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ON

T O W N M I L K.

BY

JOHN CHALMERS MORTON.

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FROM THE
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ON

TOWN MILK.

THE following report on this subject is based upon a paper on the London Milk Trade, which was read two years ago before the Society of Arts, and was reported in their Journal of December 15, 1865. Since the preparation of that paper, and the examination then made of cowhouses in various parts of London, I have had charge of a suburban farm where a large number of cows—at one time more than 250—were kept exclusively for the London milk supply. This, with a renewed examination of a few additional town and suburban dairies, enables me to speak with some confidence on a subject which is of considerable agricultural and of very great social consequence.

The latter consideration is not sufficiently regarded, for the importance of it can hardly be overrated. "The returns of the Registrar-General exhibit a fearful tale of infant mortality; and a large proportion of the various causes of death assigned in them may be summed up," says Dr. Druitt, Medical Officer of Health to St. George's, Hanover-square, "as simply meaning starvation." The milk supplied in shops has, in fact, been to a large extent deprived of its nutritive elements; and, "little more than the thick curd remaining, the delicate stomach of a child cannot digest it; and hence diarrhoea, atrophy, and the multitudinous diseases which tell so terribly on infant life in towns." And not only is there a result of this immediate kind contingent on the non-supply of unadulterated milk, but, as Mr. Chadwick has pointed out, the health and strength of the whole future life are compromised by it. "The foundation of

the adult is laid in childhood and youth. Our strongest and best labourers are from milk-and-oatmeal fed, or milk-and-bread fed, or milk-and-potato-fed children. Our strongest navvies are from the hill-districts of Lancashire; our strongest labourers from Cumberland and Westmoreland, and from the hill-districts of Scotland, where milk is always a large portion of the food of the family. These, too, are the favourite recruiting grounds for guardsmen and soldiers of the greatest size and strength."

If mothers sufficiently realised the future consequences of insufficient nourishment in infancy, they would be quicker to recognise the causes of those ailments which are current during the time when this process of imperfect feeding is going on. No doubt there are, however, many examples of this quickness; and I met with one the other day in the case of a poor woman purchasing a pennyworth of milk in a shop where it has never been adulterated or diluted, for which every day she was content to walk a mile, saying that it was "four times better" than any she could get close by her house; and the life of her child depended on it. The stomach of a child is an unquestionable test of the quality of its food; and she had been rightly guided by its indications. But the verdict of the analyst may be also trusted; more confidently perhaps in the case of milk than in that of any other food. A mere aroma, which the balance of the chemist cannot weigh, may, indeed, sometimes destroy the value of milk, as of other food; but that is easily recognisable without analysis: and varieties of mere texture, which sometimes upset, as to any practical guidance they may offer, the conclusions of the analyst, after he has examined other foods, are unknown in the case of milk. Dr. Voelcker's analyses, published in past volumes of this Journal as well as elsewhere, are thus directly serviceable; teaching us with definiteness and in detail a lesson which, however, experience has already taught many of us more generally, that milk, whether good or not, when coming out of London cow-houses, is very often impoverished and adulterated when served over London counters.

The 'British Medical Journal' of November 23rd, 1867, called attention to a more recent series of analyses by Dr. Voelcker which very strikingly illustrate this fact; and a short reference to his results will suffice to prove the first point to which I am directing attention, viz., that Town milk is very often most outrageously and mischievously robbed and maltreated before it reaches the consumer. Ten samples were submitted to examination—taken from shops in Blackfriars, the Strand, St. Giles's, and some of the western districts north and south of Hyde Park. Of these only one was just as the cow

had yielded it. It contained 86·16 per cent. of water,—rather less than the ordinary natural proportion; and 12 per cent. by measure were cream. The other samples contained from 90 to 91 per cent. of water; and from $9\frac{1}{2}$ to only 3 per cent. were cream. The price in every case but two was 4*d.* per quart; in those two it was 5*d.*; and there the quantity of cream was only 4 and 6 per cent. respectively! How great the temptation to dishonesty, and how great its facility, are both apparent from these analyses. A large business in “a first-class establishment” is prospering which sells as new what is “no better than skim-milk.” The reports regarding the other cases are as follow:—“much coloured artificially, one-fourth of cream removed, and one-sixth of water added;”—“one-fourth of cream removed, and one-third of water added;”—“skim-milk, with one-third water!”—“one-third cream removed, and one-fifth water added.” If 4*d.* per imperial quart be the price at which milk can fairly be sold retail, then in one of these instances, where it was sold at 5*d.* after one-third of the cream was removed and one-fifth water added, no less than 20*l.* per annum profit, beyond that of the fair retailer, is made for every gallon sold per diem: and if 100 gallons be sold daily, there is the enormous premium of 2000*l.* per annum realised by this dishonesty.

This then is the first point for consideration in any discussion of town milk—the great temptation which is offered in the trade to dishonesty, to which dealers very often yield with lamentable consequences to their customers, especially when the milk is bought for the nourishment of young children. But the ‘Agricultural Journal’ is hardly the place for a detailed examination of this part of the subject, and I will conclude by quoting the letter of one recently in the trade who has had the best opportunity of forming an opinion. He says:—

“I suppose it is allowed on all sides that the London milk trade is not what it should be, and that very little pure milk is sold, especially to the poor. Before attempting to remedy this great evil the causes must be ascertained. With the poor, milk is a necessary more than a luxury; and, if pure, it is a most valuable article of food. As sold to the poor it yields a much greater profit than to the upper classes, as the former nearly always ‘fetch’ it themselves, and thereby save the milkman the expense of distribution, which at a West-end shop costs about $\frac{1}{4}$ *d.* a quart for a wide-spread business, and $\frac{1}{2}$ *d.* for a compact one: and besides this, the rent in a poor district is so much lower. But in spite of all this the poor are the worst served, and the reason is that the trade among them has fallen into the hands of such very ‘small’ men, who sell so little, that the business cannot yield a maintenance without help from the ‘cow with the iron tail.’ These same small men cannot contract with a country farmer for his milk, and therefore are in the hands of the wholesale dealers. The wholesale dealers, again, give only so low a price to the farmer that he in his turn, to make it pay, must add a little water.

"And if you go below the labouring class to paupers: they are treated worst of all. We have tendered for five or six workhouses at a price which would have given us a profit of less than one farthing a quart, and yet we have not been accepted. Tenders of 1s. 4d. a barn gallon (8 quarts) have been accepted, or 4d. a barn gallon less than our milk now costs us at our shop; and we are only paying the market value of pure milk in large quantities. We have had men in attendance at the opening of the tenders, and it was evident that it was all settled beforehand who was to have the contracts, as the outsiders knew well before it was announced. The fact that a dealer offered to buy a large quantity of our 'skim,' avowedly to supply a workhouse contract for 'new,' shows what the paupers really get.

"Next, as regards the upper classes, the expense of distribution is so great that only a very small margin is left for profit on each quart; but, on the other hand, the businesses are generally large. The bar to the sale of pure milk among the better classes is the system of percentages to servants. They all expect 5 per cent. on the gross amount of their master's bills, and this is just about what would be net profit on an honestly-conducted West-end business. If this is not paid the milkman is 'worked out.' So, to avoid this unpleasant process, he commences by adding water sufficient to pay this tax, and as that seems to pay well he soon doubles the quantity. We lose two or three customers a week from the servants, but we continually get more new ones, as pure milk will draw in spite of all this.

"The different causes which I have enumerated above have gradually made the milk trade one of the most dishonest in London, and I believe few in it now ever make the effort to be honest.

"I have forgotten to mention one of the most rascally tricks of it, which deserves exposure. I mean the selling cream in quantities short of imperial measure. When we began our business we were forced to have cream-cans of correct measure made on purpose, as the tinman assured us that no dairyman in London sold cream except in measures 25 per cent. short, and consequently he had no others. We have found this to be true by measuring the cans of many other dealers. The milk, however, is sold in proper measures."

I now turn to what may be called the agricultural side of my subject.

PURCHASE OF THE COW.

The art of producing milk with profit depends on the selection of a cow, and of food for it, on housing her comfortably, and on treating her with gentleness and regularity. On the selection of a cow of course depend both her current produce and her ultimate selling value. She should not be a very young cow, because her milk is not then at its full yield; and she should not be a very old cow because there is then great difficulty in fattening her. The general practice is to buy one, if possible, immediately after her 3rd, 4th, or 5th calf; and then to keep her on till she does not yield more than 6 quarts of milk a day. When her milk begins to shrink she will generally put on flesh on the same food that she has been all along receiving; but

towards the end of the process 3 or 4 lbs. of oil-cake are given in addition to the ordinary food; and the upshot is, that if she was bought for 20*l.* she may sell for 17*l.* up to even 19*l.* after a milking which shall have lasted on an average from 8 to 10 months. During the last few years, when a good cow has been worth 20*l.* to 25*l.*, and markets for second-class beef have been very dull, there has been a loss on buying and selling of 4*l.* or 5*l.* a-head; and this is not merely a loss per annum, it is a loss upon 9 months, amounting therefore to one-third more per annum; so that it is thus often equal to a loss of 6*l.* or 7*l.* per annum on every stall in the cowhouse, which is a serious and may be a ruinous discount from the returns of the cow-keeper. It is plain then that in the case of this business, even more than in that of ordinary stock-farming, everything depends on skill and judgment in marketing.

In the better class of London cowhouses you see large framed, wide and straight backed, deep bodied short-horn cows, equal for size and mass and ability to carry meat, as well as yield milk, to any cattle in the world. They may have cost 20*l.* to 25*l.* a-piece on entering. Elsewhere you see small Irish and Dutch cattle—cows that have cost 13*l.* to 15*l.* apiece on entering the cowhouse, and will sell for 10*l.* to 12*l.* on leaving it. In both cases it has been customary for the cowkeepers to attend country fairs and markets and importers' yards, and pick up a cow here and a cow there as they could. It has also been a common thing for the London cowkeepers to purchase of the dealers, Bruce Johnson of Finchley, Judkins of Islington, C. Roach of West Hampstead, and others. At present cows are brought close up to the edge of the metropolitan district, cow-keepers hear of them,* and they are purchased out of some wayside lair and driven straight to the stall without entering the market, and after serving their time perhaps 8 or 10 months, and yielding at first it may be 16 and at length 6 quarts of milk a day, they go to the metropolitan market and are sold to the butcher in whatever condition as to fitness they may be. The dealers tell you that buyers invariably look to the prospect of a good sale when they buy, and that a cow which will "feed" as well as milk is essential to profit. The consequence is that the preparation of cows for the London market is a general practice in many dairy districts. Cows which are on the point of becoming too old for ordinary dairy usefulness are thus fed so as to be half fat at the time of calving, and Mr.

* Many cows are sold on the arrival of the trains, being purchased of the dealer in the truck, or immediately after leaving it, in the street.

Bruce Johnson's agents pick them up in this condition all over the northern and midland counties: and a finer lot of beasts is rarely to be seen than are offered weekly throughout the year at the Finchley Manor Farm. The attempt is made by liberal feeding and warm housing to retain this flesh with which they enter the cowhouse; and add to it so soon as the milk begins to shrink, so that by-and-bye the cow is sold weighing 7 or 8 cwts., fetching almost as much as was given for her. I have indeed seen before Christmas time a byre full of cows in Chelsea still giving 4 and 5 quarts of milk a-piece a-day, which must have been worth 28*l.* to 30*l.* a-piece for the beef they carried. That is one style of management. The cows sold out of the Somersetshire, Wilts, Gloucester, and Berkshire dairy districts do not come up so fat—do not fetch such large prices at the beginning—milk probably rather longer as a rule than the others, but lose more on being sold; or if they sell like the others at a loss of 2*l.* or 3*l.* a-piece, yet that being a loss upon 16*l.* or 18*l.*, instead of on 20*l.* or 22*l.*, is a larger loss per cent. The foreign and Irish cows, both of which are met with more frequently now than formerly, are bought much cheaper than the others, and are often very good milkers; and though they are sold for considerably less at the end of their milking (for little or no attempt is made to fatten them), yet the loss, greater than usual perhaps upon every 100*l.* of their purchase-money, is not, probably, so great in reference to the quantity of milk which has been produced by the animal; and this after all is the true test of economy.

FOOD OF THE COW.

Having got your cows well purchased, the point of next importance is to feed them properly. Their invariable food in London cowsheds is grains (brewers' or distillers' grains, the spent barley or other grain after being well washed or "worked out" in the process of brewing and distilling) with mangolds and hay in winter, and grass in summer. When first the cow is received into the shed it is important that she be gradually accustomed to her new food. She should therefore receive during the first week little but green food, grass, or clover or vetches in the summer, and mangolds and hay in winter, with bran mashes, into which grains may be gradually introduced, until, as she takes to them, she may at length be treated as the others are. What this management generally is, I take from the statements of two men, neither of them very large dairymen,

but both of them successful managers. Mr. Sumpton, of Little Warner Street, Clerkenwell, who usually milks about thirty cows, describes his day's work as follows:—The cowmen enter the shed at 4 A.M., and proceed to milk. In the case of the wholesale milk trade, when the dealers who buy the milk do the milking, one good man suffices for thirty cows. The cowman then only helps if necessary at milking-time, and sees that the work is thoroughly done,* his main business being to feed and tend the cows. When not only milking, but serving the customers at shops and houses has to be done, three men are required for thirty cows. They begin milking at 4 A.M., and finish between 5 and 6. About a bushel and a half of grains is then given between each pair of cows, and they are partly cleaned out, and when the grains are done, a truss of hay ($\frac{1}{2}$ cwt.), is divided amongst twelve. In the meanwhile the men have been serving the milk; after which they have their breakfast (about 8 A.M.). After breakfast time a bushel of chopped mangolds, weighing 50 or 60 lbs., is given to each two cows, and the cows receive another truss of hay amongst twelve. The cowshed is then cleaned out, and the cows are bedded and left. At 1 P.M. milking recommences, and very much the same feeding as before is given. At 2.30 grains are given as before, followed by the same quantity of hay and then (and only then during the twenty-four hours) the cows are freely watered. They again receive a truss of hay amongst twelve, and are left for the night. The grains are either brewers' or distillers' grains: the former are as much inferior to the latter in value as they are in price—the one at present costing 3*d.* to 4*d.* a bushel, and the other 8*d.* and 9*d.* In the case of cows in heavy milk—also in the case of those rapidly losing their milk, which must be sent to market as quickly as possible—it is common to give 2 or 3 quarts of pea-meal mixed up with the grains morning and evening; each cow thus receiving that quantity daily. And when the milking is coming to an end, for three or four weeks before the cow is sold, she may receive 2 or 3 lbs. of oilcake in addition. A full bushel of grains, half a bushel of mangolds, one-third of a truss of hay, and 5 or 6 lbs. of pea-meal in the case of the fatting cow, are thus the daily ration in a London cowhouse.—The grains at 2*s.* a quarter, the hay at 5*l.* a ton, and the mangolds at 20*s.* a ton, cost 1*s.* 3*d.* a day, and with meal or cake the daily allowance may cost from 1*s.* 6*d.* to 1*s.* 9*d.* per cow—10*s.* to 12*s.* a week.

* If he has any reason to suspect that a cow is not milked out, it is his duty to his master to "strip" her, for nothing injures a cow more than imperfect milking; and if he succeeds in getting another half pint from her his master will give him 6*d.* or 1*s.* for it, and fine the dealer that amount for his servant's default.

In summer time the food is grass with grains, and meal if necessary. Most cowkeepers, except the very smallest men, either have a small suburban farm, or buy a few acres of vetches, clover, or grass, and cart it in themselves. When it is bought daily at the cowhouse it costs from 1s. to 1s. 3d. a cwt. during the summer, and the cows receive about that quantity daily, given to them as fast as they can eat it, morning and evening, with their grains.

Of course the proper feeding of the cow after she has been well bought is the very essence of the business of the cowkeeper. It is a proof of good management when she is so treated that no kind of food which she receives shall pall upon her taste. The maxim is—never overdo a cow with any kind of food. Some cows are exceedingly greedy for distillers' grains, and they yield a very large quantity of milk upon them. But it is easy to "overdo" a cow with grains; and she should be always stinted of her favourite food, or she will get sick of it, as I have seen often enough in the case of this very article,—distillers' grains.

I add to this the statement of Mr. Dancock, of Brompton, another successful manager of cows. He uses steam in the preparation of his cow food, and in particular gives his meal in the form of gruel over cut hay or grains, 1 lb. of meal being added to a quart of water, with a little salt. "My plan," he says, "is to fill with cold water an 8 'gallon' churn (holding twice that number of imperial gallons) up to the figure 7. This allows room for meal and steam. I then put the steam-pipe within 6 inches of the bottom, and, supposing the pressure in the boiler to be 10 lbs., turn on full, and in five or six minutes the can is full and the gruel is done. I have sixteen cows, and my quantity is three cans, which allows one large pail full to each cow twice a day. I think this is better than giving them meal dry over grains. I milk before feeding, give 1 bushel of grains to a pair of cows twice daily with gruel over it, and when this is done give them green stuff and mangolds, a little hay if necessary, then water and rest till milking time again, when they are fed as before with grains; then I give oilcake, about 3 lbs. between two cows, then water and do up with hay." Mr. Dancock adds, "Cleanliness is essential to health—whitewashed walls, mangers well cleaned, cows well cleaned and littered down with short straw—in fact, everything belonging to cows and a dairy must be thoroughly clean to preserve health. This combined with energy and attention will, in due time, bring profit to the owner."

It may be right to give the daily ration in the case of the

smaller Irish and Dutch cows which are seen in some of the smaller town dairies. Mr. Mosey, of the Albion Dairy, Barnsbury, whose cows cost him from 10*l.* to 18*l.* apiece, milks at 4 and 5 A.M., gives so large a quantity as a bushel of grains to each cow at 6 A.M., and in winter 7 lbs. of hay at 9.30; as much water at 10 as they will drink, say 6 gallons (imperial) apiece, and 1 bushel of mangolds at 11. He milks again at 1 P.M., and the cows get another bushel of grains apiece at 2 P.M.; 7 lb. of hay at 5, and afterwards water if required. In summer they receive the same grains and hay as in winter, with grass, vetches, or green clover afterwards, both morning and afternoon.

The suburban cowkeeper, though more favourably situated than the London dairyman as regards the bulk of the food he consumes—the grass, the mangolds, and the hay—is less favourably situated as regards grains; and this disadvantage combined with the other of distance from the consumer, is such as at least to balance, often to overbalance, any advantage he possesses over the town dairyman in respect of labour, rent, and cheaper farm produce. Going further afield, as for example, to Swindon, and beyond it, or to distant stations on the South Western and North Western Railways, you find that the farmer feeds his cows for London, just as he has hitherto done for cheese or butter dairying. Bringing them to the pail at all months of the year, so as to have a regular produce to meet his contract with the London dealer, he milks his cows out at pasture during the summer, and feeds them on hay and mangolds in the winter. Receiving 6½*d.* to 8*d.* per imperial gallon for the milk delivered at the nearest station, and getting 500 to 550 gallons from his cow per annum, he receives 15*l.* to 18*l.* per annum for her produce, which is more than he can generally make of it in the form of cheese or butter, at the same time that he avoids all the cost of labour in the dairy. He runs, however, especially during hot weather, the risk of the milk souring on its journey, in which case it is thrown away on its arrival at his expense. But by cooling it before it starts, this risk is very much diminished; and this is done either by standing the full can (“churn” is the technical term for it) in running water, or by placing the milk, before filling it into these cans, in large tin vessels, surrounded by cold water, and traversed by cold water pipes. The risk is further diminished by filling the cans so that they shall not shake, and covering them with wetted jackets, so that evaporation may help to keep the contents cool. There is, however, great difficulty in ensuring its arrival sound after a long journey in hot weather, during which it has been in a constant tremble, which is just the condition likely to promote chemical change. The

evening's milking in the case of distant country farms arrives in London about midnight, ready for the London breakfast tables, and the morning's milking reaches town in time for tea.

Nearer London the management is very like that of Clerkenwell and Chelsea already described, excepting that to give time for the transmission of the milk everything begins an hour or two earlier. Mr. Collinson Hall, of Navestock, near Brentwood, describes his cow-house management as follows:—

“We begin milking at 1 o'clock in the morning; each man should have 15 cows. The milk arrives at 5 o'clock in London. The cows are again milked at 10 o'clock, and the milk is in London at 1 o'clock.

“They are fed as follows:—Each man gives about 4 lbs. of meadow hay to his 15 cows after the midnight milking, and then goes to bed. At 7 o'clock he gives them $\frac{1}{2}$ bushel of grains mixed with a bushel of sweet chaff, and a handful of salt; the cows are then cleaned and fresh littered; 2 lbs. of hay apiece are given, and at 11 o'clock 1 bushel of mangolds are given; at 4 o'clock p.m., 1 bushel of grains and chaff; and at 6 about 2 lbs. or 3 lbs. of hay. The cows are not untied, that they may not mix together, and their water is carried to them. We feed often, and avoid giving large quantities at once.

“Lime on the floors, gas tar enough to be not offensive, and ten drops of arsenicum (3rd dilution) in the drinking water; great cleanliness, and all the provender good; not putting too many in one shed; good ventilation at the top; no draughts:—These are my precautions.”

Nearer London still, the management is almost exactly that of the London cowhouses. Mr. Sumpton tells me that he feeds his cows at his farm in Hendon parish exactly as he does his cows in Little Warner-street, only beginning an hour earlier, so as to give time to bring the milk in. No attempt is made to cool it for transmission this short journey, but it arrives warm an hour after milking, sometimes however the worse in summer-time for even so short an interval.

Mr. Panter who manages Lord Granville's large dairy-farm at Golder's Green, upon the Finchly-road, thus described the management of his cows, in evidence before the Royal Commissioners on the Cattle Plague:—

“We give about a bushel and a quarter, or from that to a bushel and half of brewers' grains to each cow, and about 15 lbs. of hay, and about 30 lbs. of mangold wurzel, with 4 lbs. of meal (pea-meal principally), in addition to that feed in the winter. In the summer, grass is given instead of hay and mangold wurzel. This mode of feeding, though it damages the constitution of a cow, is adopted in order to force the greatest quantity of milk which the dairyman can get. The gain more than covers all the loss; at least it is supposed to do so. In our suburban district we give them more air, and feed them more on grass in the fields. We do not feed them so heavily upon grains and artificial food as they do in London. We give them much more natural food. Some turn them out from about July to October; and some do not. The cows always lose condition by being turned out; that is invariably the case. They

lose milk, too, to the extent of a quart a day, unless the pasture is very good indeed."

It is plain that the London cow management for milk production is certain to be followed wherever it can, if cows lose both flesh and milk when turned out to grass. Mr. Balls, who manages the dairy-farm at Oakington, near Sudbury, in the occupation of Colonel the Hon. W. P. Talbot, has kept from 80 to 100 cows constantly in stalls. They are milked at 3 and 4 A.M., and again at 1 and 2 P.M., and are fed exactly on the London plan, first on grains, a bushel between two, next with a little hay, then with a bushel of either cabbages or mangolds, and then again a little hay,—in the afternoon grains and hay and water (they are only watered once a day), and again hay before night. The alteration in summer is a substitution of grass for hay and mangolds. A small quantity (3 or 4 lbs. a day) of meal is given along with grains in the case of cows nearly dry; or rather this used to be given, for Mr. Balls now declares that there is no profit in the attempt to put on extra flesh with extra feeding, so long as meal is so dear and meat so cheap. He contrives, however, by careful purchasing to get cows which will put on flesh without extra feeding as they get dry.

At Lodge Farm, Barking, where several cowhouses holding 60 cows a-piece have been built at intervals of 200 or 300 yards from one another, in the midst of 50 acres of land, which is being irrigated with North London sewage, and has been thus producing enormous crops of Italian rye-grass, the rule of London management has been till lately carefully followed. A bushel of grains between two cows has been given immediately after milking, and followed by a little hay (a truss amongst 10 or 12 cows). They were then watered freely, and afterwards 30 or 40 lbs. of pulped mangolds mixed with hay chaff were given, and the cows were left. The treatment in the evening was exactly the same, except that a little hay was given when they were bedded-up for the night. In this case distillers' grains were used; and whenever the supply failed us the milk ran short at once. The yield dropped one-fifth, sometimes one-fourth, at the very next milking after the missing meal of grains, and brewer's grains were a very inefficient substitute for them. The quantity of milk would however gradually increase again under other feeding, as soon as the cows had taken cordially to the new ration whatever it was, but in no case did it ever amount to the quantity which was quoted when they received their fill of distillers' grains. Latterly, partly owing to the cost and difficulty of obtaining these grains, and partly because it was desirable to test the value as cow food of sewage-grown Italian rye-grass given by

itself, the mode of feeding has been altered. Several cowhouses were supplied with grass alone during the past summer, receiving nothing else whatever, and about $1\frac{1}{2}$ cwt. a day was the average consumption per cow; and though the substitution of a bushel of grains for $\frac{1}{2}$ cwt. of grass was at once followed by an increased yield of milk, yet the latter was so much the dearer food that the balance of profit was against it as long as grass was not valued at more than 18s. a ton upon the land. In winter we are giving mangolds, hay, and meal, without grains. In one shed at present 25 cows nearly dry are receiving 16 cwts. of mangolds, 7 trusses of hay, 100 lbs. of barley meal, and 80 lbs. of cake; which is 70 lbs. of mangolds, 8 lbs. of hay (these are given as chaff and pulp), 4 lbs. of barley meal, and about 3 lbs. of cake per fatting cow. In another shed where 58 are being fed, 17 of which are freshly calved cows, and the rest are in about half milk, the consumption is 2 tons of mangolds, 12 trusses of hay, 7 trusses of straw (all chaffed and pulped and mixed) 56 lbs. of meal, and 36 lbs. of cake. This amounts to about 80 lbs. of mangolds, and 16 lbs. of mixed hay and straw (with 3 or 4 lb. of meal and cake to a few of those most nearly dry or in heaviest milk). The 17 cows in full milk get 13 lbs. of hay, 76 lbs. of mangolds, 2 lbs. of meal, and 2 lbs. of cake a-piece, costing at current prices rather under 2s. a-piece. They gave at first on the average 2 barn gallons (= 16 quarts) a-piece, which are worth delivered in London 3s. 4d.

I add here, from the paper on this subject read before the Society of Arts, a table giving the daily winter rations of a cow in 13 cowhouses, of which the owners were good enough to describe to me the management:—

No.	Cows Milked.	Daily Winter ration of a Cow.				
		Grains.	Hay.	Distillery Wash.	Mangolds.	Meal or Cake.
	No.	bushels.	lbs.	gallons.	lbs.	lbs.
1	108	$1\frac{1}{2}$	15	..	30	3 (F)
2	40	1	14	..	40	2 (F)
3	68	1	?	..	42	?
4	10	$1\frac{1}{2}$	12	..	60	2 (F)
5	100	$\frac{3}{4}$	9	..	56	3
6	20	1	6	..	56	3
7	?	1	14	..	28	Pint of condiment.
8	50	1	12	..	28	Peck of bran.
9	?	$1\frac{1}{2}$	9	..	28	Pint of meal.
10	?	$1\frac{1}{2}$	15	..	30	?
11	50	1	14	..	25	5
12	?	$1\frac{1}{2}$	7	..	60	4
13	?	$1\frac{1}{2}$	11	6	42	3

The letter F intimates that the meal or cake was given only to fattening cows. It will be seen that in only one house was distillery wash given; and I believe that though productive of a great quantity of poor milk, it is not by any means a common article of food in London dairies. Its reputation as a washy food may, however, have hindered my being told of its use. There is nothing, I believe, that more excites the milk secretion, and when given fresh along with other substantial food, no objection can be made to its use.*

In only one other particular does town dairying differ from that of country farms. No attempt is made to breed from the cow. It is very rarely indeed that a bull is kept, or that the cow receives one in a London cowhouse. She is kept till the quantity of her milk no longer pays, and she is then sold. In the country, on the other hand, it is of course generally the policy of the farmer to keep on his better cows for several seasons, and to breed from them. But the management in that case in no respect differs from that of ordinary dairy-farms, which is not my subject; and even as regards suburban dairies this perhaps more properly comes under the third section of my subject—the general treatment of the cow.

TREATMENT OF THE COW.

In so far as the feeding of the cow belongs to this part of the general subject of town dairies—and of course it is the most important part of it—the only remark that need be made after what has been already said is that the food must be always good of its kind, and regularly and punctually given. Faulty food soon shows itself in the quality of the milk; and irregularity in feeding or any other disturbance of so sensitive a creature as a milch-cow is sure to be followed by a diminished yield of milk. Swedes and common turnips taint the milk; and if given at all should be used either in small quantity with other food, or, what is better, cooked in a hot mash.† I have given cabbages for months together to upwards of 100 cows without any particular care being taken to keep spoiled or rotten leaves out of the manger, but I have never found the milk tainted by them. To steam food which has any aroma belonging to it communicable to the milk is of course, as already said, the best way to make it

* It is, however, objected to the use of distillery wash, and in a less degree to that of grains, that the milk derived from their use as a food needs to be consumed at once, as it will "turn" more rapidly than the milk of grass-fed cows. I know of no direct experiment on this point, and can only refer to the impression which some milk dealers have that this is so.

† Here, too, attempts are made, by using saltpetre in the water with which the cans are washed, and by putting a little in with the milk itself when they are filled, to get rid of any taint which it may possess.

harmless. But though I have been over 60 London and suburban cowhouses, I know of none where cow food is steamed or cooked, excepting only Mr. Dancock's shed at Brompton, and there the steaming goes merely to the manufacture of a gruel to be thrown over an uncooked food, as hay, chaff, or grains. It is nevertheless certain that steaming food, wherever labour is not very costly, or where the existing hands have time to spare for the purpose without interfering with their efficiency elsewhere, improves its nutritiveness, and may be confidently recommended.

A correspondent of the 'Agricultural Gazette' some years ago thus described his management of cows in winter time. He said:—

"I have a boiler containing about 40 gallons, and into it I put about 50 lbs. of turnips, a considerable quantity of water, and about 12 lbs. of straw cut into chaff, and this is boiled for about two hours, when it becomes a dark nasty-looking mess; one-half of this is taken out into two tubs, and whilst warm $1\frac{1}{2}$ lb. of bean or pea-meal is stirred into each, and then given to each cow at about 110° of heat. That which is left in the boiler remains till morning, and if well covered up is still warm enough for use; it is then mixed with the pea or bean-meal, as before, and given to the cows at break of day; this, with hay *quantum suff.*, constitutes their daily diet; and I get about $6\frac{1}{4}$ lbs. of butter weekly from each cow. The butter produced in this way has no taste of turnips; and the avidity with which the cows eat this boiled mess is a good criterion of its value. When given to the cows it should be thin and sloppy."

Mr. Horsfall's management as regards steamed food for cows, already described in this Journal, is no doubt fresh in the memory of its readers.

He gave his dairy cows rape-cake, of the kind termed 'green' cake, which imparted to the butter a finer flavour than any other kind of cake; and in order to induce them to eat it, he blended it with one quarter the quantity of malt-dust, one quarter bran, and twice the quantity of a mixture in equal proportions of bean-straw, oat-straw, and oat-shells; all well mixed up together, moistened, and steamed for one hour. This steamed food had a very fragrant odour, and was much relished by the cattle: it was given warm three times a day, at the rate of about 7 lbs. to each cow (or 21 lbs. daily). Bean-meal was also scattered dry over the steamed food, cows in full milk getting 2 lbs. per day, the others but little. He found this substance to be an unfailing means of keeping up the condition of cows while giving milk. When the animal had eaten up this steamed food and bean-meal, they were each supplied daily with 28 to 35 lbs. of cabbage from October to December, of kohl-rabi till February, or of mangolds till grass time; each cow having given to her, after each of the three feedings, 4 lbs. of meadow hay (or 12 lbs. daily). The roots were not cut, but given whole. The animals were twice a day allowed to drink as much water as they desired. After the date of his original report, Mr. Horsfall discontinued the use of bean-meal owing to its comparative price, and gave in its place, along with about 5 lbs. of rape-cake, an additional allowance of malt combs, and 2 or 3 lbs. of Indian corn-meal per cow. On this food, in instances actually observed, his cows gave 14 quarts of milk a day, at the same time that they gained flesh at the rate of about $\frac{1}{4}$ cwt. per month.

These instances, however, of the use of steamed food in country experience are perhaps the less likely to induce any alteration in town cowhouses, from the fact that there a large portion of the dairy food, viz., brewers' and distillers' grains, has already gone through a cooking process.

But the thing of all others, so far as my experience has gone, which is most important in order to the sweetness of the milk is, that the water given to the cows be clean and good. In one of the Lodge Farm cowhouses the tank sunk for the reception of grains, large enough to hold two or three days' supply when firmly trodden into it, had not been built water-tight, and the leakage of stale grains escaped and tainted the well, at some little distance (in a gravel subsoil), from which the cows were watered; and the milk of several milkings was utterly spoiled before the cause of the mischief was discovered. It arrived in town during two or three days stinking of foul grains; and there is not a more offensive smell. The foul water given to the cows was I believe the sole cause of the misfortune, for it ceased soon after pure water was supplied. Good food and water, regularly given, are thus essential parts of successful cow-keeping. It should be added here that the proportion of soft and succulent dry food should be regulated with regard to the condition of the dung. If a cow becomes at all costive she loses milk at once. The dung ought to be rather loose than otherwise, in order to keep her in good productive condition. I need hardly say that quiet and gentle treatment of the cow is also an important point; and an ample interval of absolute rest between feeding and milking, during which the less she is disturbed the better, contributes materially to her productiveness at the pail.

One of the things which most strikes a stranger who first enters a London cowhouse during winter is the warmth in which the cows are kept. Experience has proved that this, too, has an important influence on their productiveness. They stand very thickly on the ground—one to every 30 to 36 square feet; the windows are closed and matted, and no thorough draught allowed; and thus the shed is warmed. There is generally room enough overhead, and perhaps a tiled roof, which allows ample ventilation; and thus, where the shed is kept tolerably clean, the air is sweet enough, as well as warm.

Very little litter or other bedding is used. I have been over large suburban cowsheds where none whatever is used. The cows stand so close to each other that they cannot get across, and thus the dung and urine fall from them into the gutter behind them, from which it is cleared twice or thrice a day, and the lair—an earthen floor—is thus kept dry. At the Lodge Farm we have used sawdust. At present 8 cwt. is the daily

allowance in two sheds containing 85 cows, and there were exactly 21 tons of dung removed from these two sheds last week, being 3 tons daily. Most of the urine runs into a tank, only a portion of it being retained in the litter that is used. Two or three bushels of sawdust are, in the first place, put under every cow, and thereafter one bushel daily is sufficient, as much being daily taken as fast as it gets soiled. The quantities amount to about 11 lbs. per cow added, and 80 lbs. of dung per cow taken; so that we collect about 70 lbs. per diem of the actual *fæces* of the animal. I may on this refer to a letter received twelve years ago from Mr. Telfer, of the Canning Park Farm, near Ayr, who kept 48 of the small Ayrshire cows for a butter-dairy. He found that these cows yielded 60 lbs. of dung and 18 lbs. of urine every twenty-four hours. Taking their smaller size into account, this agrees very fairly with our experience at Lodge Farm. He adds that the cows yielding most milk, at the same time yielded the most dung and urine; which is not surprising, seeing that these are, in fact, the *débris* of a manufacture, and must be greater or less according to the quantity of raw material which passes through the machine. Mr. Telfer's cows lay on a cocoa-nut matting, their dung and urine falling into an accurately-made gutter, which was cleaned out perfectly by a single draw of a drag made to fit the groove. In London cow-houses the rough causewayed floors are cleaned out with besom and spade into a dung-pit, which the sanitary inspector requires to be emptied at intervals; and the gutters in well-managed houses are washed down from the pail.

THE COWHOUSE.

The mode in which the cattle are housed is an important part of their treatment.

As regards the existing cowhouses I cannot do better than quote, in an abridged form, the description given of them in the Paper read before the Society of Arts:—

“A London cowhouse may be, and often is, a piece of ill-conditioned, rather ricketty old stabling, with a sort of brick-built manger on the floor, the length divided by short and scanty stall divisions, 7 feet or $7\frac{1}{2}$ feet apart, furnished with ropes or straps or chains, with running rings, so as to tie up two cows between each pair. This floor is roughly causewayed, and there is a gutter lengthwise down it, parallel with the manger, and a little more than a cow's length from it. The house may be only wide enough for a single row of cows, or there may be one on either side, with the gutter between them for the drainage of both. I am now referring to the average style of the smaller and inferior cowhouses in the city, and in the poorer districts of the metropolis. The roof is either low, with plenty of ventilation through its loosely-lying tiles, or if higher, there is a ‘tallet’ or floor overhead, where hay and other food are placed, and in which wide spaces are left next the walls and over the heads of the cattle, and then the space of this upper room is measured

into the 1000 cubic feet per cow, which is the rule that must be observed (for instance, in St. Pancras) if the cowkeeper wishes to avoid being opposed for a renewal of his licence. There are window places, which at winter time are closed, perhaps with a bit of sacking nailed over them.

"It is either a clean and tidy place, where both the cowmen and their stock are clean and dry and comfortable, everything in its place, the animals all lying down, having comfortably fed, and the air with no other perceptible smell than that of the chloride which the careful owner sprinkles once or twice a day along the gutter—or, it is a filthy hole. In general the accommodation—limited as it is—is quite apart from the dwelling-house, but there are exceptions even to this.—Such is the smaller but most numerous sort of London cowhouse.

"Go a step higher, and you come upon a class of men many of them also occupying small farms near town, all of them employing very considerable capital. They keep 30, 50, 80, or more cows apiece, and these are lodged either in larger establishments of the kind already described—not unfrequently ram-shackle old buildings with yards attached, either with double-roofed cowhouses, or covering a square, sometimes with a floor overhead, and at others open to the roof, where the cows are arranged, first around the walls, and then in a square block head to head in the middle. Sometimes there are parallel rows of roofing together, and double rows of stalls under each. And here, too, there is the same variety of management as to cleanliness and order. I could point out some samples even of this higher class, which are unquestionable nuisances, and others as clean and sweet as a parlour; for in this middle class of cowhouses, as they may be called, there are examples of the very best style of cow accommodation.

"Take for example Mr. Dancock's dairy already named: you enter through a wide gateway a passage roofed with glass, covered with vine-leaf and sometimes grapes, leading you to a well-kept yard, with clean and comfortable cowshed on one side, and stabling, hay-house, and food-store on the other, and an inner cowhouse further on. Elsewhere, still in Chelsea, you may enter a larger yard in a poorer neighbourhood, and find shedding closed against the winter, providing as good accommodation, in single rows, for as good a herd of dairy cows as I ever saw—cleanliness and order being apparent everywhere. Or you may pass from a well-kept mews into a lofty, clean, and, though ceiled, well-ventilated and well-drained apartment, at least 12 feet high, with, I should suppose, 60 square feet of standing ground to every beast—warm, well-watered, and well-fed.

"In Marylebone (at Mr. Drewell's, Upper Weymouth-street) you find in a good street, a corner shop, where the side road leads to a well-kept first-class mews. The master takes you through his three-storied cowhouse, as you may call it—and first into an apartment for 12 or 16 cows, which is the quarantine station through which, after some weeks' trial, they pass into the other rooms, one directly overhead reached by a sloping gangway, and the other along-side but lower down. The floors are all closely bricked in cement, the upper one being laid on brick arches, and the drainage is everywhere perfect. Nowhere are there better, cleaner, neater, and sweeter cowhouses than, taking these examples as an illustration, may be kept and are to be found in London streets.

"Lastly, I come to the larger establishments, where 200 cows and upwards may be milked. And here, too, you find two classes of establishments—houses, on the one hand, where you can touch the ceiling, dark and dirty, and crowded with unfortunate beasts; or where, in spite of ample space and lofty roof, the poor cows are comfortless and filthy—and places, on the other hand, where the accommodation is first-rate, roomy, clean, and comfortable—a single cattle shed, it may be, like Mr. Camp's, in St. Pancras, in the midst of

a large and roomy yard, 90 yards long and 26 feet wide, with a broad gangway between two rows of cattle—or several sheds, clean, dry and warm, each well managed, placed at intervals in a clean and spacious yard, such as Mr. Veale's first-rate establishment, in the Acacia-road, St. John's-wood.

Such then are the London cowhouses, of many sizes, and of at least two styles of management, in one of which a daily cleansing of the whole establishment, dung-pits included, insures perfect order and condition; and in the other, muddle and dirt easily create a nuisance."

To this I add a short description of the cowhouses erected on the Barking farm to which I have referred, which are complete and satisfactorily-equipped cow-sheds. They were designed by Mr. James Avis, one of the clerks of works employed by the Metropolis Sewage Company. Intended to hold 60 cows, with room for fodder, shed for grass and roots, pit for grains, well, tank for urine, safety for tools, and sleeping apartment for men, they are boarded buildings 120 feet long, and 26 feet wide, 10 feet high to the eaves, with boarded and felt-covered roof. The beams, morticed into uprights at 2 feet below the eaves, are 7 feet 9 inches from the ground, and carry a floor along the middle about two-thirds of their length in width, and extending the whole length of the building, except in the central shedding for grass, which is open to the roof. The cows stand back to back, the mangers lying along the sides of the building, and a central gangway, $5\frac{1}{2}$ feet wide, lying between the two rows. The space is thus open to the roof above the heads of the cows, and there is ample ventilation, by means of flaps under the eaves, louvre ventilators in the ridge, and open doors at either end. The sleeping-room for the men—a space about 15 feet square—is boarded off from the upper flooring, which is used for storage of hay and straw.

Near the middle of the house—14 pairs of cows being on one side, and 16 couples on the other—boarded up so as to make two separate cowhouses on each side of it—is the shed for grass and roots, 15 feet wide. Underneath one corner of it is the well and pump, and in the other the grain-pit. Here, too, is a lock-up for the tools employed. Into this shed the carts are backed and tilted, and the food—grass, or roots—lies stored here, midway of the cattle which are to consume it, so as to economise the labour of distributing it. The whole surface covered by the roof is laid out for the most part with a common brick floor on concrete. A tiled drain runs down the middle, 2 feet deep, to take the urine to the tank at one end of the building. The mangers along each side of the building are about a foot off the ground, brick-built and cemented, so as to be fit for holding water as well as food. They are about 2 feet wide and 6 inches deep. A pump, drawing from the well, is furnished with a moveable spout, so that each of the four sections into which the

mangers throughout the building are divided may be supplied with water in succession. The cows stand two and two in seven-foot stalls with short wooden divisions. The lair next the manger is rammed earth, the latter half of its length is a brick floor. It is 6 feet 3 inches long (from the manger to the gutter), and there is a drop of 4 inches into the gutter, which empties at intervals into the central drain. The gangway behind the cows and between the two gutters is $5\frac{1}{2}$ feet wide; and in this central gangway a wooden tramway is sunk flush with the brick-floor, on which a truck runs from one end of the shed to the other, and is used to collect the dung when the shed is being cleaned, and to carry it to the manure stance at the further end near the tank. The cows are secured by neck-chains and sliding rings to long upright iron staples in the posts, each on its own side of the double stall. The whole thing is compendious, not very expensive (costing about 4*l.* per cow), and economical of the labour performed in it; and this is a very important consideration.

HEALTH OF THE COW.

The treatment of the cow has thus been discussed under the several heads of food and water, regular and gentle attendance, and accommodation, including reference to its lair and to the ventilation and warmth of the air it breathes. And on these particulars, if the cow be free from illness when she is bought, her health depends. But she may be purchased with the seeds of disease already implanted, and she may thus bring disease to others as well as suffer it herself. Generally the first symptom of any impending attack is a diminution in the milk. Mr. Mosey, of the Albion Dairy, Barnsbury, tells me that he has long been in the habit of daily recording the milk of every cow, just for the sake of having this indication brought immediately under his attention. And the cowman who is constantly in attendance on a dozen cows, of course at once detects a failing of this kind, whether he records it or not. The loss of milk sometimes appears even before a loss of appetite. In such a case, when the cattle plague has been about, the rule has always been immediately to send the cow to market: and even now, if the cow is half fat, it is the best policy whenever, if guided by these symptoms, the owner believes a serious attack of any kind to be impending, to sell the cow at once. For the avoidance of disease, and even it is believed for the cure of it, when only the germ exists, it is a good plan in the case of all newly bought cattle to give a drench of one ounce of nitre in a quart bottle of water, into which 4 ozs. of flour of sulphur have been well shaken. I have known dealers of large experience thus drench all

their cattle immediately after leaving the fair where they have been bought; and there are stock-owners who invariably give this drench at spring and fall of the year, when a change of food is general; and in both cases it is said that great advantage is derived in the consequent freedom from diseases such as foot-and-mouth disease, which are picked up in markets, or happen at the change of the season. And the practice may therefore be recommended to any one who is buying country cows for a London cowhouse. Of course when your stock is attacked by any malignant disease like cattle plague, there is no help for you in any such expedient as this. I have gone through an experience of this kind, 127 cattle out of a herd of 238 having been slaughtered on the Barking farm in August last year, owing to an attack of cattle plague. Here the only safeguard for any neighbouring cows is entire seclusion. Refusal of admission to strangers when any infectious disease is near is the only hope of avoiding it. Daily sprinkling with chloride of lime along the gangways after they have been cleansed; hot lime thickly spread in all entrance ways through which those going to and fro must tread, and above all, a strict quarantine—must be insisted on. Two of the cowhouses on the Barking farm containing 111 cows were thus saved while the cattle plague was raging in the homestead and in other sheds along the thoroughfare only 300 yards away; and I have no doubt that the safety of these was owing to the entire isolation in which for a month they were kept. The attendants on these cows, whether men or horses, were refused access to any other part of the farm for that time, and the cowmen were strict prisoners for a month.

Before referring to the produce of the cowhouse, and to the quality and quantity of the milk obtained in it, it is proper very shortly to insist on the essential need of cleanliness. This though especially required in the dairy is desirable everywhere. The cow, like all other animals, is the happier and more healthy for it. The dairy vessels must of course be clean, the pails must be scoured and rinsed after every milking. The milk is poured from them through a strainer at once into the can or "churn," which stands ready to receive it at the cow-house door; and in a suburban farm it is at once lifted into the spring-van which takes it directly up to town. Or in the case of a farm farther afield, the churn is placed to stand in water and its contents are cooled down before being sent away. These "churns" must be scalded and rinsed after being emptied at the dealer's; and when returned to the farm they must be again scoured, and scalded, and rinsed, before being used. There is a boiler in the washing-house on the Lodge Farm, Barking, with a steam-pipe from it lying along

the floor; and steam-jets rise from it. After they are scoured the churns are put upside down over these, and receive a very thorough final cleansing by a jet of steam playing thus for four or five minutes within them. They then stand on an open floor in an open shed to drain and cool, and are fit for use. Cleanliness and coolness are essential things. Having these, and providing as rapid a transmission as possible, the consumer, will receive the milk, such as it may be, at its very best.

THE MILK PRODUCE.

What this milk is, however, depends upon the cow and the treatment of her, to which we have been referring. The milk of every cow has its own natural standard of quality, but taking the case of each apart, her milk is rich or poor, *first*, according to her nearness to the time she calved; and *secondly*, according to the quality of her food. The milk of a big ordinary cow, bought half fat for a London cow-house, will throw up 14 to 16 per cent. of cream in three hours in the lactometer during the first few weeks after calving; and the same cow similarly fed will not yield much more than half so good a quality, when after six or eight months milking she is rapidly diminishing her quantity. At an equal age however at the pail, the London cow, fed so as if possible to maintain or increase her flesh, will yield a richer milk than a country-fed cow which is being milked at grass. The way to keep a uniform quality when, as in London, a great part of of the food (grains and hay) is constant throughout the year, is to keep buying in fresh cows in pretty constant numbers, throughout the year. But except in the poorer districts, where the demand for milk does not vary throughout the year, this is not commonly done. A London cowshed in the west-end for example, is full only during the spring and summer months when London is full. And as it is then that a richer milk is wanted for the sake of the cream which is required at "good houses" during the season, that is the proper time to buy in freshly calved cows. And, as the quotation given at the outset of this essay proves, dealers do not scruple to take a portion of the cream it throws up, and even to add water before selling the thus manufactured article as new milk.

As regards the average quantity of milk yielded by a cow under the circumstances of a London cowhouse, I have been told that this very dishonesty is sometimes a difficulty in the way of obtaining trustworthy information. The small cowman who, by adding water, sells more than his cows produce, will, it is said, report a yield larger than the truth to cover his roguery.

At many small cowhouses which I visited two years ago I was

told that 11 and even 12 quarts a day are obtained on an average throughout the year; that is to say a house of 10 stalls always full will yield $10 \times 365 \times 11$ quarts of milk per annum, which is equal to 40,150 quarts or 1000 gallons per stall. If, as is probable, these cows are changed every 8 months on an average, then 10,000 gallons is the quantity yielded by 15 cows during the 8 months after calving before they are sold. Each cow therefore yields 666 gallons in its 8 months milking. This, though a large quantity, is not incredible. In the case of the Frocester Court Dairy (Gloucestershire), of which a full account has been given in the 'Bath and West of England Journal,' Mr. Harrison (now one of H.M. Rivers Pollution Commissioners) found that of his 104 cows, 8 in the first year of milking (calving at $2\frac{1}{4}$ years old), yielded 317 gallons per annum; 15 also in their 1st year (but brought to the pail at 3 years), yielded 472 gallons; 14 in their 2nd year averaged 535 gallons; 15 in their 3rd year averaged 616 gallons; 20 in their 4th year made 665 gallons a-piece; 18 in their 5th year yielded 635 gallons; 9 in their 6th year made 708; 15 aged cows averaged 651 gallons a-piece. These figures, however, give only an approximation to the truth if they be taken to indicate the average yield of milk of a cow at different ages; for doubtless in a large herd like that of Frocester Court, the bad milkers, which would keep down the average of the 1st or 2nd year, would be culled out, so that only the better cows would remain. It is cows in their 3rd, 4th, 5th, and 6th year of milking which are found in London dairies; and such cows at Frocester, depastured in the summer, yielded from 650 to 700 gallons of milk a-piece per annum. They were however milked 10 months, whereas the London cow is got rid of after 8 months milking in the case I have supposed. But the quantity of 11 and 12 quarts a day, which is the extreme report of some of the smaller cowkeepers, does not seem on a comparison with Frocester so incredible. On the other hand if you consult the larger cowkeepers, supplying dealers who come and milk the cows paying for what they take away, they will tell you that the average yield does not exceed 9 or $9\frac{1}{2}$ quarts a day to every stall. It is plain that where cows are kept on till their daily yield is 5 quarts or less, in order to get fattened before sale, the average must be less than where the cow is got rid of sooner, and a greater loss submitted to upon her sale. On Lord Granville's farm at Golder's Green, Mr. Panter, his lordship's agent, has told me that 3900*l.* was received one year for the milk of 100 stalls; in another year the sum received was 4300*l.* from 108 stalls constantly occupied; and in a third 4900*l.* was received from 120 stalls. This at 1*s.* 10*d.*

per 8 quarts, which was the price received, amounts to 851, 868, and 891 imperial gallons per stall per annum, or $9\frac{1}{3}$, $9\frac{1}{2}$, and $9\frac{3}{4}$ quarts respectively per cow per diem. This is where about 150 cows were purchased and sold every year at a loss varying from 3*l.* to 4*l.* a head to keep 100 stalls constantly full. The cows were thus kept upon an average 8 months each, and two-thirds only of the above quantities, 568, 587, and 594 gallons are all that was taken from each cow during the 8 months it was kept.

I was informed that 89,236 imperial gallons were obtained in one year upon Colonel Talbot's farm at Sudbury from 80 stalls. The cows were sold earlier than at Golder's Green, not being kept longer on the average than six months (153 having been sold and bought to keep 80 stalls full). In this case no less than 1115 gallons was obtained per stall per annum, or fully 12 quarts per stall per diem. The cow here yielded 560 gallons in little more than 6 months; which is an enormous quantity for the average of so large a number as 80.

I have yet two other cases by which to illustrate this point—the small dairy in Islington and the farm at Barking, to both of which I have already referred. In the former there are (Jan. '68) 17 cows in milk, and they are giving rather over 140 quarts a day, or about $8\frac{1}{4}$ quarts a-piece; but many of them are old cows, and some, an unusual thing, are in calf and nearly dry. The owner tells me that the quantity calculated on in a shed of 20 Irish cows is an average of 10 quarts a day a-piece. He seldom keeps a cow after she gets down to 6 quarts; and, as he considers it does not pay to fatten cows in London, he sells at an average loss of 4*l.* or 5*l.* a head. Buying them at from 12*l.* to 18*l.* a-piece, or at an average of 15*l.*, he has generally sold them at an average of 11*l.* He has given me the following account of six cows during the past year, which, however, represents more than his ordinary experience.

No.	When Calved or Bought	Cost a-piece.	Daily Produce in Quarts.		
			Till June.	June till September.	September till December.
	1867.	£.			
1	February 5	18	16	14	12
2	" 7		13	11	8
3	July 12	15	..	12	11
4	" "		..	12	10
5	August 3	15	..	14	13
6	" "		..	12	10

Of a small shabby-looking little cow I saw there the other day the following history was given me:—She was in heavy milk when attacked by the cattle plague in the summer of 1866, which of course entirely stopped her milk. She recovered, however, and her average produce amounted to twenty quarts a day for nearly three months after her recovery. It averaged seventeen quarts a day during the next six months; and twelve quarts a day for another six months; and it is now shrinking rapidly, as she is in calf; but she is still giving seven quarts a day. We occasionally meet with extraordinary examples of this kind, where cows remain for years together in milk without breeding; but, like all other agricultural maxima, they have little or no influence on the general average of experience.

I have now to relate the experience of a year at Lodge Farm, Barking, notwithstanding that, owing to the disaster in August, when more than half the cattle were slaughtered by orders of the Cattle Plague Inspector, the returns do not so accurately represent ordinary experience as would otherwise have been the case. I give in the following table the number of cows milked each week up to the end of 1867, the quantity of milk sold each week, and the daily average per cow during each week. It will be seen that 126 cattle were killed in the middle of August. We have not ventured to purchase again till lately. Twenty newly calved cows were bought two months ago, and are now averaging rather more than three gallons a day apiece. But there are a large number of cows giving hardly more than six or seven quarts a day upon an average, which have been long at the pail, and which there is no profit in fattening. Most of them accordingly have been got in calf, and are drying rapidly. This, of course, is much against the average of the year. On the other hand, a large number of cows were killed off in full milk. So that while there are a hundred cows or more which have been ten or eleven months at the pail, and which pull down the annual average, there are more than a hundred on the list of the year which were only two or three months in milk when slaughtered; and, they, on the other hand, contributing more than the ordinary daily quantity, increase the average. It will be found on an examination of the following table that about $139,746\frac{1}{2}$ gallons have been given in 65 weeks by 57,334 days' milk of a cow. This is equal to rather more than $9\frac{2}{3}$ quarts a day per cow; which very closely resembles Mr. Panter's experience at Golder's Green. See opposite page.

The true significance of these figures will perhaps better appear if the amounts which they indicate for twelve months be taken out. In the table at p. 28 accordingly I have given the quantity

Week ending.	Number of Cows at end of Week.	Number of Days Milking of a Cow during Week.	Total Produce of Milk during Week.	Gallons per Cow Daily during Week.	Week ending 1867.	Number of Cows at end of Week.	Number of Days Milking of a Cow during Week.	Total Produce of Milk during Week.	Gallons per Cow Daily during Week.
1866.	Cows.	Days.	Gallons.	Gallons.		Cows.	Days.	Gallons.	Gallons.
Oct. 5	8	56	161	2.88	May 24	247	1,720	4,589	2.66
" 12	8	56	188	3.36	" 31	252	1,764	4,830	2.72
" 19	14	93	310	3.32	June 7	252	1,764	4,827	2.72
" 26	23	148	435	3.06	" 14	253	1,765	4,750	2.68
Nov. 2	23	161	545½	3.38	" 21	255	1,775	4,688	2.63
" 9	23	161	549	3.4	" 28	255	1,785	4,501	2.54
" 16	23	161	540	3.34	July 5	255	1,785	4,262	2.39
" 23	28	191	596	3.12	" 12	255	1,785	4,054	2.27
" 30	35	231	695	3.0	" 19	247	1,729	3,910	2.26
Dec. 7	35	245	777	3.08	" 26	247	1,729	3,832	2.21
" 14	44	276	824	3.0	Aug. 2	237	1,659	3,739	2.25
" 21	46	312	958	3.06	" 9	237	1,659	3,658	2.20
" 28	53	346	1,095	3.14	" 16	116	1,239	2,488	1.76
1867.					" 23	111	777	1,458	1.89
Jan. 4	57	384	1,170	3.04	" 30	111	777	1,431	1.85
" 11	61	411	1,234	3.0	Sept. 6	111	777	1,405	1.82
" 18	70	458	1,365	3.0	" 13	111	777	1,403	1.82
" 25	72	496	1,475	2.7	" 20	111	777	1,418	1.82
Feb. 1	77	524	1,575	3.0	" 27	111	777	1,443	1.88
" 8	87	594	1,736	2.92	Oct. 4	111	777	1,414	1.82
" 15	87	609	1,831	3.0	" 11	111	777	1,339	1.73
" 22	94	651	1,929	2.96	" 18	111	777	1,359	1.74
Mar. 1	95	695	1,961	2.8	" 25	100	739	1,338	1.82
" 8	132	793	2,167	2.6	Nov. 1	100	700	1,266	1.8
" 15	169	1,040	3,067	2.94	" 8	92	644	1,190	1.82
" 22	186	1,238	3,631	2.92	" 15	92	644	1,121	1.74
" 29	192	1,357	3,970	2.92	" 22	92	644	1,060	1.64
April 5	204	1,420	3,876	2.72	" 29	92	644	983	1.52
" 12	207	1,434	3,698	2.40	Dec. 6	90	630	987	1.56
" 19	202	1,437	3,675	2.56	" 13	79	578	1,087	2.09
" 26	203	1,421	3,702	2.6	" 20	78	546	1,099	2.19
May 3	203	1,421	3,615	2.54	" 27	73	511	1,076	2.1
" 10	224	1,515	4,040	2.60	Total ..		57,334	139,746½	2.44
" 17	224	1,568	4,351	2.77					

of milk produced in twelve months, dividing it by the number of days of a cow milked during those twelve months; and so representing the average daily produce of the cow during the whole year.

I fear that these figures (let alone the fact which we may infer from them, that disastrous losses, if not from cattle plague, from pleuro-pneumonia and from foot-and-mouth disease, are possible) are not particularly encouraging. We have been receiving 1s. 5d. to 1s. 8d. the barn-gallon—*i. e.*, from 2½d. to 2½d. per quart—for this milk upon the farm. We have been paying more

Year ending	Quantity of Milk produced.	Number of Days of one Cow.	Daily Milk per Cow.
	Imp. Gallons.		Imp. Gallons.
Sept. 27, 1867 ..	124,427½	48,723	2·55
Oct. 25 , , ..	128,783½	51,440	2·5
Nov. 29 , , ..	131,478	53,811	2·44+
Dec. 27 , , ..	132,073	54,897	2·41—
67 weeks ..	139,746½	57,334	2·44—

than 1s. a week per cow for cowmen; the grains and meal and hay consumed, with grass at 18s. a ton cut and delivered at the cowhouse, have cost 9s. to 12s. weekly; the loss on sales has been at least 2s. a week per cow: and taking rent of sheds into account, the cow has cost more than from 13s. to 15s. a week. It is plain that wherever the average yield throughout the year falls below ten quarts a day, there must be a loss, if the cowkeeper does not receive a higher price than I have named.

The dairy-farmer who disposes of his milk at the nearest station for 2d. a quart, makes perhaps more of it than he could by cheese or butter, and he saves a good deal of the labour for which, as a cheese or butter farmer, he has hitherto had to pay. But it is right to warn any one who thinks to begin dairying near town in any locality where the industry is new, that his labour-bill will be a very great difficulty in his way. I need not, however, illustrate this at any greater length. Enough has been said to show that the profits of the honest wholesale cow-keeper are earned with difficulty.

The commercial aspect of this subject as distinguished from the agricultural, must be treated very shortly in this Journal. I have little to add to the information collected two years ago for the Society of Arts. From returns then made by asylums, schools, and institutions (not infirmaries, or hospitals, or workhouses, where special dietaries exist), it appeared that 2·5ths of a pint of milk a-day is the average quantity which a mixed population of healthy people consumes when its diet is under medical direction. And in some places the actual consumption approaches this quantity. Thus the town of Stirling, which has a population of 12,500 persons, was then supplied by 190 cows in

the town, besides 200 gallons a-day of buttermilk (a most nutritive and useful food) brought in by rail and otherwise. There was here a cow to every 60 people; and this, at the average of 800 gallons yearly to every cow in milk gave 100 imperial pints per annum to every man, woman, and child, or about 2-7ths of a pint a-day a-piece, very nearly the medical standard; and indeed exceeding it when the 200 gallons a-day of buttermilk are taken into account, for this would furnish half a pint a-day to the 3200 belonging to the labouring class in a community of 12,000.

The English town of Mansfield may be fairly compared with the Scottish town of Stirling. It contains about 10,000 people, and 108 cows. Taking these at 800 gallons a head per annum, and adding 20 gallons of skim milk daily, of which I heard as being sold in the outskirts of the town, there were only nine gallons (72 pints) per annum for each inhabitant, or 1-5th of a pint a-day a-piece—one half the medical standard.

Take, now, Bedford:—It contained in 1865, at the time of my inquiry, about 15,000 people, and 100 cows: and 123 gallons of milk, the daily produce of about 50 other cows, were brought in daily by railway. 150 cows to 15,000 people are one cow to 100 people, about the same as at Mansfield; and this, at 800 gallons a cow, is about 70 pints a year, or 1-5th of a pint a-year a-piece—one-half the medical standard.

If then 1-5th of a pint a-day be taken as the quantity, not which ought to be, but which is consumed in general by a mixed population of English people, then the 3,000,000 of our London population require 300,000 quarts a-day; and this, at 10 quarts a-day from each cow or rather from each stall, indicates 30,000 stalls occupied by cows kept upon the London plan as needed for the London milk supply. And if people were fed according to the medical rule of our selected institutions, twice this number of stalls, representing about three times that number of cows per annum, would be needed for the supply. At the time of my inquiry into this subject, two years ago, I ascertained that the usual number of cows kept within the metropolitan district was about 24,000; and between 30,000 and 40,000 quarts of milk a-day, in addition to the town production, were then being brought in from the country, which must have needed 3000 or 4000 cows for its production; so that the total number of cows then engaged in supplying London fell considerably short of the number indicated by the average of such towns as Bedford and Mansfield.

During the cattle plague more than half of the 24,000 London cows disappeared, and the railway delivery of milk rapidly increased, and though, as the London cowhouses have

again filled, the country trade has somewhat declined, yet the quantity still delivered is very great indeed.

The following table, of which the figures have been most obligingly supplied to me by most of the leading metropolitan railways, indicates the growth and, in some measure since the spring of 1866, the decline of the trade.

MONTHLY DELIVERY OF MILK (IMPERIAL GALLONS) BY METROPOLITAN RAILWAYS.

	Great Western.	North Western.	Great Northern.	Midland.	Great Eastern.	South Western.	London and Brighton.
Jan. 1865	8,954	14,168	14,904		76,818		13,547
Feb. „	9,460	13,024	15,276		76,846		13,872
Mar. „	14,590	12,752	16,416		74,783		14,891
April „	11,775	10,242	18,216		84,452		17,424
May „	13,050	6,624	20,124		69,891		17,258
June „	14,932	6,656	20,392		68,212		21,992
July „	12,791	8,480	20,556		82,525		19,239
Aug. „	23,474	23,152	20,952		70,005		17,322
Sept. „	59,782	76,160	21,924		101,212		22,251
Oct. „	103,214	123,952	26,016		112,890	116,560	23,483
Nov. „	116,802	116,700	27,576	3,760	88,714	112,800	19,394
Dec. „	140,293	148,296	27,180	10,120	109,325	116,750	21,816
Jan. 1866	143,600	155,952	30,348	23,620	95,269	97,812	21,604
Feb. „	186,764	143,880	31,608	20,740	106,483	107,772	22,884
Mar. „	201,686	158,484	33,516	21,980	116,700	116,352	26,663
April „	211,016	142,188	35,516	18,100	145,647	161,448	30,725
May „	285,918	125,208	39,492	15,000	120,993	133,476	35,508
June „	221,851	95,352	37,512		120,178	135,516	42,696
July „	166,892	80,304	39,012		109,973	164,268	34,171
Aug. „	153,766	64,572	38,292		109,431	112,716	30,813
Sept. „	110,159	53,772	35,280		109,362	137,976	29,710
Oct. „	115,834	63,072	36,444		107,955	114,024	34,399
Nov. „	120,346	59,936	35,316		107,542	111,276	28,717
Dec. „	126,819	66,564	33,336		109,295	119,388	28,792
Jan. 1867	118,870	63,480	31,668	12,528	110,048	118,824	32,649
Feb. „	131,210	54,648	29,784	16,368	102,500	112,152	27,478
Mar. „	156,579	61,908	37,128	16,284	106,228	124,584	30,086
April „	122,979	60,696	36,180	16,152	106,510	120,348	24,680
May „	160,628	54,156	38,316	12,816	106,968	126,720	30,691
June „	125,499	49,800	40,212	10,572	109,107	129,600	30,027
July „	112,233	49,752	43,392	11,676	105,542	132,012	39,457
Aug. „	118,720	39,084	42,744	14,244	105,487	126,576	42,240
Sept. „	95,965	38,088	39,788	16,764	109,605	118,224	38,051
Oct. „	86,668	50,640	40,728	13,068	107,561	124,140	59,526
Nov. „	149,510	50,652	38,772	19,908	128,084	121,176	32,630
Dec. „	123,121	60,528	37,884	19,920	126,784	125,916	31,739

It is this aspect of the subject which more than any other is directly interesting to the readers of this journal. So large an increase in the quantity of milk brought up to town as took place during the cattle plague indicated of course a very considerable alteration in the management and industry of many a dairy district. And as the facilities offered by the London railways

increase, and the methods of transmitting milk with safety are improved, so no doubt we may expect an extension of the trade between the London milk dealer and the country dairy farmer. The latter cannot generally make more than 7*d.* a gallon by cheese or butter and pork or bacon; and if the London milk dealer will give that or a little more at a distant railway station, it may be for the interest of the farmer to give up the expense and labour of dairy management, and in their place incur the risks and costs of a new and unaccustomed trade. The exchange has not always been satisfactory: for until, by cooling the milk before starting and by perfectly filling the cans and carrying them without excessive shaking, the liabilities to souring and spoiling on the road have been diminished or avoided, great losses, especially in hot weather, have been and will be suffered.

I say nothing here of other risks which interfere with the extension of this trade—the risk of bad debts which the farmer runs and the risk of adulterated milk which the dealer runs—for these are common to all commercial dealings. A London wholesale cowkeeper will receive from his customer who comes to his cowhouse and milks his cows 3*d.* or 4*d.* an imperial gallon more than the farmer will receive for country milk delivered, with all its charges paid, at the London terminus; not only because it is the produce of specially fed cows and perfectly fresh, but because it is certain to be unadulterated. I was told the other day by a London milkman that every barn gallon of such milk as his would “bear” a quart of water without any chance of the adulteration being detected by an ordinary consumer; and he had known that quart put in before the milk had left the country farm on its railway journey. The mere risk of such dishonesty is enough to lower the market value of the article to dealers, who probably would rather benefit by some such dilution than suffer from it.

I add from the information laid by Mr. Brooks of the London and North Western Railway before the Milk Committee of the Society of Arts the following particulars; which, being indicative of the management of the traffic on that one railway, are instructive on the subject of the railway milk traffic generally.

The milk is brought to Euston Square from all railway stations between London and Northampton; being conveyed (in cans provided by the senders) on open carriage trucks. The charge for a distance not exceeding 100 miles is 1½*d.* per imperial gallon, and when the distance exceeds 100 miles 2*d.* per gallon. When the great increase in the traffic commenced, milk was sent up from places 180 and 200 miles distant—from Huddersfield, Macclesfield, &c. The greatest distance from which milk is sent now is about 95 miles. The carriages which are used for the conveyance of the milk are as well constructed

as they can be in respect of the springs, as it is desirable that the milk be as little shaken on the journey as possible. —The French milkcans are about half the size of those used here. Our cans are much too large and too heavy to be loaded and handled by one man. Their shape too hinders close packing; they are broad at the bottom and tapering towards the top. The French cans, from their cylindrical shape, can be packed with greater economy of space. The French milk trucks are very much like the narrow-guage sheep-truck used in this country, with two floors, one above the other—two tiers, in which a great number of cans can be packed, and there is a circulation of air all round them. On the other hand the French cans are heavier per gallon of their contents than the English; and it is not likely that the former will be adopted.

It is a stipulation with the dealers that their men shall assist the railway porters in unloading the trucks, because the cans are too heavy to be handled by one person. The weight of a can filled with milk is nearly 200lbs. The trade has come to be of such an extent as to lead to the despatch of special trains for the purpose; and the milk is brought to the various stations in time for them. One train arrives in London at a quarter to twelve in the forenoon—for the afternoon supply: and the second train arrives about half-past eight in the evening—for the next morning's supply. During the time of the greatest scarcity of milk, an arrangement was made for bringing cream from a distance so remote as Carlisle; and that was done by the article being placed in small cans—much smaller than the French milk-can—and carried suspended in the truck; but, when it arrived in London, it was found that the cream was reduced almost to the consistency of milk. That trade was therefore abandoned.

Mr. Brooks, in reply to the questions of the committee, stated that no other means are now taken by the railway company to develop the milk trade than the putting on of more trucks and eventually establishing special trains for it. He says that those who make complaint about the rates of carriage cannot have calculated the price per ton at which the company carry the milk, or they would have found that the milk, including the weight of the cans, is carried a distance of 100 miles for 1s. per cwt. When the milk train arrives the dealers assist in the unloading of the vans, and the milk is carried away in the dealers' own conveyances. He was not aware of any other means by which the milk could be more promptly or more rapidly distributed than it is under the present system.