that the children admitted to the Depot are only such as belong to Finsbury.

CHAPTER IV.

A STUDY OF RESULTS.

The Depot was opened on November 23rd, 1904, and up to November 22nd, 1905, 129 children had been entered on the books. About 93 per cent. of these children were introduced to the Depot by medical men, or by the Lady Sanitary Inspectors working in the Borough. They belonged, with very few exceptions, to the poorer classes. Twenty per cent. of the children came from homes of one room only, and another 43 per cent. from two-roomed homes. So that not less than 63 per cent. lived in homes of two rooms or less, and very few indeed lived in homes of four rooms or more. It may be taken, therefore, that the children came as a rule from poor homes.

A second point of importance is that 75 per cent. of the children admitted were ill at the time of admission, many of them were very seriously ill, and some of them dying. It is obvious that healthy children would not usually be introduced by medical men, who sent fully 55 per cent. of the total number. But many of the others were ill, under-fed and wasting, and the mothers sought the Depot on that account. Previous to admission 58 per cent. of the children had been fed on some form of cows' milk, and 42 per cent. on condensed milk or artificial foods. In a number of cases the child had had a little breast milk during the first few days of life.

The age and sex of the children admitted were as follows :—

| Infants. | Months. | | | | | | | | | | | | Totals. |
|----------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|-------|-------|---------|
| | Under 1 month. | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10-11 | 11-12 | |
| Male ... | 9 | 15 | 11 | 11 | 7 | 7 | 3 | 3 | 2 | 3 | 1 | 1 | 73 |
| Female | 14 | 12 | 13 | 5 | 4 | — | 5 | — | 2 | 1 | — | — | 56 |
| Totals | 23 | 27 | 24 | 16 | 11 | 7 | 8 | 3 | 4 | 4 | 1 | 1 | 129 |

From this table it will be seen that 74 (or 57 per cent.) were admitted at or under three months of age, and this is a very important fact, for it directly affects the death rate, which is, as we have seen, much higher in the first few weeks of life. Unfortunately not all the 129 children "completed" their year of milk feeding. In fact as many as 62 withdrew before that period had been completed. The reasons for withdrawal were as follows :—

| | | |
|---|--------|----|
| Withdrawn within 14 days without stated reason | ... | 9 |
| Removed from Finsbury | | 15 |
| Admitted to Hospital, or temporary withdrawal on | | |
| medical advice | | 19 |
| Applied and entered on books but did not use milk | ... | 11 |
| Dissatisfied after trial | | 7 |
| Withdrew without stated reason | | 1 |
| | | — |
| | | 62 |
| | | == |

This, of course, is a large number of withdrawals out of 129 cases. But it must be remembered that many of these 62 children, as will be noticed subsequently, were, for a considerable period, at the Depot and using the milk, *but they did not remain to complete the twelvemonths*. The unsatisfactory items in this Table are the withdrawal of 17 children whose parents were soon dissatisfied, and 11 children who were weighed and examined but never used the milk. That is a total of 28. In the early months of the Depot various difficulties arose which prevented its smooth working; and it received a considerable amount of adverse criticism from certain milk vendors and others in the Borough, who were under a misapprehension as to its objects, and felt it to be to their interest to oppose its work. This led, undoubtedly, to a number of withdrawals at that time. It soon, however, became evident to all concerned that the Depot was not a milk-shop, was not being worked in opposition to the milk trade, and was only intended for certain infants who could not well be fed in any other way. At the end of each month the cases in the Depot were as follows :—

| | | |
|----------------------|--------------|------------------|
| November, 1904 ... 9 | March ... 29 | July ... 28 |
| December „ ... 15 | April ... 29 | August ... 26 |
| January, 1905 ... 24 | May ... 23 | September ... 36 |
| February ... 30 | June ... 23 | October ... 40 |
| | | November ... 39 |

It is evident that the 11 cases in which the milk was not used must be subtracted from the 129 cases admitted, leaving 118 cases of which the results are to be considered. Of these, 10 have died, 18 have completed their year of age and have been discharged in good health and weight, and 39 remain at the Depot. The figures may be presented as follows :—

| | | | |
|-------------------------------|-----|-----|-----|
| Infants that have died | ... | ... | 10 |
| Infants discharged a year old | ... | ... | 18 |
| Infants still on Depot | ... | ... | 39 |
| Withdrawn (see Table p. 23) | ... | ... | 62 |
| Total | ... | ... | 129 |

Before discussing some of the results of this milk feeding in detail, it may be desirable to deal with two matters, namely, the general increase in weight, and the cause of death in the 10 cases which ended fatally.

First as to increase in Weight. The importance of the weight of an infant as a criterion of its health and progress is well known. Indeed, the weight is often the only criterion as to whether the infant is improving in health or not. At birth the average weight is about 7 lbs. ; at three months it may be about 9 to 11 lbs. ; at six months about 13 to 15 lbs. ; at nine months about 16 to 17 lbs. ; and at 12 months 19 to 20 lbs. Dufour's standard has been used in the Finsbury Depot, as in French Depots, and the charts appearing in the present report are drawn to that scale. It is well known that the standard rise in weight in the early months of life is greater than subsequently, but roughly it may be said that throughout the 12 months of infancy the average increase is one pound a month (12 lbs. + 7 lbs. at birth = 19 lbs.). We have taken that as a standard, with the following result ;—

Out of 118 infants 74 have attended more than one month and of these 60 (or 81 per cent.) have gained more than half-a-pound each per month and on an average $16\frac{1}{2}$ ozs. per month; the remaining 14 (or 19 per cent.) have gained less than half-a-pound per month.

Of the 14 infants who, though taking the milk for at least a month, did not gain even average standard weight and therefore did not prove satisfactory, three died, five were fed irregularly and not in accordance with the instructions, and six were suffering from disease during the period they were on the Depot.

Secondly as to the deaths. There were 10 cases of death out of the 118 infants. Three of these were children brought to us in a dying condition, and at special and urgent request were given a little of the milk for a few days before the fatal issue. Ten cases of death yield an infant death rate per 1,000 births of 84·7, but if these 3 exceptional cases be excluded the death rate is 57·5 per 1,000 births.* The Infant Milk Depot at Liverpool, which is the largest in this country, yields an infant death rate of 89 per 1,000 births. It should, however, be remembered that the average age at commencement of the use of the milk at Liverpool has been four-and-a-half months, whereas at Finsbury it has been three-and-a-half months, and more than half the infants were admitted under the age of three months, and more than a quarter were under six weeks of age. Moreover, the percentage of admissions of sickly children is higher than at Liverpool. The causes of death were as follows:—

1. W. T. R., m., admitted to Depot, December 14th, 1904, suffering from specific disease; wasted and ill. Two previous infants died at one month and three months of age. On Depot five months. Died May 20th. Increased about 22 ozs. (weight, 8 lbs. 8 ozs.).
2. E. C. B., m., admitted to Depot, December 21st, 1904, suffering from rickets, wasting and diarrhoea and vomiting. Died January 23rd (weight, 9 lbs. 6 ozs.). Traumatic meningitis.

* In 1904 the infant mortality rate for Finsbury was 168·6 and for London 146·1. I do not suggest a comparison, as the Depot figures are small.

3. E. L. W., f., admitted to Depot, February, 15th, suffering from wasting, diarrhoea and vomiting. Died July 31st (weight, 7 lbs. 5 ozs.). Certified cause of death, *infantile enteritis*.
4. H. M. B., f., admitted to Depot, April 26th, suffering from bronchitis, wasting, etc., practically dying. Three previous infants in this family died of "consumptive bowels." Died May 6th before the milk had had a fair trial (weight, 7 lbs.). Certified cause of death, *malnutrition*.
5. H. I. B., f., admitted to Depot, May 10th a week old. Began to do well and increased in weight. But in August suffered from diarrhoea and vomiting and "convulsions." Was taken to St. Bartholomew's Hospital on August 4th and died there on August 7th (weight, 9 lbs. 6 ozs.). Certified cause of death, *epidemic diarrhoea*.
6. W. P., m., admitted to Depot, August 2nd, suffering from tuberculosis, enlarged abdomen, very ill. On Depot three weeks, gained 6 ozs. Died August 25th (weight, 9 lbs.). Certified cause of death, *zymotic enteritis*.
7. V. B., f., admitted to Depot, July 26th, suffering from thrush. On Depot a month, gained only 9 ozs. Died August 25th (weight, 6 lbs., 13 ozs.). Certified cause of death, *epidemic enteritis*.
8. A. I. S., f., admitted to Depot, July 15, suffering from wasting and probably specific disease. Mother had had two previous children, both premature and both dead. One room, rent 6s. Child improved steadily on milk, gaining $3\frac{1}{4}$ lbs. in six weeks, was doing excellently. On September 20th was vaccinated; this appeared to upset the child, who subsequently suffered from diarrhoea and vomiting, and died September 30th (weight, 9 lbs.). Certified cause of death, *zymotic enteritis and exhaustion*.
9. M. W., f., admitted to Depot, September 19th, aged one month, suffering from diarrhoea and vomiting, thrush and wasting (weighed $4\frac{1}{4}$ lbs.), practically dying condition. Had frequent convulsions and died October 1st.
10. C. M., f., admitted to Depot, October 14th, suffering from diarrhoea and vomiting and wasting, practically dying condition. Did not improve and died October 27th before the milk had had a fair trial (weight, 7 lbs. 11 ozs.). Certified cause of death, *marasmus*.

From these 10 records it will be seen that all these infants were admitted to the Depot more or less seriously ill, three of them practically dying, and brought as a last resource. Seven out of the 10 deaths were due to epidemic diarrhoea, directly or indirectly.

It is now necessary to consider somewhat more closely the effect of the milk upon the infants at the Depot. For convenience they are divided into 4 classes, as follows:—

A.—Infants who have shown steady improvement throughout.

B.—Infants who, whilst taking the milk, suffered from epidemic diarrhoea and the results of the attack.

C.—Infants brought to the Depot suffering from epidemic diarrhoea and who recovered on the milk.

D.—Infants brought to the Depot suffering from grave constitutional disease and for whom this milk-feeding has done little or nothing.

A.—Infants who have shown steady improvement throughout.

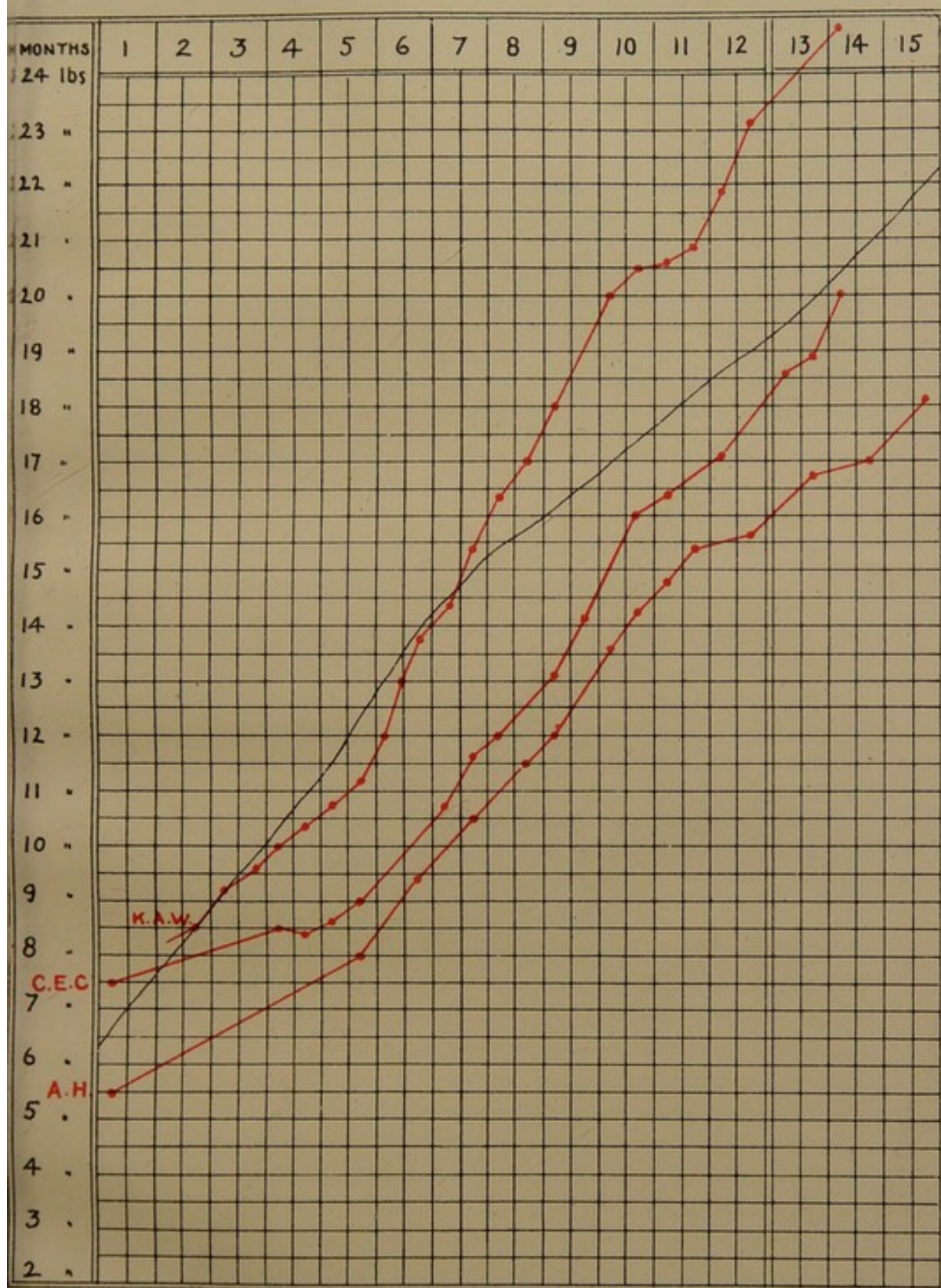
The following are six typical illustrations of thoroughly satisfactory cases:—

1. K. A. W., f., born October 3rd, 1904; began Depot milk November 25th, 1904; aged seven weeks. Health of mother, fair, anæmic; first child; insured. Occupation of father, cabinet maker; 40s. per week. Sanitary conditions of house good. Three rooms; 6s. 6d. per week. Infant—reported weight at birth, about $7\frac{1}{2}$ lbs. Weight on admission, $8\frac{1}{2}$ lbs. Reason for admission—mother had no milk. Condition of infant—fair, thrush at time of admission; slight eczema. Weight increased from 8 lbs 8 ozs to 25 lbs. in 12 months. Child did excellently throughout. Touch of diarrhoea in August lessened the steady rise for a month. (*See Chart A*).
2. C. E. C., m., born 15th September, 1904; began Depot milk 17th December; aged three months. Mother's health, good; four other children, all living and healthy. Father, bookbinder, out of work. Family occupy two rooms; rent, 4s. 3d.; sanitary

conditions good. Infant—reported weight at birth $7\frac{1}{2}$ lbs. Had mother's milk for first fortnight, then cow's milk and barley water. On admission—weight $8\frac{1}{2}$ lbs., wasted and some eczema. Increased from $8\frac{1}{2}$ lbs. to 20 lbs. in 10 months. Reason why this child did not normally increase in weight during first three months of life, before admission to the Depot, was illness and operation. After admission child did well throughout. (*See Chart A.*)

3. A. H., f., born 19th July, 1904; began Depot milk 2nd December; then aged $4\frac{1}{2}$ months. Health of mother fairly good; dyspeptic. Three other children, all living and healthy. Insured. Family occupy whole house; six living rooms and shop. Sanitary conditions good. Infant—premature; reported weight at birth 5–6 lbs. Had mother's milk for $3\frac{1}{2}$ months, was then weaned as she was not thriving. Had diarrhoea at time of weaning. General health fair, but much wasted and feeble. On admission weighed 8 lbs. instead of 12 lbs.; increased to 18 lbs. 2 ozs. in twelve months. Did excellently throughout. (*See Chart A.*)
4. R. W., f., born 25th July, 1904; began Depot milk 16th December; aged nearly five months. Insured. Mother's health good; five other children, four living and healthy, one died (prematurity, lived only fifteen minutes). Father, carman, wages 20s. Family occupy three rooms, rent 5s. 3d. Sanitary conditions good. Infant—reported weight at birth $6\frac{1}{2}$ lbs.; had mother's milk for one month, then mother had influenza and lost milk, after which the child had Nestlé's milk and barley water. Wasted after weaning. On admission weighed 10 lbs., and increased to 18 lbs. in seven months. Did well throughout, but had epidemic diarrhoea in the last month which somewhat lessened the steady increase in weight.
5. F. R. H., f., born 23rd November, 1904; began Depot milk 17th June, 1905; aged nearly seven months; insured. Mother's health good. Has had one other child, which died of diarrhoea and sickness at five months of age. Father, engraver, piecework, makes up to 40s.; 1 room, rent 5s. Infant—reported weight at birth 8 lbs. Has always been subject to bronchitis. Had mother's milk for six weeks and then Nestlé's milk in addition. On admission—weighed 13 lbs. and increased to 18 lbs. in $4\frac{1}{2}$ months. Had more or less bronchitis all the time, otherwise did very well.

"A" Group of Cases—Nos. 1, 2 and 3.



The figures at the top are of months, divided into fortnights. The weight in pounds is stated in the column on the left.

The black line shows standard increase of weight, the red lines the actual increase of infants charted.



6. E L., f., born 6th April, 1905; began Depot milk 9th June; aged two months. Mother has been in hospital several times with gastric ulcer, and a year before the birth of the baby had severe hæmatemesis. Was aged 40 at the birth of this, the first child. Father, engine driver in a brewery, wages 30s. Occupy three rooms; rent 7s. 6d. Exceptionally clean and well kept. Infant—reported weight at birth $10\frac{1}{2}$ lbs. Had Nestle's milk since birth. On admission—weighed 11 lbs. and increased to 16 lbs. 6 ozs. by November 1st. Still on the milk. Doing excellently.

Respecting this group of cases, comment is needless. These six infants represent many others who have passed through the Depot, and have done well from the beginning. As a rule they have been put on the standard modification for their respective ages, and in comparatively few cases has it been necessary to put them back on to weaker milks.

B.—Infants who whilst taking the milk suffered from epidemic diarrhœa, and the results of the attack.

7. F. M. C., f., born 26th November, 1904; began Depot milk 28th February, 1905; aged three months. Mother has good health. Father died of phthisis when the baby was two weeks old; four other children living and healthy. The family of five live in one large room (one is in an Orphan Home), fairly clean and tidy; rent 4s. 6d. Not insured. Infant had had good health, no illness or diarrhœa; reported weight at birth $6\frac{1}{2}$ lbs. Had mother's milk for a little over three weeks, then cow's milk and barley water. Condition on admission—fairly well nourished; no diarrhœa. Weight at first attendance $9\frac{3}{4}$ lbs. During the first eleven weeks that she had the milk she did well, gaining $2\frac{3}{4}$ lbs. Then she gradually took less milk, and was occasionally sick, with short attacks of diarrhœa. She also began to waste. The diarrhœa was never continuous, but recurred repeatedly. The child was therefore put on a lower modification of milk, combined with medicinal treatment by a medical practitioner. During her illness the child was always very languid, and took hardly any milk, till, in September, she only weighed what she did at the start ($9\frac{3}{4}$ lbs.). She was still kept on a very dilute milk. At last she began to improve, the diarrhœa and sickness ceased entirely, and she is now taking all the milk well, is bright and contented, and rapidly gaining weight. (See Chart B.)

8. E. S., f., born 9th March, 1905; began Depot milk 15th July; aged four months. Health of mother, fair; has had six other children (one died at two years of diphtheria). Father, carman. The family of eight occupy two rooms; rent 7s.; fairly clean and well looked after. Infant not been ill but did not get on and increase in weight; reported weight at birth $5\frac{1}{2}$ lbs. On admission weighed 8 lbs. 10 ozs. Had thrush. Mother's milk alone for seven weeks, then cows' milk and water in addition. Was entirely weaned at 10 weeks, and then had cow's milk and barley water. Had an attack of epidemic diarrhoea in August, and took the Depot milk badly and lost weight ($\frac{1}{2}$ lb.) The child was therefore placed on a lower modification ($\frac{2}{3}$ water) and at once recovered. Has gained 3 lbs. in the four months that she has been taking the milk, and is doing well. (*See Chart B*).

9. E. B., m., born 28th August, 1904; began Depot milk 20th January, 1905; aged five months. Health of mother, only fair, dyspeptic; has had four other children and two miscarriages; two children died (one at five months of diarrhoea and sickness, and one at two years and five months of pneumonia and measles). Baby insured. Father a carman; wages 25s. Family of five occupy two rooms; rent 5s.; clean; drainage, ventilation and sanitary conditions good. Infant: reported weight at birth $8\frac{1}{2}$ lbs.; had mother's milk for four months, then cows' milk and barley water. Had epidemic diarrhoea since birth; habitually vomited and screamed after food. On admission weighed $14\frac{1}{2}$ lbs. Continued intermittently with diarrhoea, and in June had severe bronchitis. Frequently did not take nearly all the milk. Gained and lost weight alternately till the middle of August, when he went back from 16 lbs. to $14\frac{1}{4}$ lbs., owing to epidemic diarrhoea. During September the diarrhoea ceased and the child took all the milk. He is now gaining rapidly ($2\frac{3}{4}$ lbs. in four weeks). (*See Chart B₂*).

10. C. E. A., m., born 10th January, 1905; began Depot milk 22nd April; aged $3\frac{1}{2}$ months. Health of mother, good; 1st child. Father, porter; wages, 20s. Family of three live in one room; rent, 5s. Fairly clean and well looked after. Infant—reported weight at birth, 6 lbs. Had cow's milk and water since birth. Was always sick and did not improve; lost weight. On admission, weighed 7 lbs. 2 ozs. Started on a very dilute milk, which he took well and improved rapidly. During July had a severe attack of diarrhoea. Was admitted to St. Bart's Hospital for one night

"B" Group of Cases—Nos. 7 and 8.



THOMAS BEAN & SON, 67, GOLDEN LANE, E.C.

The figures at the top are of months, divided into fortnights. The weight in pounds is stated in the column on the left.

The black line shows standard increase of weight, the red lines the actual increase of infants charted.



when he was not expected to live through the night. He rallied, however, and was sent home and returned to the Depot. He recovered completely and is now gaining weight rapidly—(8 lbs. in six-and-a-half months.) (See Chart B₂).

In all 18 children suffered from epidemic diarrhœa, and it was the direct cause of death in five instances. The following table furnishes particulars of these 18 cases (10 of whom were previously weakly or diseased) :—

CASES IN WHICH EPIDEMIC DIARRHŒA OCCURRED IN DEPOT-FED CHILDREN.

| Numbers. | Age of Infant. | Length of time on Depot Milk. | No. of rooms occupied. | Sex. | Particulars of Attack. | Attack commenced. | Notes. |
|----------|----------------|-------------------------------|------------------------|------|--|-----------------------------|--|
| 1 | 10 mths. | 8 mths. | 3 | F | Two short attacks of Diarrhœa and vomiting | August 10th and August 25th | Very clean child and well looked after; social and sanitary conditions good. |
| 2 | 13 mths. | 8 mths. | 3 | F | Diarrhœa and vomiting, severe | August 19th | Fairly clean and well looked after; sanitary conditions fair. |
| 3 | 11 mths. | 8 mths. | 2 | M | Slight Diarrhœa and vomiting for few days | August 25th | Clean and well looked after; sanitary conditions fair. |
| 4 | 11 mths. | 6 mths. | 3 | M | Ill for 5 weeks, Diarrhœa very severe; death | August 5th | Clean and well looked after; sanitary conditions fair. |
| 5 | 8 mths. | 5 mths. | 1 | F | Diarrhœa and vomiting, severe; intermittently for two months | August 8th | Fairly clean and well cared for; sanitary conditions fair. |
| 6 | 9 mths. | 4 mths. | 2 | M | Slight attack of Diarrhœa and vomiting | August 15th | Clean and well cared for; light good, ventilation fair. |
| 7 | 6 mths. | 3 mths. | 1 | M | Diarrhœa and vomiting, very severe | July 20th | Quite clean and well cared for; sanitary conditions fair. |
| 8 | 4 mths. | 3 mths. | 6 | F | Two severe attacks of Diarrhœa and vomiting | August 1st and August 17th | Clean and well cared for, but lived mostly in basement kitchen, hot and stuffy and dark; sanitary conditions unsatisfactory. |

CASES IN WHICH EPIDEMIC DIARRHŒA OCCURRED IN DEPOT-FED CHILDREN—*continued.*

| Numbers. | Age of Infant. | Length of time on Depot Milk. | No. of rooms occupied. | Sex. | Particulars of Attack. | Attack commenced. | Notes. |
|----------|----------------|-------------------------------|------------------------|------|--|-------------------|---|
| 9 | 3 mths. | 2½ mths. | 3 | F | Ill 5 days, Diarrhœa and vomiting, severe; death | August 3rd | Quite clean and well cared for; sanitary conditions good. |
| 10 | 9 mths. | 2 mths. | 3 | M | Short, sharp attack | August 25th | Clean, but incompetent mother; sanitary conditions fair. |
| 11 | 7 mths. | 2 mths. | 4 | F | Diarrhœa and vomiting for several weeks | August 21st | Very clean and well cared for; social conditions fair. |
| 12 | 5 mths. | 1 mth. | 2 | M | Diarrhœa and vomiting, severe; death | August 15th | Dirty, slovenly people; baby not well cared for; hot stuffy rooms, ground floor; sanitary conditions decidedly bad. |
| 13 | 5 mths. | 1 mth. | 2 | F | Diarrhœa only, no vomiting | August 20th | Clean and well cared for, but very poor, frail infant. |
| 14 | 7 wks. | 1 mth. | 2 | F | Diarrhœa and vomiting, severe; death | August 21st | Shiftless, ignorant mother but "did her best for the baby;" Sanitary conditions bad. |
| 15 | 7 wks. | 1 mth. | 1 | F | Diarrhœa and vomiting | August 10th | One stuffy, hot ground-floor room, looked after by old grandmother; sanitary conditions bad. |
| 16 | 4 mths. | 2 mths. | 1 | F | Diarrhœa and vomiting came on after vaccination; death | Sept. 24th | Hot, close room; ventilation bad; fairly clean. |
| 17 | 2½ mths. | 2 mths. | 2 | F | Short attack of diarrhœa | Oct. 7th | Clean and well cared for; sanitary conditions good. |
| 18 | 4½ mths. | 2 mths. | 1 | M | Diarrhœa and vomiting, severe for a week | Nov. 9th | Mother at work, baby left with young sister; rather dirty; sanitary conditions poor. |

From these results three conclusions may be drawn. First, the feeding of infants on modified and sterilised milk does not necessarily prevent them from having epidemic diarrhoea, particularly in the third quarter of the year. The milk was consumed direct from the bottle, through a clean teat, without a tube. The milk itself was of a high standard of purity; in the summer months it was absolutely sterilized, and during the rest of the year was almost germ free. It was modified to suit the age of the infant, and yet with all this care a number of these infants contracted epidemic diarrhoea. It is impossible to believe they contracted specific infection from the milk, for the milk could not contain specific infection of any kind. Moreover, if it had contained such virus more than 16 out of 57 children (in third quarter) using it would have contracted the disease. It seems probable, therefore, that they contracted the disease through some channel other than the milk. We have carefully enquired into all the possible channels that occur to us, and we have come to the conclusion that the virus of this disease has gained access to these infants through dried dust and dirt, and particularly by means of the "comforters," which are india-rubber rings or dummy teats. This class of children, almost without exception, suck and chew these articles during their considerable leisure. Such "comforters" are dipped in sugary messes or dirty milk to give them a palatable taste. They fall on the floor and so collect dust. Flies settle upon them. They are never cleaned, except perhaps, on a dirty apron. They are nearly always moist and warm owing to contact with the child's mouth, and therefore afford an ideal nidus for the multiplication and development of germ life.

It is, of course, almost useless to give a child milk which is free from infection if between its meals it is supplied with a filthy and infected "comforter." There can, I think, be little doubt that "comforters" and the long tubes of milk bottles are two sources of much disease, and it would be well if they could be entirely abolished.* Their use has been discouraged at the Depot.

Secondly, it is evident from a study of these cases that epidemic diarrhoea reduces the strength and weight of the infant even though it be fed on pure, properly-modified milk.

* See Report of Committee on Physical Deterioration, 1904, vol. i., p. 56.

Thirdly, children properly fed on pure milk suffer from epidemic diarrhoea less than children fed in other artificial ways. During the third quarter we had 57 children on the Depot, 16 of them suffered from epidemic diarrhoea (28.0 per cent.). They were in no way a selected set of children, indeed if anything they were much below the average of Finsbury children, for they were nearly all brought to the Depot already ill. How does this 28 per cent. compare with the Borough as a whole? We have no means of knowing exactly how many cases of the disease occur in the Borough, as it is not notifiable. But we may obtain some guidance in the following way. In the whole Borough there were in the same third quarter 702 births and 65 deaths from epidemic diarrhoea. It may be safely assumed that each death indicates at least five cases of the disease, which would give 325 cases of the disease in the Borough (or 46.2 per cent.). Further, the general fatality is less in the children properly fed on artificial lines than it is in improperly fed children.* This fact would be enormously emphasised if it were possible to draw out the Borough infant death rate in two forms, namely, a death rate of breast-fed children and a death rate of artificially-fed children. But it is impracticable to state this accurately in figures. How great the difference between the death rates of the artificially-fed children at the Depot and the artificially-fed children outside in the Borough would be, is, however, clear when one remembers that out of the 146 children dying in the Borough, 115 were artificially fed.† It is perfectly clear therefore that the

*Of the 57 children on the Depot in the third quarter 5 died, yielding an infant death rate of 87.7 per 1,000 births. In the same quarter the infant death rate in the Borough as a whole was 207.9 per 1,000 births. I do not wish unduly to contrast these figures, as they are not altogether comparable, and the returns for the Depot are based upon small numbers (only 57 cases) at a different age incidence; but the broad conclusion is obvious—that amongst the Depot-fed children the fatality rate was lower than the general infant death rate of the Borough.

† Of 63 infants dying of epidemic diarrhoea in Finsbury in the third quarter of 1905, we have been able to ascertain the method of feeding in 54 instances. Out of the 54 only 9 were breast-fed, 45, or 83.3 per cent., being artificially fed.

high Borough infant death-rate of 207·9 is mostly due to deaths of infants artificially fed. No one can study these figures and the clinical history of these Depot-fed children without being satisfied (a) that such children suffer much less from epidemic diarrhœa than other artificially fed children, and (b) that they have a much lower fatality, even when they are attacked. And yet nearly all the Depot children are of the poorest classes. All of them are artificially fed. All were living at home, and subject to precisely the same external conditions of life as the other children. All the conditions indeed were the same for both classes, *except that the Depot-fed children were receiving pure milk and proper supervision.*

C.—Infants brought to the Depot suffering from Epidemic Diarrhœa and who recovered on the Milk.

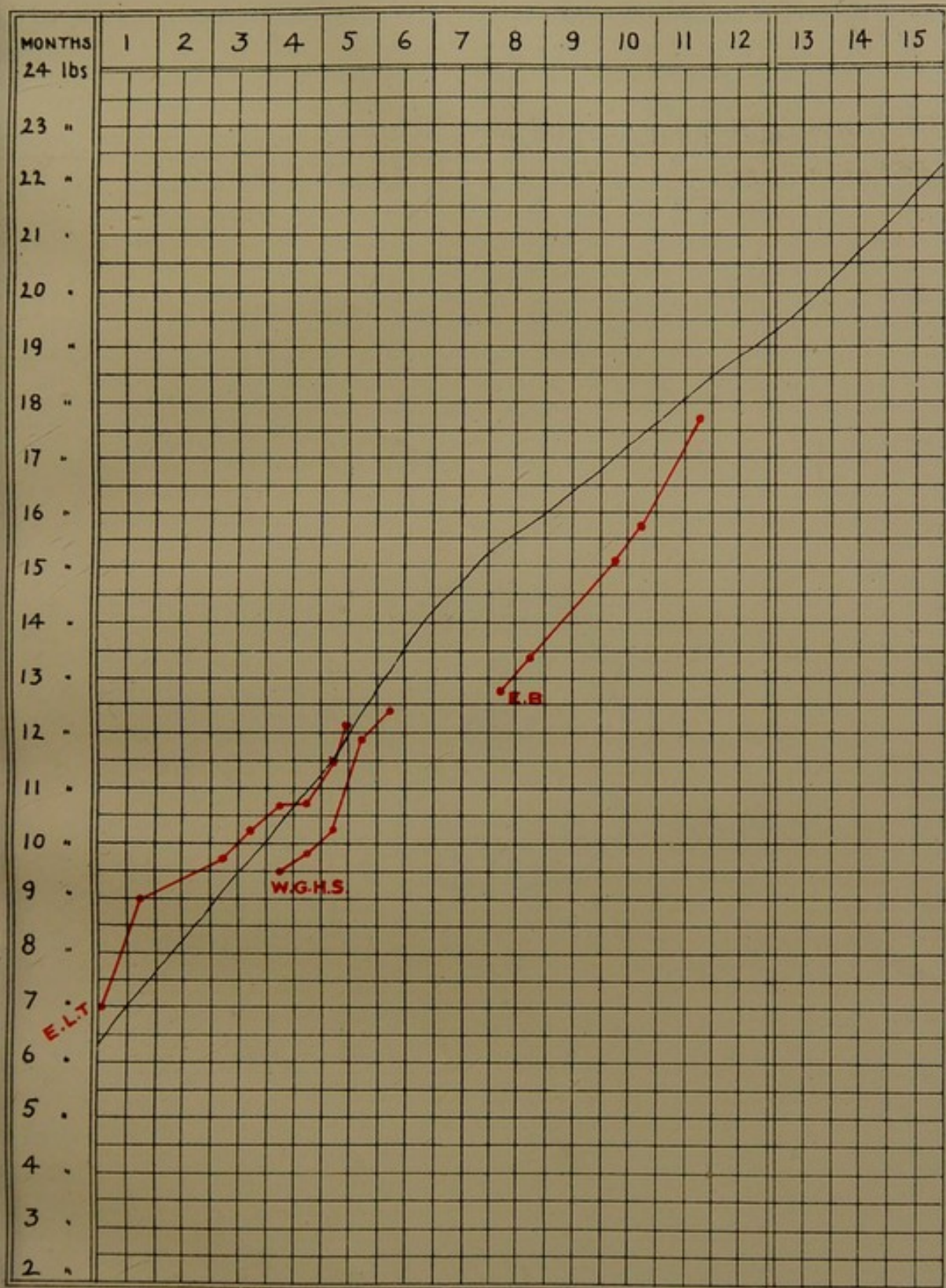
11. E. B., born 16th January, 1905 ; began Depot milk 12th August ; aged 7 months. Not insured. Mother cook in P.H. Baby boarded out with a family of four persons who occupy four rooms ; rent 8s. Clean and well cared for. Infant—reported at birth to have been small ; weakly ; always constipated. Had been fed on cow's milk and barley water since birth. Condition on admission : Had had epidemic diarrhœa for a month, pulled down and thin, skin hanging loose, wasted, discharge from right ear. Weight at first attendance, $12\frac{3}{4}$ lbs. (standard weight at seven months is $15\frac{1}{2}$ lbs.) Started on a dilute milk ($\frac{1}{2}$ water), suitable for three months' child. Has gone steadily ahead with the exception of one week, when she was admitted to hospital for mastoid abscess during which time she lost $1\frac{1}{2}$ lbs. Weight on November 22nd, $17\frac{3}{4}$ lbs. Weight gained in 15 weeks, 5 lbs. Is now very well and contented, sleeps well ; no diarrhœa or sickness. (See Chart C.)
12. W. G. H. S., m., born 30th May, 1905 ; began Depot milk 17th September ; aged $3\frac{1}{2}$ months. Health of mother only fair ; first child. Father in Post Office Telegraphs ; wages 25s. Mother in rubber works ; wages 14s. Grandmother tends child during day. Occupy two rooms, rent 7s. 6d. ; clean and well looked after. Infant—not weighed at birth ; been under medical care since six weeks old ; chronic colic since birth. Breast fed for about four or five weeks, then Mellin's food, beef tea, barley water and cow's milk. Condition on admission—diarrhœa and sickness, colic, bronchitis and wasting ; seriously ill. Started on very dilute

milk ($\frac{2}{3}$ water). Weight at first attendance $9\frac{1}{2}$ lbs.; weight on Nov. 8th $12\frac{1}{2}$ lbs.; weight gained in seven weeks 3 lbs. Is now fat and well; very contented and sleeps well; no diarrhoea or sickness; quite recovered. (*See Chart C.*)

13. E. L. T., f., born 22nd July, 1905; began Depot milk 9th September; aged seven weeks. Not insured. Mother's health good; has had four other children; two dead (aged eight months and eleven weeks, both from epidemic diarrhoea). Father potman in public-house; wages 14s.-25s.; unsatisfactory person and drinks. The family of five have two rooms, but only occupy one, the other being unused; furniture pawned; fairly clean; rent 6s. 3d. Infant—weight at birth stated to have been 7 lbs., and on tenth day 9 lbs. Had some mother's milk for first few days, then cow's milk and barley water. Condition on admission—seriously ill; enlarged abdomen, diarrhoea and sickness; wasting. Started on small quantities of very dilute milk ($\frac{2}{3}$ water). Milk strengthened after seven weeks. Weight at first attendance $9\frac{3}{4}$ lbs.; on 15th November 12·3 lbs.; gain in ten weeks $2\frac{3}{4}$ lbs. No diarrhoea or sickness; contented and sleeps well; quite recovered. (*See Chart C.*)

These three typical cases, and those numbered 7, 8, 9 and 10, illustrate an elementary point of importance which must not be overlooked respecting the effect of a Milk Depot upon epidemic diarrhoea. It appears to be commonly supposed that the use of sterilised milk is suitable treatment for an infant suffering from diarrhoea. That is not so. In acute epidemic diarrhoea milk must be stopped. The child should be fed for 24 hours on boiled water or weak barley water, and even when milk is again commenced it must be greatly diluted and low in percentage of casein. We have adopted this treatment in cases of acute diarrhoea. The child has been starved for a few hours in order to remove remnants of its last food and then fed on small quantities of a very dilute milk (two-thirds boiled water) which also contains only half the amount of casein present in ordinary human milk. The beneficial results of this feeding have appeared repeatedly, and may be seen also in the cases above quoted. An infant Milk Depot is an institution that requires careful watching and controlling. It is not making the

"C" Group of Cases—Nos. 11, 12 and 13.



THOMAS BEAN & SON, 57, GOLDEN LANE, E.C.

The figures at the top are of months, divided into fortnights. The weight in pounds is stated in the column on the left.

The black line shows standard increase of weight, the red lines the actual increase of infants charted.



best of such a Depot to distribute the milk indiscriminately, not only to any infant whether it can be breast fed or not, but to any artificially fed child, and particularly to infants suffering from epidemic diarrhoea.

D.—Infants brought to the Depot suffering from grave constitutional disease, and for whom this milk-feeding has done little or nothing.

14. E. L. W., f., born 6th December, 1904; began Depot milk 18th February, 1905; aged ten weeks. Health of mother only fair; six previous children; two dead (one died of whooping cough, one of bronchitis). Sanitary condition of house fair. Family of seven live in two rooms, which are rather unclean. Occupation of father, picture frame gilder, piece work, poor wages. Mother puts bristles in tooth brushes at home. Infant—weight at birth stated to have been 5 lbs.; always weakly and ailing. Insurance agent would not insure it. Condition on admission—emaciated, poorly nourished, weakly and seriously ill. Weight at first attendance 6 lbs. 4 ozs. (10 weeks). Been fed on cow's milk since birth. On Depot milk from Feb. 18th till its death, July 31st, gained only 17 ozs. in the four months during which it was weighed (standard gain for four months 75 ozs.); took milk well throughout till last fortnight. During the latter half of July had diarrhoea and sickness, and only took a small quantity of milk. Died July 31st; weight unknown. Certified cause of death was *infantile enteritis*, but also suffered from generalised tuberculosis. (See Chart D.)
15. J. T. W., born 22nd February, 1905; began Depot milk 8th July; aged 4½ months. Insured. Health of mother poor; ill all through pregnancy; instrumental labour. Has had five other children, four living and well and one dead (at 7½ months of malnutrition). Father is a clothes salesman. The family of seven occupy two rooms; rent 6s. 6d.; bedding, &c., dirty, but children fairly clean and well looked after. Sanitary conditions fair. Infant not weighed at birth; very small, about 5½ lbs. Has an imperfectly formed throat with a large double uvula; always regurgitates food through nose, and has much difficulty in swallowing. Has cried incessantly since birth. On admission weight 6½ lbs. (standard at same age 12 lbs.). Child emaciated with an aged appearance; skin shrivelled; seriously ill. Improved somewhat on the milk, especially at first, then during

October had three abscesses—two on right thigh, and one on left side of chest. Depot milk discontinued Nov. 13th, as the mother was not satisfied with the child's progress; weight 8 lbs. 14 ozs. (standard weight $16\frac{3}{4}$ lbs.). (See Chart D.)

These two cases represent a remnant of infants brought to the Depot suffering from grave constitutional disease which neither breast milk, artificial milk, or any other food could permanently alleviate. In such cases the Depot, of course, failed to be of any real value, although it may somewhat have prolonged the short life of the infant.

CHAPTER V.

SUMMARY OF CONCLUSIONS.

1. That the Finsbury Infant Milk Depot seems to illustrate the essential principles upon which such work should be carried on. The chief of these appear to be :—
 - (a) Direct control of the milk at the farm ;
 - (b) Treatment of the milk, whatever it may be, *immediately* after its yield, and before the contained micro-organisms have had time to multiply or secrete their products ;*
 - (c) Medical supervision of the Depot and of the infants using the milk.
 - (d) A discriminating and careful distribution of the milk only to children who cannot be breast-fed, and the use of a suitable modification for each child ;
 - (e) The systematic study of the effect of the milk on each child, accompanied by medical examination and periodical weighing ;
 - (f) The adoption of a policy of increasing rather than decreasing the sense of responsibility of the mother.
2. That the milk used in the Depot under consideration is prepared under exceptionally good conditions, but not such as cannot be adopted by other dairy farms. Not the least valuable part of the work which has been done seems to me to be the practical demonstration which it furnishes in model dairying, which could, and should, be more widely practised in this country.

* The importance of this matter is not sufficiently recognised by Dairy-farmers generally.

3. That as far as can be judged, the Depot has saved the lives of some children and strengthened the physical condition and constitution of others.* Eighty-one per cent. of the children who consumed the milk for a period of not less than a month gained the standard average weight of one pound per month. Whilst it is admitted that an Infants' Milk Depot is only a palliative method of preventive medicine, these results show that under certain circumstances it may be of substantial value in the reduction of infant death rates.
4. That there is evidence to show that the Depot will serve as an important training school of infant management. Its value in this respect, as well as in respect of nourishing and saving life, would appear to depend in large measure upon the personal assistance and advice of a skilled visitor at the homes of the children.
5. That the history of the first year of this experimental Depot, particularly the clinical record, confirm the view that infants, even when properly and well fed on artificial lines, may still suffer from one of the most preventable and fatal of children's diseases—*epidemic diarrhœa*.

It would therefore appear that, however much this disease may be spread by milk—and undoubtedly such is the case—it may also be communicated to infants in other ways. Uncleanliness in the home, and particularly the common use of articles known as "comforters" and other similar appliances which readily collect dust and dirt, may contribute largely to this result, especially in

* It is, of course, perfectly clear that the number of infants using the Depot has been very small. Therefore death rates and deductions must be accepted as tentative only. The total death rate, however, for the year of the children fed at the Depot is 84·7 per 1,000 births; 168·6 per 1,000 births in the Borough of Finsbury in 1904; and 146·1 in London as a whole. The infant death rate in the third quarter of 1905 in the Borough of Finsbury was 207·9 per 1,000 births, whereas the death rate of the Depot-fed infants in the same period was 87·7. Reservations with regard to these figures will be found in the Report, and in any case they are not comparable owing to variation in age incidence at death.

the summer months.* The clinical records of Depot-fed infants suffering from this disease further seem to indicate that with careful dieting the disease may often be prevented or cured, and death averted. No doubt there are points in the working of this experimental Depot which are open to criticism, and which should receive the attention of the Medical Committee responsible; but, on the whole, the results show an exceptional measure of success, and such as justify the establishment of similar Depots elsewhere.

* Evidence is accumulating to show the pollution of the air of houses by infective or injurious dust and dirt being present in the houses. Many years ago Cornet demonstrated the presence of the tubercle bacillus in the dust of houses, and others have proved the same fact. In the present year Dr. M. H. Gordon has shown that the air entering and leaving the House of Commons contained microbes and particulate matter of intestinal origin (from manure) derived from Members' boots. If that be so, it is much more likely that tenement houses in Finsbury will be affected in the same way, and in a greater degree. Recently also, Dr. Niven, of Manchester, has collected facts which increase the probability that house-flies act as transmitters of the virus of summer diarrhoea by carrying infected filth to food or other material. [Appendix.

NOTES.

Resolutions of International Congress of Infants' Milk Depots
(Paris, October, 1905).

1. That Local Authorities should take all measures in their power to impress upon mothers the greatly increased liability to disease to which artificially-nourished infants are exposed. [This, of course, refers to uncontrolled and unwise artificial feeding as commonly practised.]
2. That *gouttes de lait* be established as widely as possible.
3. That all *gouttes de lait* be under Medical supervision.
4. That Local Authorities should encourage and facilitate their development as well as the popularisation of infantile hygiene by every available means.
5. That rigorous legislation be introduced in all countries for the supervision of milk destined for the food of infants.

English Milk Depots.

Infants' Milk Depots have been established at St. Helens, Liverpool, Battersea, Glasgow, Dundee, Bradford, and other places. Depots are being established also at Woolwich, Lambeth, etc. The scope of these Depots varies widely, and therefore their expense and utility also vary. The apparatus necessary for the proper equipment of a Depot (250-400 children) costs, approximately, £200. This does not, of course, include farm expenses. Liverpool spent £640 in initial capital outlay, Battersea £400, Glasgow £650. Most of the Depots are worked by Municipalities, and at a loss, involving a charge on the rates (Liverpool, about £2,000 a year; Battersea about £300; St. Helen's £180). The York and the Finsbury Depots appear to be the only ones worked by voluntary societies. The Finsbury Depot seems to be the only one in England established on French lines.

In 1903 the Official Auditor of the Local Government Board disallowed certain expenditure undertaken in connection with the Battersea depot "because there was no authority in law for charging any cost in regard to the said depot upon the General Rate Fund of the said Borough." The Board concurred in this surcharge, and up to the present date have not withdrawn their judgment that such expenditure of the general rates is without legal authority, but each year the surcharge has been remitted. The Woolwich Borough Council have obtained legal authority under a special Act for the establishment of a depot. A Milk Depots Bill was introduced into Parliament in the present year "to enable local authorities to establish and maintain depots for the purification, improvement, preservation, sterilization and sale of milk and cream," but it did not become law. The Finsbury Borough Council, amongst other Authorities, approved and supported the Bill.

In March, 1904, I reported to the Borough Council on Municipal Milk Depots (*Minutes of Proceedings of Council, 1904, pp. 20-24*), and the various ways in which they might be worked and the principles upon which they should be established.

