

The practical grocer : a manual and guide for the grocer, the provision merchant, and allied trades / by W.H. Simmonds ; with contributions by specialists, trade experts, and members of the trades ; illustrated by a series of separately-printed plates.

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Publication/Creation

[London] : Gresham Publishing Company, 1904.

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THE PRACTICAL GROCER



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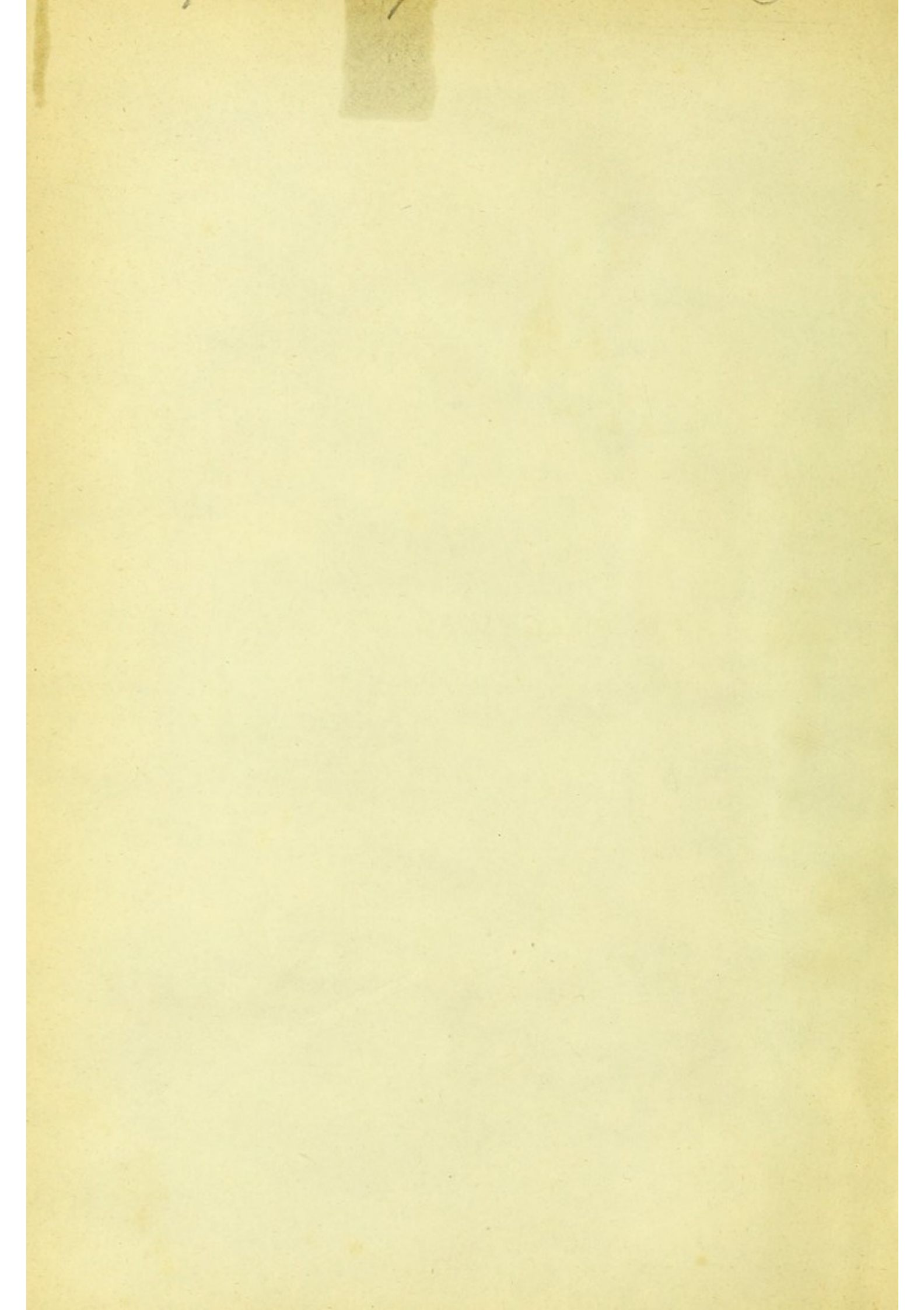
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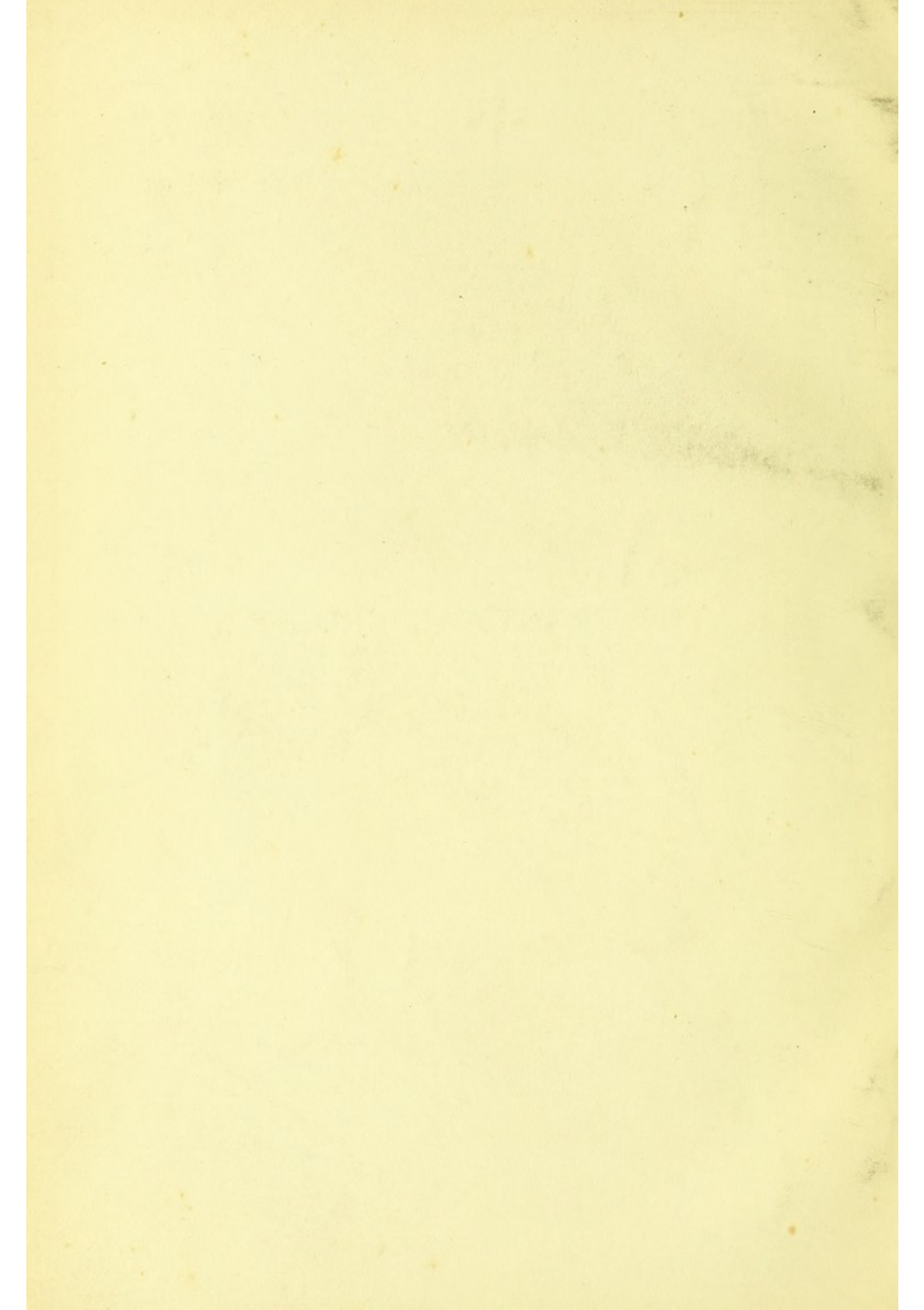
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THE PRACTICAL GROCER







UNLOADING SALMON AT A CANNERY

Fraser River, British Columbia

UNLOADING SALMON AT A CANNERY

In the provision trade and those allied with it, the tinned-salmon industry has become one of great importance, and there is little doubt that it will continue to grow. North America is the great source of supply, and the Fraser River, which flows into the Pacific Ocean from amidst the snowy mountains of British Columbia, is one of the most famous centres of the trade. The natural wealth of that river in this article of food is but feebly suggested by the illustration, the quantities of fish sometimes taken being so enormous as almost to surpass belief.



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THE PRACTICAL GROCER

A Manual and Guide for the
GROCER the PROVISION
MERCHANT and Allied Trades

BY

W . H . SIMMONDS . F . J . I .

With Contributions by SPECIALISTS
TRADE EXPERTS and Members of
THE TRADES

Illustrated by a Series of Separately-Printed Plates

VOLUME THREE



THE GRESHAM PUBLISHING COMPANY
THIRTY-FOUR SOUTHAMPTON STREET STRAND W.C.
1905

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THE PRACTICAL GROCER

PROVISIONS, &c.

I. SOURCES OF SUPPLY

Of all trades, that in PROVISIONS affords perhaps the most striking example of the change wrought in comparatively recent years by the remarkable development all over the world of the means of rapid transport and intercommunication. The reason of this is, of course, the extremely perishable nature of most of the goods with which the provision merchant is concerned, and which are the subject of this volume. But this is only one side of the trade's development.

The century just closed saw a wonderful process of change of a double nature, and which on both sides directly affected the trade in perishable provisions. On the one hand, the farthest parts of the earth were linked up as it were by avenues of steam transport, traversed by modes of locomotion ever becoming speedier, whilst the avenues themselves were constantly being shortened by the construction of railways or canals to save detours. On the other hand, we had the application of science to the means of arresting the perishability of the foods themselves. By freezing and refrigerating, by cold stores on land, cool chambers on steamers, and refrigerated cars on railways, a revolution has been effected in the transport of food. Yet this is not more important than the contemporary revolution brought about by preservative processes, the use of such agents as borax and salicylic acid, and the enormous development of the canned-food industry. The combination of these factors, the various improvements in the means of "keep-

Cold Trans-
port and Pre-
servatives.

ing" food, side by side with the constant acceleration of transport, has in the course of a few generations completely transformed the food trade of the world. And as all routes nowadays lead, not to Rome, but to Great Britain, to London, Glasgow, Liverpool, Bristol, Hull, and the other ports around these small islands of the United Kingdom, we are in the unique position of living upon perishable foods drawn from the farthest corners of the earth.

With the goods of many trades rapid transport is not essential. The railway theorist who "thinks in continents" is apt to overlook in his schemes the practical fact that for a great number of commodities cheapness rather than speed is the prime necessity in transportation. We know, for instance, that the Suez Canal has changed the course of all our own trade with the East, so that since 1869 the sending of China produce by sailing ship round the Cape of Good Hope or Cape Horn, of which trade the races of the tea "clippers" were an annual feature, has almost died out. But the great Russian tea trade with China, which, next to the transit to London, represents much the largest volume of tea traffic passing in one channel, is still carried on mainly by overland transport, by caravan, enormous quantities of tea compressed into flat tablets or "bricks" being carried by camels out of the Kalgan Gate of the Great Wall through Manchuria or Mongolia to Siberia—or, now, by the Trans-Siberian Railway; whilst other large quantities of tea for Russia are carried by sea to London, and thence to the interior through the Kara Sea and the Gulf of Obi or the Yenisei River, opened up by the famous Captain Wiggins. The camel caravan, again, is still the great means of transporting produce in Persia, Turkestan, Afghanistan, and elsewhere, and to such places as Smyrna, Damascus, and Trebizond; while in Africa produce is still largely carried on by recognized cross-country trade routes by means of native bearers. For many kinds of goods and raw produce such slow modes of transport as the sailing ship, the camel, the ox-wagon, or even the human bearer, tramping for months with the load upon his head or shoulders, may still continue to be employed long after speedier means are available, cheapness, not time, being the determining factor.

It is otherwise with perishables. With these the demand

depends greatly on the season when they reach the consuming market, and although refrigeration has much simplified the problem, rapid transport may make all the difference as regards the date of arrival and the freshness, and therefore saleableness of the goods. Hence we see how it was that at the beginning of the twentieth century the Siberian railway in a comparatively few months effected a most important change in the British butter market, Russia at once stepping into the position of a chief source of supply, and the white "butter trains" of refrigerated cars becoming an immediate feature of commercial Siberia.

The importance of the change effected by the application of the freezing process to meat is shown by the fact that we commenced the twentieth century by importing, in 1901, Foreign Meat Imports. no less than nine million cwts. of frozen meat, the supply of this food to our markets being ten times what it was only twenty years earlier. In fact, the importation of frozen meat has created an entirely new class of meat consumers in the United Kingdom, large numbers of the artisan classes having become meat-eaters who were not so before, others eating more largely, and many others now eating meat instead of cheese.

The canning and preserving industry has also made vast strides. In the first year of the present century it is estimated that the United States alone exported nearly seventy million lbs. of canned meat. The previous year considerably over a thousand million lbs. of vegetables were canned in the States, besides over three hundred million lbs. of fruits, and over a hundred and sixty million lbs. of salmon, sardines, and other fish—an industry in the introduction of which a large part was played by Mr. Charles Mitchell, a Scotsman who had learned the trade in Aberdeen. In France and elsewhere the canning industry has The Canning Industry. reached enormous proportions. To enumerate all the kinds of foods now thus dealt with would need a whole volume. In 1902 Dr. Dutton's Senegambia Expedition carried with it, to mitigate the hardships of up-to-date African exploration, such articles as bottles of anchovies, blanc-mange, meat extract, cherries, chutney, lemon essence, figs, apricots, parsley, mint, and ginger syrup, lemon syrup, lime-juice cordial, olives, chow-chow, walnuts, onions, plums, sauce, vinegar, &c.; tins of baking-powder, barley, arrow-root, cocoa, coffee, milk, butter-beans, currants, curry-

powder, peeled apricots, peaches, pears, plums, and strawberries, baked beans, jams, julienne, lunch tongues, marmalade, mustard, peas, pepper, salmon, sago, sardines, sardines with tomatoes, corned beef, army rations, tongue, brawn, hare soup, chicken broth, mock turtle, tomato soup, oxtail, tomatoes, asparagus, biscuits, butter, and plum pudding; jars of extract, bloater paste, chicken, crab, shrimp, lobster, and game; and tabloids of saccharine.

It is well known that Ireland is an important contributor to the provision supply of Great Britain as handled by the provision merchant, a great deal of Irish bacon, Irish butter, and other produce such as eggs being imported for consumption on the British side of St. George's Channel, whilst Ireland also sends over three-fifths of the cattle and sheep imported alive to Great Britain, and a large number of pigs to be fed up there and turned into prime English bacon. But until 1902 no official statistics were kept of this important British-Irish trade, interesting as it is to the producers, distributors, and consumers on both sides. Again, the reader hardly needs reminding of what a large proportion of certain kinds of provisions is produced in Great Britain itself—the fresh butter, “new-laid” eggs, York and Cumberland hams, Wiltshire and other home-cured bacon, Cheshire, Stilton, and “English Cheddar” cheese, Loch Fyne herrings, “finnon haddies”, Whitstable oysters, Yarmouth “bloaters”, and so on through a wide gamut of food supplies of the highest recognized quality. Of all these home supplies we can offer but little statistical information; but with the colonial and foreign supplies which now figure so largely in the provision trade, so far as our readers the provision merchants are concerned, the case is different, full official records being kept of the importations.

In the first year of the present century we paid for imported frozen and other “dead” meat, £39,987,806; for live cattle and sheep, £9,400,033; for condensed milk, cheese, butter, and margarine, £29,777,934; for eggs, £5,495,776; for lard, £4,037,690; for fish, £3,619,129; and for poultry and game, £980,739—nearly a hundred millions sterling for these items of food alone. The following list from the official statistics of 1903 gives some interesting totals, which we have arranged in the order of values:—

Home
Supplies.

Importation
Statistics.

Imports.				Quantity.	Value.
Butter	...	...	...	4,060,694 cwts.	£20,798,707
Bacon	...	...	...	5,156,988 "	13,619,140
Live cattle and sheep	...	...	...	876,787	9,755,185
Frozen beef	...	...	...	4,159,606 cwts.	8,366,141
Frozen mutton	...	...	...	4,016,622 "	7,826,062
Cheese	...	...	...	2,694,358 "	7,054,710
Eggs	...	...	...	2,381,867,280	6,617,599
Lard	...	...	...	1,732,790 cwts.	3,870,774
Hams	...	...	...	1,141,332 "	3,142,574
Meat preserved (not salted)	...	...	...	767,563 "	2,435,777
Margarine	...	...	...	882,123 "	2,313,618
Condensed milk	...	...	...	915,717 "	1,738,931
Frozen pork	...	...	...	705,844 "	1,555,452
Meat unenumerated	...	...	...	663,261 "	1,206,052
Poultry and game	...	...	...	—	1,202,288
Rabbits	...	...	...	475,645 cwts.	723,881
Salted pork	...	...	...	237,574 "	319,256
Salted beef	...	...	...	173,692 "	245,605

Besides these there were the fish. Not to mention shell-fish, it is estimated that there were landed on our coasts in 1901 nearly sixteen million cwts. of fresh fish, worth over nine million pounds sterling (England and Wales, £6,521,815; Scotland, £2,237,952; Ireland, £284,735), yet we also imported seven hundred and fifty thousand pounds' worth of fresh fish (mainly from Norway), and cured or salted fish to the value of nearly three million pounds sterling.

It will be seen that, by value, *Butter* is by far the largest single item in all our imported provisions. For the United Kingdom the official statistics give the number of cows kept as about a hundred per thousand of the population. Of the total number of cows and heifers about 75 per cent are supposed ^{Butter.} to be giving milk all the year round on the average, and each cow is supposed to yield in the year 531 gallons of milk (49 cwts.). Of the total milk-yield 15 per cent is assumed to be used for the calves, 32 per cent for butter-making, 20 per cent for cheese-making, and the remaining 33 per cent consumed as fresh milk. A ton of milk is supposed to yield 80 lbs. of butter, or 220 lbs. of cheese. Making these assumptions, it is calculated that in the United Kingdom the quantity of butter produced in 1900 was about eighty-eight thousand tons, and the quantity of cheese about a hundred and fifty thousand tons. With regard to the butter

production of Ireland separately, it may be mentioned that in 1903 the Cork Butter Market Trustees estimated the approximate value of the butter produce of Ireland as £8,000,000. Cork, by far the most important Irish butter market, received in 1902 91,700 firkins of butter, of which 52,000 firkins were of the heavily salted kind. Irish butter-making has undoubtedly been greatly improved of late years by the adoption of more scientific methods, but the following resolution passed by the Grocers' Annual Conference in 1902 tells a tale:—"This Conference of the Federation of Grocers and Provision Merchants of the United Kingdom strongly deprecates the primitive, unbusinesslike, and unscientific methods of the railway and shipping companies for the conveyance and exporting of Irish butter, the consequence being that the butter industry of the finest butter-producing country in the world is thereby seriously injured, as evidenced by the fact that butter from Australasia, a distance of 14,000 miles, is delivered in Great Britain in much better condition than a large quantity of the butter exported from Ireland. The Conference would urge upon the Irish carrying companies the great importance of adopting refrigerating cars for the conveyance of butter from inland districts, and cold-store chambers at the wharves and in the steamers—methods of transit which have been in existence for many years in all other butter-exporting countries." Equally significant is the following from a review of the butter trade in 1901:—"There is very little doubt that the main reason why the home production of butter does not increase is that the knowledge of how to make butter on a commercial scale, equal to the quality made in the colonies and foreign countries, is unknown to our farmers generally. Their methods and appliances are antiquated, and thus their labour is not nearly so productive as that of their rivals. In most foreign countries and in the colonies the governments, by means of experiment stations, colleges, schools, and the publication among the farmers of the results of the experiments, and of agricultural research generally, have educated the farmers in their business to a degree almost unknown in this country."

Transport of Butter. It is but fair to say with regard to the Irish supply that the Irish Department of Agriculture has given special attention to the subject of packing and transport, and in June, 1901, issued a circular which stated *inter alia*: "Having regard

to the nature of the article concerned, and to the great importance of the butter trade of the country, the department consider that every practicable step should be taken by the consigners to secure that, so far as lies in their power, the butter shall reach the markets in good saleable condition. The department accordingly desire to invite attention to the following suggestions:—

“All butter should be packed in a cool temperature, and when being put into boxes, kiels, &c., it should be packed full up to the lids.

“The sides and bottom of the boxes should be constructed of wood not less than one-half inch thick, and the several parts should be securely fastened together by nails and sufficient tin clasps, or by some other proper method. The packages generally should be made of sufficient strength to bear the strain of ordinary transit. Wooden handles securely attached to the sides of the boxes are an advantage.

“All packages should be neatly finished off, and be perfectly clean and fresh looking. They should, during transit, be enclosed in clean covers of canvas or other suitable material.

“Due care should be taken to guard against the packages being soiled by careless handling. They should not be put in an uncleanly place, or conveyed in an uncleanly vehicle, or allowed to come in contact with any material likely to injure them in any respect. When being conveyed to the railways or steamships they should be protected from the weather.

“The large boxes or chests in which lump butter from the country markets is conveyed to the stores and factories of Irish merchants should, in every instance, be thoroughly cleansed before being again returned for further use, and, to this end, it would be desirable that such boxes be lined with some suitable impervious material which can be efficiently washed with water, and which will not admit of any fatty substances passing through to the outer covering.”

In no industry, perhaps, have organization on a large scale, and state aid, as illustrated above, been applied more successfully than in dairying. Denmark and Russia, and also our own colonies of Victoria, New Zealand, and Canada, and now Ireland under her Agricultural Department, are all notable examples. The wonderful progress made in Danish butter—which in 1860 was reported “execrably bad” by the British vice-consul at Copenhagen—is attributed to technical education and the extension of the co-operation principle in dairy-farming. The co-operative dairies are societies from which each member receives a dividend proportionate to the quantity of milk delivered, less a deduction for working expenses. The first of these was founded in Jutland in 1882, and there are now (says a consular report of 1902) 1040 in operation, converting into

Danish
Dairying.

butter about 4,000,000,000 pounds of milk per annum. Not only do these co-operative dairies produce butter of a uniform quality, but the best results are obtained from each cow, by observing what foods are best suited for her, while in other respects every attention is paid to both quantity and quality. One of these unions of dairy farmers possesses over 6000 cows, producing 31,000,000 pounds of milk annually. The factory buildings of this union cover 2000 odd square yards, and consist of a three-winged building, a boiler-house, and an engine-house. The front building, which is 147 feet in length, is of one story, having an exterior discharging platform running the whole length, and also platforms on a level with it inside the building. One wing contains three departments, namely, a separator-hall, a weighing-room, and a cheese-room. All the floors are paved with tiles or concrete. Large skylights and ventilators, with adjustable blinds, are fixed in the ceilings. Close by is a rinsing-house in connection with the main building. At the end of the separator-room is the receiving-room and magazine for butter. The milk is conveyed to the dairy in specially-built wagons, and after being unloaded on the exterior platform, is taken through sliding doors to the separator-hall to the weighing machines, each capable of weighing 1000 pounds of milk at a time. There are six separators, each having a skimming power of 4000 pounds an hour. The separators are divided into two series, each of which has its own sweet-milk heater and cream pasteurizing apparatus. All waste water is collected in pipes under the floor, and conducted to a well, from which it is pumped up to a hot-water tank. All pails used are placed upon an automatic carrier, which takes them to the rinsing-room, where they are at once scalded and washed. Under the pail-carrier are tin gutters, into which the milk still left in the pails may drip while they are being conveyed to the washing-room. The consul also describes the cream and cheese departments, showing that in these matters, as in the butter export trade, co-operation in Denmark has risen to a high standard. Especially is this noticeable in the export of pork and eggs.

In Siberia the State, and the Siberian Railway constructed by the State, have been the prime movers in industrial development. Butter-making in Siberia is chiefly carried on in the districts along the Siberian Railway between the river Tobal (town of

Kourgan) and the Ob (Krivoshtchekova), a distance of 733 miles, or over an expanse of territory of about 150,000 square miles. Butter production in Siberia by the aid of separators dates from 1893, when the first dairy works of the Siberian Dairying. kind were opened in the district of Kourgan. An agricultural show at Kourgan in 1895 spread the new method of production, while an exhibition held at St. Petersburg in 1899 by the Imperial Economic Society brought the Siberian product to the notice of foreign buyers. The use of separators has now (says a Foreign Office report in 1902) extended from the western to the eastern districts, and covered the above-mentioned region. It will doubtless soon extend to the whole of the Barnoul, Biisk, and Semipalatinsk districts. The old method of disposal, once a year only, through the medium of the autumn fairs, chiefly at that of Ishim, has been practically abandoned both by Siberians proper and by Russian settlers. The chief impulse favouring the change was the opening of offices by foreigners for the purchase of butter in the centres of production themselves, first at Kourgan, then at Omsk, and then at other considerable butter-exporting stations. As a natural consequence of these offices buying butter not on credit but by settlement on delivery, or buying on commission, with advances of 90 per cent of the local cost, there grew up a tendency to form village dairy associations, this being the case more especially in the Omsk region. The Moscow Imperial Agricultural Society came to the assistance of the new industry by opening branches at Kourgan, Tomsk, and Omsk. By means of shows and periodical meetings of manufacturers and exporters, arranged by the Kourgan branch of the above society, producers and exporters were enabled to come into constant intercourse with one another, to exchange views in general, and to work out the best conditions and arrangements possible for the direct export of Siberian butter to the consuming markets, at the head of which is London, so as to do away, as far as possible, with intermediaries.

In Canada the State helps the farmer by training his intelligence, by showing him, in four great experimental farms under different climatic conditions, what can be done, and State Aid in Canada. how to do it; by collecting information; and by organizing transit in a way that no individual effort could emulate. The Canadian principle is that it is the business of the govern-

ment to take first risks. Where an experiment must be made, the government bears the cost. For instance, in one district the farmers discovered the benefit of co-operative dairying. The thing was an obvious success, but it would have taken generations for the plan to spread across the thousands of miles of Canada. The government took the matter in hand, established model co-operative dairies throughout the country, and now the farmers everywhere have taken up the system, and in fifteen years a change was accomplished which would otherwise have taken half a century. Not only does the Canadian Government teach its farmers how to grow produce, but how to get to market. Whenever there is a probability of a paying trade, it guarantees the cost of cold-storage cars for dairy produce sent to the coast. It has succeeded in inducing steamship companies to provide refrigerating plant and cool-air chambers for bringing produce to this country.

Agents in the ports in this country watch the unpacking and condition of every ship-load of produce, and report to Canada. Self-registering thermometers under seal are placed in every ship before leaving Canada, and the diagrams showing the temperature of the cargo throughout the voyage are posted back to the Dominion authorities. The produce is watched to its destination, and every care is taken that the Canadian farmer shall not suffer in reputation through ill-handling in transit. While doing all this for the farmer, the government is careful that the reputation of Canada shall not suffer by any malpractices among its own people. The production of margarine, or of cheese artificially "filled" with foreign fats, is prohibited by law, and there are stringent regulations as to fair and honest packing and branding of all goods. Care is also taken to help the farmer against his myriad enemies. Those birds and insects which make war on destructive pests are studied and commended to the farmer's protection; bacteria which promote plant life and help to conserve moisture in the soil are cultivated; boys and girls at school are trained to pick out from corn the grains which will be most reproductive as seed. Finally, a periodical circular telling all about science and markets is posted to fifty thousand farmers.

Nor is the State's activity less intelligently directed in our Antipodean Colonies, New Zealand being a particularly bright

example. The export of butter from Victoria may be said to date from 1889, when the creamery and factory system was inaugurated. No country exercises more careful state ^{Australian} supervision over the quality and exportation of its ^{Provisions.} agricultural products, this being done with the object of giving consumers in the countries to which they are exported, as far as possible, an absolute guarantee of quality, and in the case of butter, cheese, wine, and honey, perfect certainty of their freedom from adulteration. The butter, on being made, is put up in clean white Kauri-pine boxes, each containing 56 lbs. Each box is stamped with the district name of the butter factory. Refrigerator cars of the most recent American pattern have been built for the conveyance of butter from the inland districts, and by these it is brought by rail to the government cool-storage chambers at Melbourne. These buildings, erected for the cool storage of butter, frozen meat, frozen poultry, rabbits, and hares, are of great size, built on the most modern principle, and are among the finest of their class in the world, no expense having been spared to secure every known facility and advantage. Here the butter is all carefully inspected by government experts appointed for the purpose, every box passed as of first quality receiving the stamp of the Department of Agriculture. From these cool-storage chambers the butter is placed on board steamships fitted with refrigerating machinery, and carried by them to England. On arrival of steamers in London, a representative of the Victorian Department of Agriculture makes an inspection of the shipments of butter during discharge, in order to see that the contract of shipment has been carried out, and the butter landed in good condition.

In such ways as these are enlightened countries in all quarters of the world engaged in perfecting the supplies of dairy produce for our favoured tables!

It is estimated that for every lb. of *Butter* made in the United Kingdom, two lbs. roughly speaking are imported, and that nearly one of these is from Denmark! Denmark in 1903 ^{Our Butter} sent us more than ever before, the amount being over ^{Supplies.} one-and-three-quarter million cwts. The article is the most important item in the Danish export trade, being in value over one-third of that trade, and nearly the entire quantity comes to the United Kingdom. Next to Denmark came, in point of

quantity, Russia (12 per cent), France (11 per cent), Australasia (9 per cent), Holland ($8\frac{1}{2}$ per cent), Sweden (6 per cent), and Canada ($4\frac{1}{2}$ per cent). In 1903 the Australasian colonies sent to the British market 42,000,000 lbs., or 9 per cent of the total in value. It has not escaped notice of late years that Denmark is a large importer of margarine, and this fact, and occasional complaints that a good deal of other butter is shipped to Denmark and simply passed on, has helped the competitors of the Danes in the butter market; the Danish position, won originally from the Irish by the use of the Swedish separator and better methods of butter-making, being now challenged in turn, as we have seen above, by the butter from the centrifugal creameries of Ireland, Canada, the Argentine, Victoria, and New Zealand. In the Canadian butter trade rapid development began with the century, the total quantity shipped to this country by Canada in 1902 being 285,765 cwts. against 138,313 cwts. in 1900. About the same time the possibility of an Egyptian butter trade began to be discussed, the milk of the Egyptian cows being admittedly very good, and some enterprising Greeks having started dairies in Lower Egypt. The French butter trade with Great Britain has suffered much from the competition of Northern Europe and Australasia, but is still of very great importance. A noteworthy development of co-operative dairying has taken place in the Charentes and Deux-Sevres departments. In 1902 the British Consul at Cherbourg reported that about three-fourths of the

French Butter. butter exported from France went through that port from the surrounding districts, and was sent chiefly to the United Kingdom, being despatched nightly by the boat to Southampton. "This butter", said the consul, "is of the highest quality and well packed." In such delightful districts of beautiful Normandy as Pont l'Evêque, Caen, Vernon, and Gournay dairying is carried on to the greatest advantage, Bayeux being not more famous for its tapestry than for its butter, and the most perfect brand of French butter being marketed at Isigny; whilst Lisieux, St. Pierre-sur-Dives, Gournay, and Neufchâtel are noted for such *cheeses* as Pommel, Bondon, Neufchâtel, and Camembert. In Holland, a country of agriculturists and small holdings, the single province of Friesland exports annually nearly 30,000,000 lbs. of butter, a large proportion of which comes to this country.

The Dutch *Margarine* factories are most numerous in South Holland and North Brabant, each of which had ten at the beginning of the century, using large quantities of suet, cotton-seed oil, arachide oil, oleo, milk, and butter in the fabrication of this butter substitute. Margarine. Margarine we import to the extent of nearly 1,000,000 cwts., over 90 per cent coming from the ports of Holland, and the remainder from France, Germany, and the United States. There are several manufacturers of margarine in this country also; and the total number of wholesale dealers and manufacturers registered is nearly 3000.

Of *Cheese* the grand total of the home production and imports in 1901 was estimated to be some 278,000 tons, rather more than one-half of this being made in the United Kingdom, Cheese
Supplies. over 80,000 tons in the colonies (mainly Canada), and less than 50,000 tons in the United States and other foreign countries. In the imported cheese Canadian is easily first, that colony sending us considerably more than half of the quantity annually landed at our ports, and in point of value 56 per cent of the total. Next comes the United States cheese, about 25 per cent. Dutch cheese we import to a value representing regularly about 12 per cent of the whole. New Zealand sent us in 1901 some 4000 tons, Belgium rather less, France about 1200 tons, and a little came from other sources.

Bacon, which is so important an article on the British breakfast-table, we obtain in largest quantities from the United States. Of the 576 million lbs. of this article which we bought from abroad to supplement our home supplies in the year 1903, the States sent us 324 million lbs., Denmark Whence
our Bacon
comes. 168 million lbs., and Canada 75 million lbs. But although the United States bacon is thus in bulk nearly twice that from Denmark, the value is only three-quarters more, Danish bacon fetching the highest price. "While the United States", says a United States official report, "furnishes a much larger portion of the British bacon supply than either Denmark or Canada, the latter countries take greater pains to produce for export the particular grade preferred in the British market, and their produce accordingly brings on the average a considerably higher price than the bacon received from the United States." After the United States, Denmark, and Canada, the only sources from

which bacon was imported into the United Kingdom to any considerable extent are the Netherlands, Sweden, and Russia, but the combined importations from these three countries amounts to only about 1 per cent of the total. *Hams* also, so far as we import them, we obtain chiefly from the United States, although no imported ham compares in flavour with the home-fed product, whether English, Irish, or Scottish. Of the total importation

of 128 million lbs. of hams in 1903, the States sent us 105 million lbs. and Canada 22 million lbs., the former representing in value 84 per cent of the whole, and the latter 16 per cent. *Fresh Pork* comes mainly from the Netherlands and the United States, also from Belgium and Denmark, and a little from Canada, Australasia, and Argentina. Pickled or *Salted Pork* comes mainly from the States and Denmark, also from Canada and Germany, and a little from Holland and France. *Lard*, of which we take from abroad over 200 million lbs. every year, comes to the extent of 93 per cent from the States. Such figures as these indicate the enormous dimensions of the "hog-packing" industry in the United States. The following table from an official report gives detailed particulars of that industry in the States in the year ended March 1st, 1902:—

Hams,
Pork, and
Lard.

Hogs, packed	...	...	No.	25,411,676
Average live weight	...	...	Lbs.	214.15
Average yield of lard	...	...	"	31.60
Cost of live hogs, per 100 lbs.	...	...	Dols.	5.94
Aggregate live weight	...	...	Lbs.	5,441,898,000
Green meats made	...	...	"	3,047,462,000
Lard made	...	...	"	803,129,000
Aggregate cost of hogs	...	...	Dols.	323,346,000
Lard (Tierce=330 lbs.)	...	...	Tierces	2,433,700
Mess pork made	...	...	Barrels	106,195
Other pork	...	...	"	360,330

Amongst the United States towns concerned in the meat-packing industry in the same year, Chicago heads the list with £51,305,590, Kansas City £14,757,554, Omaha £13,577,946, besides the millions from New York and St. Joseph. The value of the packing industry of the States is estimated at no less than £157,000,000 a year. Our consul at Chicago reports that in the conduct and control of the industry the greatest care appears to be taken at every stage. Any packing-house doing business

with any State outside that in which it is built has to be placed under government inspection, and there are now (1902) 158 packing-houses under inspection by the Department of Agriculture. The killing process, the animals, and the meat are all under the eyes of the government inspectors, so that the result ought to be satisfactory, and few can peruse the details given in the consul's report without feeling convinced that an industry carried on in such a manner is on far more wholesome lines than are many of the private butchers' shops of the old-fashioned kind. In Canada the industry is carried on upon much the same lines, with, as we have seen, still greater regard to the special wants of the British market.

North
American
Meat.

Frozen meat comes, so far as beef is concerned, chiefly from the States, mutton from New Zealand, Argentina, and Australia. Of *Rabbits* we received in 1903 fully thirty-six million lbs. from New Zealand and Victoria, and further supplies from Belgium, New South Wales, Holland, Tasmania, France, and South Australia, in the order named, the British possessions supplying nearly 80 per cent of the total. *Imitation cheeses*, as well as *Lard substitutes*, come mainly from the States.

Canned foods of all kinds we obtain very largely from the United States and Canada, as well as from France, Norway, and elsewhere. The major portion of the supply of the choicest kinds of canned *salmon* comes from the Fraser River in British Columbia. The total pack of preserved salmon on the Pacific coast is estimated to exceed annually five million cases, and of this large quantity something approaching a moiety is sent over to the British market. Quite the largest in the world are the Canadian fisheries, embracing as they do fully thirteen thousand miles of sea-coast, in addition to inland seas, innumerable lakes, and a great number of rivers. The fisheries on the Pacific coast are extremely valuable and extensive, but as yet only partly developed. The North American sea-fisheries are well-nigh inexhaustible—a fact attributable to the fishes' food supply being brought down by the Arctic currents from the northern seas and rivers. This consists of living slime, formed of myriads of minute creatures which swarm in the Arctic seas and are deposited in vast and ever-renewed quantities upon the fishing grounds. Salt-water fishes of nearly every variety

Salmon and
other Canned
Foods.

are to be found along the Canadian coasts, but the marine fisheries of greatest commercial importance are the cod, herring, mackerel, lobster, salmon, and seal. The most valuable fishery of British Columbia is the salmon. Salmon literally teem in the Fraser and Columbia rivers, and during the seasons of the salmon runs, broad expanses of river or deep pools may be seen packed with wriggling masses of splendid fish making their way to the spawning grounds. The greater number of the canneries where these fish are put up for export are on the Fraser river, but there are some in the more northern part of the province. The salmon make their way for great distances up the rivers. The salmon of the Columbia fill the streams of the Kootenay; those of the Fraser are found six hundred miles in the interior. An American estimate gives over two million cases as the salmon pack of Alaska alone in 1901. Next in importance to the salmon of the Pacific coast amongst the canning industries of the States is the sardine canning of Maine—"the sardine being a general term applied by the Americans to various small-sized fishes varying in length from five to ten inches"—*vide* official report. The true sardine fishery, so long carried on at Nantes and elsewhere on the French coast, was almost non-existent ^{Fish} ^{Supplies.} in 1902, owing to the disappearance of the fish. The importance of the British fisheries in our food supplies need not be emphasized here. For centuries the East coast of Scotland supplied the Low Countries with fish, but the trade was at one time so completely in the hands of the Dutch that hundreds of Dutch busses came annually to the "Great Fishing", as many as two thousand being recorded as seen at a time in Bressay Sound; and till 1806, it is said, Dutch and Danish coins were commoner than British in Lerwick, and only twenty years later did the Shetlanders begin curing fish in any quantity for export, although herring curing became a Scottish industry early in the seventeenth century.

Regarding *Eggs*, this dip into history may also remind us that in 1615 the Privy Council issued a proclamation denouncing the unlawful and pernicious trade of exporting eggs. Fifty years ago our imports of eggs were about five per head of the population. In 1903 we imported more than fifty per head of the population, and consumed double that number. Of our enormous importa-

tion in that year, amounting to over two thousand million eggs, or close on 20,000,000 "great hundreds", valued at over six-and-a-half million pounds sterling, Russia sent us nearly seven million "great hundreds", Germany three million, Denmark nearly four million, Belgium about two-and-a-quarter million, France fully one-and-a-half million, and Canada 560 thousand "great hundreds". Note, however, that though Germany and Belgium are thus credited by the official figures only a small proportion of the eggs sent by those countries are produced there, Austria, Southern Russia, and Italy being the countries of origin of far the greater number. The phenomenal growth of the Russian supplies is chiefly attributable to improved organization for the collection, packing, and shipment of eggs, whilst the Canadian trade is chiefly the result of the M'Kinley Tariff Act, passed in the United States, for that measure forced the Canadian poultry-keepers to look out for a new outlet for their eggs, which previously had found a market in the United States. In the States themselves it is calculated that the poultry crop (80 per cent eggs) represents annually about £60,000,000, or considerably more than either the cotton or the wheat crop of the country. The decrease in the French exports to us is probably due to the following facts: that Italian eggs are less used in the south of France than formerly, which has led to a decrease in the quantity available for exportation from France; that owing to the increased British egg production the demand for best quality eggs is met to a greater extent than formerly by home supplies; and that a large quantity of Italian eggs, formerly shipped from France, are now sent through Germany and Belgium. Many millions of eggs are also imported from Egypt. Thus, it is argued, there is shown to be an ample field for a very large increase in the Irish egg supply to the British market, as well as for other home produce. Our annual consumption of eggs is now estimated to be about four thousand millions, of which half are foreign, one-third British, and the rest Irish. Besides eggs we import annually about a million pounds' worth of *Poultry and Game*, Belgium, France, and Russia being the chief sources of supply.

It may be interesting to add that in 1903, when giving evidence before the Royal Commission on Food Supply in Time

of War, Alderman Hinton, the witness for the Grocers' Federation, stated that retailers' total stocks of bacon average as a rule about twelve to fourteen days' consumption; of cheese, "Hand-to-Mouth" Stocks. from April to September about twelve to fourteen days' consumption, and from September to April from three to five weeks'; of butter, from seven to ten days' consumption; of canned meats, fish and fruits, about one month's consumption; of flour, not more than one week's average consumption; and of tea and coffee, about a month's. A careful consideration of the question of food supplies had impressed upon him, he said, that as regards the principal articles of our imported food we live very much from hand to mouth, and that although this has the advantage of saving storage, capital, and labour, and the waste of deterioration, any threatened interference with our supplies must cause great public consternation and serious disturbance in the markets.

2. BUTTER

Butter consists essentially of the fat of milk, invariably associated during manufacture with more or less water. In addition, it always contains a small quantity of the casein or curd of the butter-milk, and the natural colouring-matter of the butter; as well as a little milk-sugar in most cases. Salt may or may not be added: in England, Holland, Denmark, North Germany, and some parts of France the addition of salt is usual, even to "fresh" butter; in Switzerland and South Germany the butter is not generally salted.

The fat as it exists in milk is in the form of countless extremely minute globules, and it is these which make the milk white and opaque. About these fat-globules there has been a good deal of controversy, the point being to explain what precisely happens to make the butter "come" in churning. Without going into the technicalities of the matter too deeply, it may be said that on the modern view each of the globules is surrounded by a thin watery covering of the milk fluid or "serum". This acts, in keeping the globules separate, very much as though it were an actual membranous envelope; and the operation of

butter-making consists in collecting and uniting together a large number of these individual fat-globules. This is effected by the concussion produced in churning the cream or milk, whereby the globules are brought into closer contact with one another and eventually coalesce to form visible granules or lumps, which are afterwards incorporated together in larger masses.

Butter may be obtained either by churning the whole milk, as is done in many English districts; or from the cream which has first been separated. By far the greater part of the butter consumed in England is made in the latter way. The following is a short description of the principal operations involved, and points which arise, in the ordinary processes of butter-making at home and abroad.

Processes in
Butter-making.

Whole-milk Churning.—This method is chiefly used in those districts where there is a demand for butter-milk. Parts of Ireland and Scotland may especially be mentioned as “whole-milk” neighbourhoods. In this process, which involves much labour compared with cream-churning, the milk is usually kept for a few days—and sometimes even for a week or more—until it naturally coagulates, when it is churned as described later on. It is asserted, however, that this method is too haphazard to be depended upon for the certain production of choice butter. The coagulation and “souring” of the milk, depending as it does upon the micro-organisms which fall into the milk from the air, is of too fortuitous a nature to be always satisfactory, and the long keeping allows of objectionable fermentative changes occurring. Hence an improved method for whole-milk churning has been introduced in some districts. It consists in artificially coagulating the milk as soon as it reaches the dairy by pouring into it about three per cent of cream, milk, or butter-milk which has been previously carefully “soured”, and allowing the whole to ferment at a warm temperature (about 70° F.) for 24 to 36 hours. By this time the milk is thoroughly soured, and it is then churned without further delay.

Sweet or “new” milk is not used for butter-making, as the yield of butter is unsatisfactory.

Cream Churning.—In modern dairying the separation of the cream from the milk is now largely done by means of centrifugal separators. The older methods of cream-raising are, however,

still much used in this country, especially where small quantities are dealt with. Denmark was one of the first countries to use the centrifugal machine on a large scale, with what success the reputation of Danish butter is sufficient testimony. Probably no other invention has done so much to revolutionize the dairy industry. By means of this separator the cream can be extracted from the milk immediately after milking; a larger yield

The Separator. of butter (10 to 20 per cent more) is obtained; the product is cleaner and more uniform—a very important point where reputation is concerned; and the skim-milk left is perfectly sweet, so that it can be used for calf-feeding and other purposes. The principle of the machine is that during the rapid rotation of the drum in which the milk is placed the watery skim-milk, being heavier than the cream, is thrown farther from the centre, and so settles against the wall of the drum; whereas the lighter cream falls on the top of this skim-milk, *i.e.* nearer the centre of the drum. The milk is thus separated into two layers, one of skim-milk and the other of cream, which are drawn off by appropriate tubes into separate receivers.

Some of the best-known separators on the market are the “Alexandra”, “Danish”, “De Laval”, “Victoria”, and “Alpha”. Hand-separators costing about £25 each are in use on a number of farms in Ireland.

The older methods of cream-raising by “setting” the milk and allowing the cream to rise need hardly be referred to, except to mention that by the old “shallow-pan” methods the separation of the fat is never so complete as with the centrifugalizer. The best of the “rising” processes are those in which the vessel (“creamer”) containing the milk is placed in cold water or ice. These allow the cream to rise in about twelve hours, whereas three times as long is required by the pans. The ice and ice-water methods (Swartz and Hardin systems) have been much used in Northern Europe, but are, of course, less suitable for this country. Some of the best-known cold-water creamers are the “Jersey”, “Speedwell”, and “Cooley” vessels.

By whichever method obtained, the cream is generally slightly “ripened” or soured before being churned. Sweet cream gives a fairly good yield of butter, but less than sour cream. More-

THE MODERN DAIRY

Whilst steam machinery and the factory system have revolutionized dairying, as our text explains, there is still room for the small farm dairy if conducted on modern principles. In milk and the manufacturing processes connected therewith great attention has been given by scientists to bacteriological investigation. The microbe has been tracked to his lair and his habits very carefully studied. As a consequence there is now very little actual "handling", even in a small dairy where hand-power is the only force employed. The Swedish separator, worked by hand, is shown in our picture, and it will be observed that the butter-maker uses wooden implements instead of her hands. In fact cleanliness in every detail is the note of the modern dairy, and should be equally so in all handling of dairy products.



INTERIOR OF A MODERN DAIRY



over, it is asserted that butter churned from sweet cream lacks the fine "nutty" flavour which is imparted by slightly-ripened cream. Sour cream, too, is more easily churned, and if the souring has been properly done, it yields a ^{Ripening and Flavour.} butter which has the best keeping properties. For these reasons, therefore, the churning of sweet cream is carried out only on a somewhat restricted scale. By far the larger proportion of butter is made from cream which has been "ripened".

This ripening is done by warming the cream to about 60°–64° F. for about twelve hours, and mixing with it about 3 per cent of cream or milk which has previously been carefully soured. Such ripened cream yields from 3 to 6 per cent more butter than the sweet cream.

It may be mentioned that the "souring" is really due to the so-called "lactic ferment", a variety of micro-organism which is contained with others in the air and falls into the cream or milk, there developing, and producing acid from the milk-sugar. In the best modern dairies care is always taken to see that the smaller quantity of milk added as a "sourer" is prepared fresh every day; since, if it is too old, the lactic microbe becomes overgrown by the other organisms, and a bad flavour is thereby imparted to the butter.

In certain cases the cream is "scalded" before churning. When turnips have been much used for feeding the cows, and also at particular seasons when the grass is young, the flavour of the butter is liable to be very distinctly affected by the food on which the cattle are fed. In order to improve the taste in such cases it is the practice with some dairymen to scald the cream by dipping the can containing it into a vessel of boiling water—taking care, however, that the temperature of the cream itself does not rise above 150° F. Also in some parts of the West of England, particularly in Devonshire, the milk is scalded before removing the cream. The pans are set for creaming in the ordinary way overnight, and the next morning ^{Devonshire Cream.} are heated on hot plates until the layer of cream begins to show bubbles or blisters. The milk is then put aside to cool, after which the cream, now called "Devonshire" or "clotted" cream, is skimmed off, and either used as such or churned into butter.

Whether scalded or not, the cream is usually next strained through a fine sieve; and, when necessary, is mixed with enough colouring matter to give the butter a rich yellow or golden colour. Annatto is generally used for this purpose, but sometimes a yellow colour expressed from pulped carrots is employed; and also a coal-tar colour called "butter-yellow".

Next comes the actual churning operation. Success in this depends chiefly upon the temperature used: an error of a few degrees may spoil a whole churning. From 55° F. in summer to 60° F. in winter is the temperature usually found best; and the most satisfactory results as regards texture and "grain" of butter are obtained when the temperature and the shaking are so arranged that the operation lasts from thirty to forty-five minutes. Butter can be made to "come" in very much less time than this; but butter of the best quality, and of uniform excellence, which is neither soft and oily on the one hand, nor hard and friable on the other, can only be produced when the churning is carried on neither too slowly nor too quickly. The end of the operation is indicated by a change in the character of the sound produced by the swishing of the cream against the sides of the churn, and by this means an experienced ear can tell almost exactly when the proper point is reached. The true criterion, however, is the size of the butter-granules. These should be of about the size of an ordinary pin-head, and when this point is reached the churning should be promptly stopped. Much or most of the inferior butter produced is simply due to the churning being continued too long, whereby the granules become agglomerated into lumps, and enclose a considerable quantity of butter-milk, which cannot afterwards be got rid of without "overworking" the butter and spoiling its texture. When left in the butter, the constituents of the butter-milk are liable to give rise to those various objectionable flavours which develop in inferior butters on keeping. It is therefore necessary to remove as far as possible all butter-milk that may have become incorporated with the butter during its formation in the churn. For this purpose, after the butter-milk has been drawn off from the churn, the butter is washed a time or two in the churn with cold water, after which it is removed with a scoop and "worked" in a butter-worker. One form of this machine consists of a fluted

Causes of
Bad Butter.

wooden roller, working backwards and forwards in a rectangular tray. It rolls out the butter into a fluted layer by a forward movement, and in the return motion lumps it together again, this kneading process being continued as long as is necessary to remove the butter-milk and any excess of water. Any further working is to be avoided, for "overworked" butters are liable to be soft and to keep badly. By the use of a butter-worker it becomes unnecessary to touch the butter with the hands.

When the butter is dry-salted, the salt is sifted through a fine sieve on to the butter as it lies rolled out in a layer on the butter-worker. Lightly-salted butters, however, are often salted in the churn by pouring brine over them after the butter-milk has been drawn off. They are allowed to remain in this brine for a longer or shorter time, depending upon the degree of saltiness required. The quantity of dry salt used varies usually from about 2 to 5 per cent in the finished product; but nearly double these quantities may have to be actually added to the butter, because a large proportion of the salt is dissolved by the water and kneaded out during the working. The amount employed depends upon the market which the butter is intended for. In the case of Irish butters, for instance, common proportions are as follows:—

Fresh butter for London	...	2	ozs. salt used to	14	lbs. butter.
For Dublin	...	5	"	"	"
For manufacturing districts	...	10½	"	"	"
Cured butter	...	16	"	"	"

Finally, the butter is made up to suit the various markets in tubs, baskets, &c.; or, if fresh butter, moulded into the usual rolls with wooden "Scotch Hands"; or pressed into rectangular or circular pounds and half-pounds by means of a butter-press.

Individual butter-making is now largely supplemented, and in some districts supplanted, by factory methods of production. Of these there are three chief systems in operation, the differences depending upon whether the raw material received at the factory is milk, cream, or low-quality butter.

Milk Factories.—In these the whole-milk is dealt with at the factory—that is, the separation of the cream as well as the making of the butter takes place here. The system is chiefly adopted in England, the separated milk being disposed of either by selling

to farmers for feeding calves and pigs, or by using it to fatten stock raised by the factory itself. Sometimes, also, it is used for making skim-milk cheese.

Cream Factories or "**Creameries**".—This is the chief factory system in Ireland. The creamery deals only with the separated cream, which is delivered each morning at the factory by the farmers of the district. The farmers take back the butter-milk, and are credited with the actual amount of butter produced, each person's delivery of cream being churned separately. Payment is made weekly or monthly by cheque. The system is generally on a co-operative basis, each farmer being a shareholder. The creamery movement in Ireland received a great impetus some fifteen or sixteen years ago, largely from a letter which Canon Bagot of Kildare published in the Dublin papers. It was a very short letter, but very eloquent as to the advantages of creameries where the butter could be properly made, compared with the haphazard rule-of-thumb and unscientific methods often adopted by the individual farmers. It simply set forth the prices obtained on the same day for butter produced by the two means. Whilst the creamery butter commanded 1s. per lb., the farmers' butter in Cork market fetched only 6½*d.* Creameries are also in vogue in Holland, Denmark, and other countries.

Butter Factories.—A different kind of factory system is almost universally adopted in Normandy, where it has assumed enormous proportions. On this system the Normandy butter is churned by the farmers themselves, or by creameries, and bought up from them by the agents of the factors. It is then sorted out, and the best quality, made up into rolls, is packed in boxes or baskets of 28, 36, or 56 lbs. each, and transmitted the same day to London. By this means uniformity of quality is ensured in the London market, for the inferior kinds are kept back for further treatment. They are chiefly inferior through not having been properly worked, and consequently contain too much butter-milk. They are therefore sent to the factory, washed and worked in a powerful butter-working machine, salted with about 3 per cent of salt, and then packed in firkins for the English market. This system also obtains in Ireland to some extent.

Danish butter-making exemplifies both the creamery and the butter-factory systems. Denmark is a country of co-operative

dairy societies, and there are over three hundred dairies essentially similar to the following, which is described as typical by the Food Preservatives Committee in their report issued in 1901. The example selected is the Hasler creamery. It is a self-contained creamery on the co-operative system, and complete down to its telephone and its own electric plant. It is thirty miles from any large town, and is in full working. The milk from 1200 cows is dealt with daily. All the milk on receipt passes through a strainer fixed on the weighing-machine, and also through a centrifugalizer. The cream and the skim-milk thus obtained are each "pasteurized" by heating to about 194° F., the cream being thereafter cooled down to about 50° F. by means of a cold-water coil cooler. The pasteurized skim-milk is returned to the farmer in his own cans. The cream, in which the heterogeneous micro-organisms have been destroyed by the heating process, is then "ripened" by the addition of a "butter-starter", *i.e.* a pure culture of the proper organisms for souring the milk, which for this ripening process is warmed to 104° F. Next morning the cream is churned, each churn making 180 to 200 lbs. of butter. When the butter-milk has been expressed on the "worker", salt is added in the proportion of 7 per cent for northern England, and 2 per cent for London. About three-sevenths of this salt is lost in the working. After being worked, the butter is placed in cold water, but before being packed in tubs it is again passed under the worker. The retention of not more than 11 per cent of water in the finished article is aimed at, and more than 16 per cent is not permitted. No preservative except salt is allowed to be used.

The two great differences between this system and the creamery method as generally adopted in Ireland are these:—(1) the cream is "pasteurized" or sterilized; and (2) no boric preservatives are used. The pasteurizing gets rid of adventitious and undesirable bacteria, and then only the proper kinds are added, so that by this means great *uniformity* of product is obtained. Also the prohibition of boric acid, &c., makes it incumbent upon the Danes to work the butter properly and to preserve strict *cleanliness* in their dairying, for otherwise the butter would not keep so well. In short, as the Preservatives Committee point out, the Danes have appreciated in theory, and

A Danish
Creamery.

have recognized largely in practice, the vast importance of cleanliness in dairy operations. As a nation they have recognized in a manner, and to an extent which is at present foreign to this country, that the destruction, inhibition, or regulation of bacterial activity is the basis of all successful dairying operations.

It is therefore interesting to note that of the foreign butter annually imported into this country (valued at $17\frac{1}{2}$ millions in 1901) more than half is of Danish origin.

The butter-factory system in Denmark is well illustrated by the working of the Esbjerg Factory in Jutland. This factory is the largest of its kind in the kingdom, and exports no less than ten million lbs. of butter every year. None of this is made on the premises. All butter reaches the factory in a half-worked condition from some sixty large creameries. It consists of: (1) fresh butter, saltless on arrival, and (2) butter containing about 3 per cent of salt. Some of the saltless butter is sent, still saltless, to England. The butter on its arrival at the factory is classified, and the different supplies of each class are blended. Any not regarded as good enough for packing in rolls is salted, and sent away as second-class butter. All the cream used for the butter has been pasteurized, the exigencies of the English market being said to render this process essential. After its receipt and blending, the half-worked butter undergoes its first working at the factory, the salt being added at the time of its second working there. It is worked a third time to ensure the expression of as much butter-milk as possible, and herein it is thought lies the excellence of its quality as regards keeping. Each pound is separately weighed by women or girls, who frequently rinse their hands in hot water, and it is then wrapped in parchment-paper and enclosed in a cartridge-paper box. The butter is despatched to England in five boats weekly, three steaming to Parkeston Quay, Harwich, and two to Great Grimsby, some of the vessels carrying refrigerating plant. The butter is some of it only four days from the churn when the English retailer gets it on to his counter, and is none of it more than five or six days old.

As regards the quality of butter produced by the various factories, compared with that made by individuals, the truth is probably this: that the factory-made butter is better than the

average farmhouse butter, but is not so good as the best butter produced in first-class private dairies. Of the fresh butters, the finest quality, Normandy and selected Devonshire, and of the salt butters, Danish, may be mentioned as those Varieties of Butter. which command high prices among commercial butters. The principal varieties of butter landed in England are:—

Irish or “**Corks**”, of four grades, 1sts, 2nds, 3rds, and 4ths, the corresponding butter-marks being I, X, †, and #. Formerly Cork butter was almost always packed in tubs; and Canon Bagot some years ago advised Irish dealers that “the London trade preferred 56-lb. beech tubs to any other weight or package”. Recently, however, a good deal has been put in prints, rolls, and in jars and tins, for export. **Dutch**, including **Dutch Creamery** and **Friesland Factory**, in kegs; **French**, including **Normandy** and **Brittany**, chiefly in baskets, jars, and firkins; **Italian**, in boxes and baskets, arriving *via* Dieppe and Newhaven; **Danish** and **Swedish**, chiefly in tubs of 112 lbs. weight, also in tins, and a certain quantity packed as rolls; **Russian** and **Siberian**, do. do. **Colonial**, from Australia, Tasmania, and New Zealand, is sent over in refrigerating chambers. Canada, Argentina, and Finland also supply a certain quantity of butter. The following are the average weights as received in London:—

Irish: firkins, from 66 to 76 lbs. net; small firkins and kegs, 50 to 56 lbs.; kits, 50 to 64 lbs.; pyramids, 28 to 56 lbs.; boxes, 14 lbs. **French**: baskets, from 28 to 56 lbs.; firkins, 56 to 60 lbs.; crocks, 28 to 56 lbs.; other sorts, 36 lbs. **Paris**: baskets, from 28 to 56 lbs. **Danish** and **Swedish**: casks, 100 to 120 lbs.; firkins or half-casks, 56 to 60 lbs.; boxes and pyramids, 28 to 56 lbs. **Finnish**, **Russian**, and **Siberian**: casks, 90 to 120 lbs. **Dutch**: **Friesland** “quarters”, about 112 lbs. gross, or between 88 lbs. and 102 lbs. net; “eighths”, from 46 lbs. to 48 lbs.; kegs, 36 lbs.; “twelfths”, 28 lbs.; **Creameries**, in “quarters”, 112 lbs.; “eighths” and “sixes”, or firkins, 56 lbs.; “twelfths” and “sixteenths”, or kegs, from 28 lbs. to 36 lbs.; **Fresh**, in rolls of ½ lb., 1 lb., and 2 lbs. each. **Australian** and **New Zealand**: boxes, 56 lbs. **Canadian** and **American**: pails and tubs, from 30 to 70 lbs.; boxes, 56 lbs. **Argentine**: boxes, 56 lbs.

In purchasing butters the retailer is recommended to see them weighed gross and then stamp them on the staves with a small

rubber stamp. The tares may be arrived at, of course, by weighing the packages when empty; if there is no weighing-machine, break up the package and weigh on the spare scales. With regard to weights, it may be mentioned that in 1903 a movement was started to induce the Danish producers to send out their butter in casks uniformly of 112 lbs. each; there is some probability of this becoming general. It is suggested, by way of a hint in buying butter, that the purchaser should draw his samples not from the middle of the butter but from the outside, where deterioration always begins. As regards choosing butters by their origin little assistance can be rendered by a disquisition here. But it may be mentioned that the most experienced retailers purchase for quality rather than name. A leading firm says:—"We purchase butter for quality alone, irrespective of clime or country, and thus we ensure perfection the year round. Our speciality is the delicious creamery butter now obtained from the model dairy farms of Great Britain and Ireland. This is undoubtedly the most perfect butter for make and flavour it is possible to find in the United Kingdom." At one time "*Kiel Butter*" was a name to conjure with, the Baltic port of Kiel being a famous entrepôt for superior butter. Gradually the term has come to be used with a small "k" instead of a large one, and to signify butter packed in the "kiels", or peculiar-shaped wooden casks known by that name; and thus it includes Hamburg factory butters, Irish butters, and others so packed, as well as butter shipped in the Baltic. Nevertheless the experience of Denmark is an excellent testimonial to the value of a good name. "Danish" covers a wider multitude of butters and qualities than charity covers sins, yet the name carries appreciable value. The average butter import prices in 1901, as compiled from the Board of Trade returns, were as follows:—Denmark, 112s. 9d. per cwt.; Germany, 111s. 4d. per cwt.; France, 109s. 4d. per cwt.; Sweden, 104s. 3d. per cwt.; Holland, 101s. 2d. per cwt.; other countries, 100s. per cwt.; Victoria, 99s. per cwt.; New South Wales, 98s. 7d. per cwt.; Queensland, 100s. per cwt.; New Zealand, 97s. 11d. per cwt.; Canada, 93s. 6d. per cwt.; United States, 91s. 9d. per cwt.; Russia, 87s. 8d. per cwt. The following year Russia moved up considerably.

Irish Butter in the same year brought an average price

on the English market of 109s. net per cwt. for Centrifugal Creameries, thus comparing favourably with the most renowned of dairy countries. The highest point ever reached in Ireland for First Cork butter was in the decade 1867-1876, when that article averaged 128s. In the next decade it averaged 119s., and in 1887-1896 it was 101s. In 1896 the Cork Butter Market Trustees took energetic steps to improve the reputation and standing of their butter, raising the qualification for all grades, and introducing "Choicest Mild" and "Choice Mild", "Choicest Salt" and "Choice Salt"; the mild cure being packed in either firkins or pyramid boxes, and the salt in half-cwt. firkins, while special care as regards cleanliness was shown by insisting on the branded butters leaving the market in parchment paper and packages canvas-covered. Thanks to such efforts, and the well-directed educational activities of the Irish Department of Agriculture, the Congested District Board, and other bodies, the general quality of Irish butter has been very greatly improved. A bad quality is now almost unknown. The Irish grass-butter season lasts from about April to November, and in its season this butter now competes successfully with Danish. Irish salt firkin butter, made with warm brine, still contains sometimes an excessive quantity of moisture, but is being rapidly improved in this respect, one reason being the fact that dealers handling it have become quite alive to the fact of its lessened value per lb. in comparison with the dry-salted butter of equal quality in other respects.

French Butter is generally made from self-soured cream, but the sourness is to a great extent removed by the effective washing out to which the butter is subjected. The Normandy butter, which holds such high reputation in French butter, is made by every farmer at his own farm. That from Isigny holds the foremost place; next comes probably that from Gournay. Brittany also produces much good butter. The Charentes and Poitou dairies are under a very close supervision, and the installations are very perfect, more especially the pasteurizing and cooling appliances. The aggregate production exceeds 8,000,000 kilos. The butter is sent to Paris in special cooling carriages; and the sale takes place at the central markets, every dairy's butter under its own brand. French salted butter is not of much interest, but the fresh butter, to which no antiseptic appears to be added, will take a good deal

of beating. The transportation to London is very systematic and prompt; made overnight by the farmers, the butter is collected in the morning and despatched to Valognes, where it is worked into shape the same afternoon and packed, cold, into boxes or hampers; the same night it reaches Cherbourg by rail, and thence travels by steamer to Southampton, and on by the next morning's train to London. There, a portion of it usually commands top price.

Danish Butter is sold by an official quotation fixed every Thursday by a committee of eight members meeting at Copenhagen. The table on p. 31 shows in Danish kroner (per 100 lbs. Danish) the movements of prices for the past twenty years.

The following table gives the prices in kroner and öre, with the corresponding money value in shillings (English), calculated at the exchange of £1 = kr. 18.10, with 112 lbs. English as being equal to 102 lbs. Danish weight of 51 kilos. A krone is valued at 1s. 1¼d. in our currency; and an öre at one-eighth of a penny.

In Danish. Kr. öre.	In English shillings.	In Danish. Kr. öre.	In English shillings.
85 18	96	98 48	111
86 06	97	99 37	112
86 95	98	100 26	113
87 84	99	101 15	114
88 73	100	102 03	115
89 61	101	102 92	116
90 50	102	103 81	117
91 39	103	104 70	118
92 27	104	105 58	119
93 16	105	106 47	120
94 05	106	107 36	121
94 94	107	108 25	122
95 82	108	109 13	123
96 71	109	110 02	124
97 60	110	110 91	125

In *New Zealand* all dairies manufacturing butter or cheese, in bulk or for export, are registered and allotted an official number, which must appear on each package of produce leaving the dairy, together with net weight and description of contents. Dairies are classified according to the number of cows from which the milk supplied is obtained. By this means the larger factories, with their more

Official Grading
of Colonial
Butter.

	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902
Jan. ...	126	122	114	104	104	98	106	100	104	114	100	96	102	96	100	96	100	101	109	96
	120	122	114	106	104	100	106	100	104	114	100	98	104	98	100	92	96	97	109	96
	120	118	114	106	104	100	106	94	104	114	...	94	102	98	97	92	94	97	103	92
	120	118	114	106	96	96	106	94	96	106	92	94	96	98	97	90	94	97	103	92
	...	120	...	...	...	...	101	96	...	...	...	...	96	95	...	...	...	...	103	94
Feb. ...	122	122	108	106	90	96	101	96	96	106	86	90	96	95	97	90	96	94	103	96
	124	124	102	100	90	92	106	98	96	106	88	90	96	96	95	94	96	94	99	100
	126	124	102	96	94	94	110	98	98	108	93	92	92	100	93	96	94	94	99	100
	126	124	104	96	98	100	113	98	101	110	96	94	87	100	90	96	94	94	96	100
Mar. ...	126	120	106	96	98	102	113	98	104	110	98	94	87	97	90	96	94	94	96	96
	122	116	108	96	98	102	108	98	106	110	92	90	87	94	90	94	96	90	96	96
	122	108	108	96	98	94	98	98	106	104	88	90	87	92	88	91	96	88	96	96
	118	108	102	90	98	94	93	92	100	96	88	86	83	88	88	91	96	88	96	96
	116	...	...	...	94	88	...	...	...	96	84	86	...	...	...	88	96	88	...	...
April. ...	110	108	96	86	88	88	93	89	95	88	84	86	83	84	85	88	92	88	96	96
	102	108	96	86	85	82	87	89	95	88	86	82	83	80	85	85	90	88	93	96
	98	104	96	86	85	82	84	93	95	90	86	82	83	80	85	85	86	88	90	96
	100	104	96	82	78	76	84	95	90	94	80	77	80	80	81	81	82	88	88	92
	...	...	90	82	...	...	...	...	82	...	...	...	...	80	81	...	...	...	...	...
May. ...	104	104	86	82	78	70	84	90	82	96	80	73	80	77	81	78	82	88	88	90
	104	98	86	83	74	70	87	85	77	92	74	73	80	75	81	78	82	88	88	90
	100	90	86	83	74	76	87	80	77	86	74	73	80	75	78	78	82	88	88	90
	96	90	82	78	70	80	82	80	77	86	78	73	80	75	78	76	79	88	88	90
	...	90	...	...	...	85	82	80	...	...	82	73	76	...	...	...	...	84	88	90
June. ...	96	90	82	72	70	87	82	75	80	82	82	73	72	78	78	76	77	86	88	90
	96	90	82	72	75	87	82	75	80	82	82	70	72	80	78	76	77	92	88	90
	96	90	82	72	80	82	86	75	76	84	84	70	74	80	80	76	81	95	88	90
	98	90	84	75	83	82	88	75	76	84	88	66	78	80	82	76	85	95	88	90
	100	...	...	85	...	...	...	...	...	84	...	...	...	...	...	76	87	...	...	...
July. ...	100	90	86	80	87	84	88	77	79	84	92	66	82	80	82	76	87	92	88	90
	100	90	88	83	90	86	90	77	83	84	96	70	84	80	82	73	87	92	88	90
	102	90	90	85	92	86	92	70	88	86	96	73	84	82	82	73	87	92	88	90
	102	92	90	85	95	86	94	70	88	88	96	75	84	86	82	75	89	92	90	90
	...	96	90	85	...	...	...	74	84	...	...	...	...	90	82	...	...	...	...	90
Aug. ...	104	100	90	86	97	82	94	78	84	88	92	75	84	94	82	77	93	96	92	90
	104	102	92	88	99	82	94	81	87	88	92	75	84	98	85	79	97	99	96	87
	104	104	98	90	100	84	89	84	90	82	94	75	86	100	90	81	101	103	96	87
	104	104	104	90	100	86	89	89	90	84	98	75	90	100	96	83	105	103	96	89
	104	...	...	...	88	91	...	...	...	100	79	93	...	...	...	...	105	103	96	...
Sept. ...	104	106	106	90	100	88	92	94	92	87	104	82	95	96	96	86	105	103	100	91
	106	110	106	92	100	88	92	96	95	93	104	84	95	96	96	90	108	99	103	95
	108	116	106	95	100	88	92	96	97	100	104	84	95	96	96	92	112	99	103	99
	110	120	108	102	103	90	94	91	97	102	104	84	95	98	96	94	117	95	103	101
	...	...	...	110	106	...	...	...	...	102	...	...	...	...	96	96	...	...	...	...
Oct. ...	112	122	110	110	108	94	96	91	100	105	96	84	97	101	96	98	117	97	103	101
	116	124	112	110	108	99	98	95	104	108	100	84	102	104	92	100	112	99	106	101
	120	126	114	106	108	102	98	100	108	112	104	84	112	106	92	100	106	102	110	101
	122	126	116	106	108	102	98	105	111	112	106	87	118	106	92	100	106	105	110	101
	...	126	116	...	...	...	98	110	111	...	...	91	118	102	...	...	...	...	107	101
Nov. ...	122	120	112	106	108	96	98	110	108	112	108	110	106	98	94	98	103	105	104	101
	124	114	108	106	104	96	100	110	108	106	108	110	96	98	97	98	100	102	104	99
	126	116	108	106	104	98	104	104	108	106	104	110	96	98	98	98	100	104	104	99
	126	118	108	110	104	102	108	104	110	106	104	106	96	98	100	102	100	106	100	101
	126	...	...	...	...	106	...	...	...	...	104	...	...	...	...	...	102	106	...	...
Dec. ...	126	120	104	110	104	108	110	104	114	106	96	102	96	100	100	106	104	106	100	102
	126	120	104	110	102	110	110	104	114	106	96	98	96	100	96	106	104	106	100	102
	122	114	104	110	102	110	100	104	114	106	92	98	96	100	96	106	104	106	100	98
	122	114	104	110	96	110	100	104	114	98	94	98	96	100	96	102	104	109	100	95
	...	114	104	104	98	...	...	104	114	98	...	...	...	100	96	100	...	...	...	95

complete machinery and facilities for turning out a high-class, uniform article, are kept distinct from the smaller manufacturing dairies, and their produce correspondingly branded (by the owner) "creamery" butter or "factory" cheese, as the case may be, as against "dairy" butter or "dairy" cheese for the smaller fry.

Another distinct class is set apart for "packing-houses"—premises where small or odd lots of butter, gathered in the way of trade by storekeepers and others, are milled, blended, and packed. This class of goods has to be plainly branded as "milled" butter, and, still further to protect the superior creamery article, the branding of milled butter packages must be done in red, in distinction from the black branding of the other classes. A close check on the brands, in order to secure uniformity and appearance, is kept by the Department of Agriculture, which supplies regulation stencil-plates at cost price. The more attractive "impressed" brands (usually put on by the box-maker) are, however, encouraged, and are now in very general use. These brands combine the regulation description of contents, &c., with owner's trade-mark or name.

At the present time there are seven duly-appointed "grading ports", through one or other of which all dairy produce for export must pass. These are Auckland, New Plymouth, Wellington, Lyttelton, Port Chalmers, Dunedin, and Bluff (the last-named for cheese only). At each grading port is a gazetted "government cool store", to which all butter intended for export to the United Kingdom must be forwarded by the shippers for grading not less than four days before the sailing of the steamer concerned. To each grading port is appointed a government dairy-produce grader—an officer invested with somewhat extensive powers. For example, he can condemn any dairy produce falling below a reasonable third grade. Besides grading all butter and cheese for export, he supervises the shipping of dairy produce generally, and has an eye to the cool chambers set apart on board ship, also to the temperature of the produce itself when going aboard or arriving in coastal boats for transhipment. As a rule, picked dairy-factory managers are selected for the graders. Both butter and cheese are railed to port in insulated cars, ice held in specially-made troughs being used with butter consignments. On arrival the cars are shunted off to the cool-store sidings and the produce unloaded into store with a minimum of exposure. The various lines of butter are then placed in the grading-room, an apartment where a cool temperature is maintained. The boxes are stacked ends out to show the registered brand, churning dates, &c. One box of each day's make or

churning is then placed on the floor against the line of produce it represents, and the top is neatly prised open ready for the grader, who is armed with a butter-trier of sufficient length to draw a plug of butter from right through the contents of the usual half-hundredweight box. Flavour to nose forms the first stage of the judging process. The plug is next rapidly examined as to the body, texture, moisture, colour, and salting. As he proceeds the grader jots down the points he awards, according to scale, concluding with "finish". The judging completed, the points are added up, and the total, generally speaking, decides the particular grade under which the butter will fall.

The grading of a line of butter completed, the boxes sampled are nailed up again, and the official grade-mark is stamped on each package by an attendant, who receives a tally-list from the grader. The stamp consists of the familiar broad-arrow over I, II, or III, as the case may be. When the produce is not intended for early shipment the packages are also stamped with the date, in order to protect the grading, should deterioration take place from prolonged storage. The stamping completed, the butter is removed to the freezing chambers and frozen. The butter is subsequently shipped in due course, the transit from the works to the steamer being effected either by rail or by insulated trolley vans. The government part of the business ends with the handling of the produce out of cool store. But before the butter leaves cool store, weights are checked officially. The grader's judging notes are handed to a clerical assistant, who from them writes the formal grader's reports. These reports are primarily intended for the manufacturer of the produce, but carbon copies are taken for the buyer and the official dairy commissioner. The head of the Dairy Division of the Department of Agriculture, the dairy commissioner, is furnished by the graders with an abstract of all shipments, and is thus afforded a bird's-eye view of the quality of the output of every dairy factory in the colony.

Russian butter has made great strides within the last few years, and Russia now takes rank as second only to Denmark among the countries supplying us with butter. Whereas in 1899 only 4.1 per cent of our total butter imports were returned as Russian produce, the quantity had risen to 10.22 per cent in

1901, and to 12.31 per cent in 1902. In these last two years the proportion was greater than from either France or Holland; the figures for 1902 being 10.42 per cent from France and 9.90 per cent from Holland. Siberian butter constitutes more than eight-tenths of the amount imported as "Russian". It is mainly produced in co-operative creameries owned by private traders and by associations of farmers, the milk being bought from the peasants and farms around the neighbourhood. These

Russian Butter. Siberian "farms", however, are not to be looked at in the same light as English or Danish farms. In the butter-producing regions of Siberia a "farm" means a whole village, the inhabitants of which club together, and collectively own large herds of cattle, numbering frequently from 1000 head to 10,000 head. The milk from the whole herd is collected and mixed, and the butter is made from the mixed milk. The chief butter-making districts are the northern provinces of European Russia, and, in Siberia, those lying along the route of the Siberian Railway, including the governments of Vologda, Yaroslav, Moghilev, Tobolsk, Tomsk, Omsk, Kourgan, and the province of Akmolinsky. The Siberian cattle in many districts yield milk which is extraordinarily rich in fat. Thus, while the ordinary percentage of fat in milk in this country and western Europe generally is about 3.5, the cows on the Altai mountains give 7 per cent, or just double; in Tobolsk the amount is 5 per cent, and in Yaroslav 4.4 per cent. But the total volume of milk yielded by the Siberian cow appears to be less than is usual in this country. A few years ago it was pretty generally thought by analysts here that Siberian butter was always of "abnormal" composition, approximating to the "winter butters" of other countries where the cows are kept out at pasture late in the season. No doubt there was at one time some justification for this idea; but methods have changed since then, and large numbers of recent analyses serve to show that, since attention has been given to proper housing and feeding, even the Russian and Siberian "winter butter" does not differ materially from other kinds in the matter of chemical composition. As regards commercial quality, the Russian (including Siberian) butter does not rank high. The average value per cwt. in 1901 was given as 8s. 6d.—lower than that of almost every other kind imported.

But, on the other hand, it appears that much of the trade is in the hands of Danish merchants, and it is believed that some of the best Russian butter is sold as, and fetches the price of, Danish produce. No doubt some portion of the Siberian and Russian butter is still of an indifferent quality; but, thanks to the enlightened policy of the Russian Government, which seeks to foster and develop the industry by the provision of competent instructors, the introduction of co-operative creameries, skilled management, analytical control, cold storage, and cheap transport, the character of the butter as a whole is distinctly improving.

The *flavour* of butter is the characteristic upon which its commercial value chiefly depends. Flavour, in the opinion of the best scientific authorities, is the result of bacteria, and the extent and character of the flavour are ^{Flavour and Rancidity.} materially affected by the conditions in which these micro-organisms exist. The same cream will yield butters of very different flavour, depending on the manner in which the cream is raised. Thus the butter from separated cream is markedly different in flavour from that made from shallow-pan cream. Authorities agree, moreover, that the food of the cow has great influence on the firmness and flavour of butter. (The chemical effect is discussed later.) The rancidity of butter is partly also ascribed to bacteria, but in the case of pure butter-fat oxidation is said to be the cause, conditioned to a great extent by exposure to light. The three factors most active in the production of rancidity in butter-fat are air, light, and warmth; and decomposition occurs most rapidly when all three conditions are favourable. In the development of rancidity there are observed, first of all, several changes as regards colour, odour, taste, and general appearance; the sample begins to acquire a lighter colour, the change appearing first on the surface and parts most exposed to light, from which points the action spreads slowly downwards until finally the whole mass has become bleached. With this loss of colour is noticed also the development of a characteristic so-called "lardy" smell and taste; and as the rancidity becomes greater the smell increases in pungency, whilst the taste, which at first was not markedly acid, becomes exceedingly burning and unpleasant. In addition, there are changes in the consistency of the

butter-fat. Originally firm and solid in texture, it assumes a granular appearance, and, after many months, finally turns into a semi-solid pasty mass.

Flavour, odour, texture or "grain", body, solidity, keeping-quality, and colour are the chief points upon which a butter is judged. These are all, especially the solidity, more How to judge Butter. or less affected by the feeding of the cow, but in a much greater degree by the operations of butter manufacture. As regards *flavour* and *odour*, butter made from sweet cream has a clean, extremely mild, and delicate flavour; that from ripened cream has a stronger, so-called "nutty" taste and a characteristic aroma, which in many districts is deemed a quite essential quality. In good butter the flavour should not be rancid, rank, cheesy, or bitter; nor should the article be over-salted to the taste, or contain visible grains of salt. It should not be "lardy" (*i.e.* with a weak tallow flavour), nor "tallowy" (with a strong taste of tallow); it should not be *oily* in taste, nor *woody* from the use of damp or musty wood in the keg. It should not taste of the fodder, as is sometimes the case when the cows have been fed on certain strong-flavoured kinds of food, such as turnips, cabbages, badly-made silage, &c.; nor should it taste of the byre, or in any way suggest the stable. In a butter not otherwise defective a soapy taste may sometimes be detected, resulting from a careless washing of the dairy utensils. Or a butter may be musty or mouldy from keeping in damp, badly-ventilated rooms; or it may be dirty, and contain débris of hairs, &c. To test the flavour of butter, cut off a small quantity with a perfectly clean knife, remove it with a clean finger, and then place it on the tongue without using the knife. Press the butter gently against the palate and then swallow it, noting the flavour in respect of the various points mentioned above.

In regard to **firmness** and **general appearance**, a high-class butter should not be rich in milky brine; and it should not be oily, soft, and overworked on the one hand, nor dry, friable, or strongly glittering on the other. Nor, as a result of defective colouring or salting, should the butter be flecked, streaked, or cloudy. There should be no cavities or crevices, since these enclose moist air and favour fermentation. When a piece of butter of good texture is broken off it shows a rough fracture.

If it breaks smooth it is said to have no "grain". The "grain" depends partly upon the breed of cow giving the milk, and partly upon the manipulation of the butter. The fat-globules from the milk of some breeds of cows (*e.g.* Jerseys and Alderneys) are generally larger than those given by others (Shorthorns and Ayrshires); and, other things being equal, the larger the globule the coarser is the texture of the resulting butter. White specks and streaks in butter arise either from the use of impure salt, or from the butter-milk or curd not having been properly removed; or, sometimes, from the cream having been kept too long before churning. The firmness of butter is tested by repeatedly pressing it with a knife-blade; and a piece should be cut off to see whether it adheres to the knife. The moisture which exudes on pressure should be quite clear, without the least milkiness; for butter with milky brine—indicating as this does the presence of fermentable constituents of butter-milk—possesses inferior keeping properties, and is not likely to remain good very long.

Coming next to the *keeping-quality*, it may be remarked that high-class lightly-salted butters, placed under the best ordinary conditions of storage, have been kept good for five or six weeks. Most butters, however, would not keep so well for more than a fortnight, and many would spoil within a week. The more heavily-salted butters will, of course, keep longer; for instance, some of the Normandy crock-butters will keep for six months, and still be good for kitchen and cooking purposes. It goes without saying, that butters containing boric or other preservative keep better than they would without such ingredients. Fermentative changes, overworking or improper handling during manufacture, and defective conditions of storage, are the three chief causes of rapid deterioration. The two first, indeed, go together; for undue exposure of the butter to the air, and contact with the human hand, both tend to bring more and more micro-organisms into the substance of the butter, and thus to induce the fermentative changes to which certain of these organisms give rise.

In respect of the storage conditions, butter should not be kept in a too warm place, as this tends to "tallow" the fat, to dissipate some of the aroma, and to promote bacterial growth. Nor should it be kept in damp, musty rooms, or moulds may appear on it.

Keeping-
quality and
Storage.

Neither ought it to be displayed for long periods in bright daylight, or exposed at all to the direct light of the sun, for both these tend to give it a tallowy flavour and to affect the colour. In a dry, cold, dark place butter keeps well, and if the temperature be not above 40° F. it may be preserved indefinitely. It is said to become slightly tallowish occasionally, however, if it is frozen and thawed again once or twice. See COLD STORAGE.

Salted butter, which after a week or a fortnight under ordinary conditions shows no impairment of flavour, is of good texture and appearance, and contains no milky brine, may be pretty confidently relied upon to be a good keeping butter, suitable either for longer ordinary storage or to be sent abroad when properly packed.

Butter which has become rancid may be improved by washing it with a dilute solution of bleaching-powder (20 grains powder dissolved in a pint of water), using a pint of solution to each pound of butter. Then re-wash it in clean water and salt.

It is one of the market requirements that butter should be of a rich yellow, bright straw, or golden colour. But this is not necessarily the colour of pure butter. In spring or late autumn, the butter made from the milk of cows fed on hay is generally deficient in colour, and is, indeed, occasionally nearly white; but unless the desired tint is imparted to it by artificial means, the price obtained will not be equal to that which would be fetched by the same butter coloured.

This market requirement is burdensome and inconvenient to dairies. Moreover, it serves no really useful purpose—beyond, perhaps, that of making the butter more agreeable to the eye of a public which expects a particular colour. Grass butter has naturally a rich colour, and consumers consequently suspect that pale butters must be of inferior quality; whereas “if the colour be something between that of gold and a brick-bat they think the butter must be the product of a Jersey cow”. Hence the demand for a highly-coloured article. The demand is met by artificially colouring the butter to suit the various markets. In Germany, Denmark, and Sweden the colouring matter is almost always annatto dissolved in hempseed-oil or sesame-oil, and tinted as desired with a little turmeric. In Holland, America, and Australia coal-tar yellows are largely used, as is also the case to some

Colour—and
the Market.

extent in Germany. The butter destined for the English market contains on an average about 0.1 per cent of the added colouring ingredients—that is, one part in a thousand. The actual colour substance, however, is only a small part of the colouring mixture. In the United Kingdom, as has already been mentioned, annatto and, to a smaller extent, carrot-juice are generally employed. It should be remarked that the artificial colouring of butter is recognized as permissible in the Margarine Act of 1887.

With regard to the **chemical composition of butter**, in genuine commercial butters the proportions of the individual constituents nearly always fall within the following limits:—Water, 7 to 16 per cent; fat, 78 to 90 per cent; curd and milk-sugar, 0.8 to 3.5 per cent; ash, excluding salt, 0.1 to 0.3 per cent; salt, 0.4 to 4.0 per cent. Varying quantities of boric acid are frequently present, in addition to the above.

To illustrate different individual butters the following examples, slightly abbreviated, are quoted by Dr. A. W. Blyth:—

	Normandy Butter.	Fresh Butter.	Butter from Isle of Wight.	Butter from Guildford.	Butter from Win- chester.	Mean of 89 analyses of foreign butters.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Water	9.3	13.0	9.7	8.6	8.6	14.1
Fat	82.7	83.9	84.7	85.5	87.2	83.1
Curd and milk-sugar...	5.1	2.7	3.5	2.8	2.1	1.6
Salt and ash	2.9	0.4	2.1	3.1	2.1	1.2
	100.0	100.0	100.0	100.0	100.0	100.0

Dr. James Bell (*Chemistry of Foods*, Part II, pp. 64–66) gives the analyses of 113 English butters, “selected so as to obtain as far as possible fair representative specimens of butter produced under different conditions”. Although published some twenty years ago they are fairly typical analyses, and the reader may refer to them if further figures are required.

A few words about the several constituents will probably be of interest.

Water.—The amount of this ingredient varies a good deal, depending on the mode of preparation. Ordinarily it is about 11 to 13 per cent. Devonshire, Dorset, and some makes of Irish

butters often contain rather large quantities of water, though there need be, as a rule, no suspicion that it is purposely left in. On the other hand, it is well known that water in excessive proportion can be worked into butter; and that this is sometimes done is certain, whether the means employed be water, brine, or milk. So far as appearance is concerned, more than 12 or 13 per cent is unnecessary—except, perhaps, in very special cases—and anything over 16 per cent is held to be injurious to the keeping qualities of the butter. By regulation of the Board of Agriculture (Sale of Butter Regulations, 22 April, 1902), it is now stipulated that "Where the proportion of water in a sample of butter exceeds 16 per cent it shall be presumed for the purposes of the Sale of Food and Drugs Acts 1875 to 1899, until the contrary is proved, that the butter is not genuine, by reason of the excessive amount of water therein".

Curd.—Too much curd is injurious, since the curd is liable to ready decomposition by micro-organisms, thereby changing the flavour of the butter. High-class butters often contain less than 1 per cent of curd; the ordinary proportion is about 2, and in extreme cases it may be as much as 5. It is the curd which causes the milkiness of the brine pressed out of butter, as referred to above.

Salt.—Butter is not often quite free from salt, as small quantities are added even to "fresh" butter in many instances. There is no sharp distinction between fresh and salt butters. They shade into each other; and what would be called a fresh butter in one district might in another be looked upon as salt butter. As regards the maximum amount of salt permissible, there is at the present time no limit laid down. All depends upon the consumer's taste. In recent years there has been a marked change in the public's likings, and the heavily-salted butters of twenty years ago have largely given place to milder articles. Whereas at one time 7 or 8 per cent of salt was not infrequently met with, to-day it is a rare thing to find more than 5 per cent. In 1902 a Departmental Committee of the Board of Agriculture was engaged in discussing questions concerning the sale of butter; but, however the case may stand as regards water and fat, it hardly seems necessary to adopt any legal limit for the amount of salt. After all, the consumer is the best judge where only

palatability is concerned; he soon discovers when the amount of salt is excessive for his own taste, and bestows his patronage accordingly,

The Margarine Act, 1887, allows "salt or other preservative" as an ingredient of butter; and, as a matter of fact, since the use of salt has diminished, its function as a preservative has been largely performed by boric acid (boracic acid). Fluorides have also been used to some slight extent. About one-third of all the imported butter contains "boric preservative" (generally a mixture of boric acid and borax), as is shown by the following returns of the Principal Chemist of the Government Laboratory:—

IMPORTED BUTTER

				Total Samples Analysed.	Containing Boric Preservative.
Year ended 31st March, 1900	...	...	1393	...	399
" " 1902	...	...	1374	...	452
" " 1903	...	...	1703	...	619

Belgium, France, Australia, and Holland are the countries from which the largest proportions of boric-preserved butters come. Danish butter is practically free from boric acid; out of 248 samples examined in 1901-02 only two were found to contain this preservative; whereas out of 184 samples of French butter boric acid was present in no fewer than 158. The following paragraph, taken from the report of the Principal Chemist for the year 1902, summarizes the results for the various countries:—

"Boric acid preservative was present in all the samples of butter from South America [these, however, were only 7], in 96 per cent of those from Belgium, 90 per cent of those from Australia, 86 per cent of French samples, 77 per cent of those from New Zealand, 50 per cent of those from Holland, and 42 per cent of those from the United States. Only 1 per cent of Danish, 4 per cent of Norwegian, 6 per cent of Russian, 9 per cent of Canadian, and 15 per cent of the German samples contained this preservative."

At the time of writing no legal limit has been actually fixed for the amount of boric acid which butter may contain, but the Food Preservatives Committee recommended in 1901 that 0.5 per cent should be adopted as the maximum. No

doubt this has served as a guide to magistrates, and several prosecutions have been successful on the ground that larger quantities of boric acid are deleterious to health. The committee also recommended that no other preservative than boric acid and borax should be permitted in butter.

Butter-fat can easily be separated from the salt, curd, and water by melting the butter at a gentle heat for some time, when the three substances mentioned will sink to the bottom of the vessel. The clear separated fat, which is known commercially as "Butter Oil", can then be decanted off, and passed through a filter of blotting-paper to remove any particles of curd or salt which it may contain. The fat thus obtained "Butter-fat." is used for the various experiments—"Reichert value", "Valenta test", and so on—which are employed for distinguishing genuine butter from margarine or mixtures of margarine and butter. A few words as to its composition will, therefore, no doubt, be of interest.

Butter-fat consists of a mixture of substances called "glycerides", which are compounds of fatty acids with glycerine. For instance, one such glyceride may be represented, with sufficient accuracy for our present purpose, as made up of the following combination:—Oleic acid, palmitic acid, butyric acid, glycerine. About 12 per cent of combined glycerine is contained in genuine butter-fat. The butyric acid just mentioned is set free when the butter turns rancid, and it is this substance which confers its characteristic flavour upon rancid butter. In sound butter the butyric acid is *combined* with the glycerine, and its taste is not then perceptible. Now, the chief thing which distinguishes butter-fat from margarine and other animal fats is the comparatively high proportion of butyric acid (and similar acids) which the butter-fat contains. These acids are called the "soluble" or "volatile" acids, because, when freed from the glycerine, they can be dissolved in water or distilled with steam. In butter-fat there is about 8 to 9 per cent of these volatile acids, whereas in margarine and other animal fats there is only about 1 per cent, or even less. Consequently, to distinguish between the two—the butter and the margarine—one method is to determine by chemical means the proportions of volatile acids. This is the principle of the "Reichert" test, which is

described more in detail later on. The following is a typical analysis of butter-fat:—

		per cent.	per cent.	
Volatile or soluble acids	{	Butyric acid ...	6.1	} = 8.2
		Other soluble acids ...	2.1	
Insoluble acids	{	Palmitic and stearic acids (chiefly palmitic)	49.4	} = 85.6
		Oleic acid ...	36.1	
Glycerine	...	...	...	= 12.5
				106.3
		Less combined water	...	6.3
				100.0

At the present day the only common adulterations of butter are the following:—(1) An excess of water, either left in through faulty working or fraudulently added; (2) admixture of fat other than butter; (3) the use of an excessive quantity of boric or other preservative. To these some analysts would add the use of colouring matters; but unless the colour is itself a harmful substance its use is not officially considered as an adulteration.

Some of the simpler tests in the examination of butter can readily be carried out by any intelligent reader with a few pieces of apparatus. The more complicated operations, however, could only be performed by a trained analyst. Nevertheless, a short description of some of the chief principles and processes involved will, no doubt, enable the reader to understand more clearly the points which are likely to arise in cases of dispute, even though he may not feel himself competent to actually perform the manipulations.

Determination of Water.—The principle of this is simply that a small weighed quantity of the butter is dried at steam-heat until all the water is driven off, as shown by its ceasing to lose weight. The weight lost represents the water, which is then calculated as a percentage on the butter. Suppose, for example, 100 grains of butter weigh, after drying, only 88 grains. Then the water = loss of weight = $100 - 88 = 12$ grains. Since 100 grains of butter were taken, the 12 grains lost also express the *percentage* of loss, so that the water is 12 per cent. If, however, 105 grains had been taken, instead of 100, then the water = loss

in weight = $105 - 88 = 17$ grains loss on 105 grains; and the *percentage* loss = loss on 100 grains = $17 \div 105 \times 100 = 16.2$, nearly.

The actual process is thus described by Dr. James Bell:—
“5 grams of butter (or say 76 grains) taken from the sample at a part towards the middle, or where a true average can best be obtained, are weighed in a platinum dish of such a shape as will allow the butter to form as thin a layer as possible at the bottom. The tare of the platinum vessel, which should contain a glass rod with a flattened end, is previously ascertained. The platinum dish is now placed in one of the holes of an open water-bath kept in a state of ebullition, and the butter well stirred from time to time in order to distribute the water through the melted fat. The evaporation of the water proceeds with great regularity, and the lowest weight is attained in three or four hours. . . . The loss of weight is ascertained and the percentage calculated therefrom. A small porcelain basin can be used instead of the platinum dish in ordinary cases, or an aluminium or nickel vessel may be employed.

Boric Acid.—This can be tested for as follows:—A small quantity of the butter, say from 100 to 150 grains, is stirred up well in about a wine-glassful of hot water to dissolve out the boric acid or borax. The aqueous solution is separated from the layer of melted fat by pouring it through a previously-moistened filter of blotting-paper. Into this aqueous liquid which has run through the filter drop a little hydrochloric acid, and then dip one end of a strip of turmeric paper (obtainable at most chemists') into the acidified liquid, leaving the other end dry. On gently warming the turmeric paper until the dipped end has dried, it will be seen that the yellow colour of the turmeric has been changed to a bluish-red if the butter contained boric acid. The determination of the actual *quantity* of boric acid in the butter requires some skill. It is effected by taking the aqueous liquid, obtained as above from the fat, and first separating from it the butter-phosphates, which have been dissolved out as well as the boric acid. This is done by adding some solution of calcium chloride, which precipitates the phosphates as a white solid. This being filtered off, the amount of boric acid in the filtrate is ascertained by adding standard alkali until all the boric acid is neutralized. By noting the exact

quantity of alkali required, the amount of boric acid corresponding to this alkali can be easily calculated, because it is known that each cubic centimetre of normal alkali is equivalent to 0.062 gram of boric acid.

Butter-fat.—A complete analysis of butter-fat, such as has already been quoted to show its composition, is never required in ordinary butter-analysis. All the requisite information can be obtained by ascertaining two points, viz. the total amount of fat and its purity or freedom from margarine, &c. The **total fat** is determined on the dried residue left from the estimation of the water (see above). This residue consists of fat, salt, and curd. By treating this with a little ether the fat is dissolved out, leaving the salt and curd behind. The ether solution of the fat is decanted off, passed through a dry filter of blotting-paper to retain any particles of salt or curd, and received in a tared glass beaker or other small vessel. Then the ether is gently evaporated from the fat by warming, and the residual fat weighed.

For the **detection of margarine** and other foreign fats we may first mention one or two rough-and-ready tests How to detect Margarine. which have been recommended. No absolute reliance can be placed upon them, though they may occasionally give useful indications. To test whether a sample is butter or margarine, twist together two or three threads of cotton and draw them through the substance. Then light the cotton for a second or two, blow it out, and smell the fumes. With margarine, or a highly-margarined butter, the smell is more or less tallowy, suggesting a recently-extinguished tallow candle. Or, melt a small lump of the sample in a test-tube or wine-glass, using only a gentle heat for the purpose. As already explained, there will result a lower residue of water, curd, and salt, and an upper layer of melted butter-fat. This upper layer is clear and transparent in the case of genuine butter, but is often turbid and milky in appearance when margarine is mixed with the butter.

The most recent method of detecting margarine is a continental one which has, so far, been scarcely tried in this country; and it must be given for what it is worth. It depends upon the supposition that butter, being the natural fat of milk, will be more easily emulsified than margarine when melted with skim-

milk. A litre of fresh skim-milk is placed in a vessel *a*. In a vessel *b*, about half the size of *a* and having a perforated bottom, 10 grams (two-thirds of an ounce) of the solid fat is placed, and then *b* is suspended inside *a*. The whole is then heated on a water-bath to a temperature of 37 to 38° C. (100° F.), until the fat in *b* melts, the milk and fat in *b* being kept constantly stirred with the thermometer. Pure butter eventually completely emulsifies, and spreads itself throughout the milk, whilst margarine remains on the surface of the milk in large globules. After repeating the stirring process several times, the vessel *b* is taken out and placed in cold water. If pure butter has been used, only a trace of fat remains behind; but if margarine were present, the whole of the margarine fat is obtained. (*Journal de Pharmacie et Chimie*, 1902, pp. 372-377.)

Coming now to more reliable criteria, there are three principal tests upon which analysts rely for distinguishing between butter and margarine, or between genuine butter and butter containing margarine. These are: (1) the specific gravity of the fat, (2) Analytical Methods. the "Valenta" test, and (3) the "Reichert-Wollny" number. We proceed to explain these points a little more fully.

The "specific gravity" of a liquid is the weight of any definite volume of the liquid at a specified temperature, divided by the weight of the same volume of water. Thus, if a bottle holds either 912 grains of butter-fat at some particular temperature, or 1000 grains of water, the "specific gravity" of the butter-fat at the specified temperature is $912 \div 1000$, or .912. The temperature usually chosen for butter-fat is 100° F., the fat then being nicely liquid. Now, genuine butter-fat at 100° F. has a specific gravity ranging from .910 to .914, and is generally about .912. Other animal fats, including margarine, have specific gravities ranging from about .901 to .904. Hence, if the fat of a suspected sample is found to have a specific gravity within these latter limits, the sample is wholly margarine; if between .904 and .910, it is most probably a mixture of butter and margarine, and in any case is not genuine butter.

The "Valenta" test is by far the most valuable *simple* test for margarine. It can be performed by anyone possessing a measuring-tube, a test-tube, a suitable thermometer, and acetic

acid of the proper strength. Three cubic centimetres of the clear melted fat are poured into a test-tube, and an equal volume of glacial acetic acid (specific gravity 1.056) is then added. The tube is then heated over a lamp until the fat is completely dissolved. A thermometer is placed in the liquid, and the tube is allowed to cool spontaneously, the contents being stirred with the thermometer. As soon as the liquid becomes turbid the temperature of the thermometer is read off. Margarine shows the point of turbidity when the liquid has cooled to about 98° – 100° C. (208 to 212° F.), whereas genuine butter does not become turbid until the temperature has fallen to about 56° – 62° C. (133 to 144° F.). Any sample which has a turbidity-point between 62° and 98° C. (144 and 208° F.) is most probably a mixture of butter and margarine, and is then further tested by the Reichert test to confirm the presence of margarine and to determine its quantity.

The **Reichert-Wollny method** is also known in slight modifications as the "Reichert", the "Reichert-Meissl", and the "Reichert-Meissl-Wollny" test. It has already been explained that genuine butter-fat contains about 8 to 9 per cent of "soluble" or "volatile" fatty acids, whereas margarine and other animal fats contain only about 1 per cent, or, in some cases, scarcely any. The object of the "Reichert" method is to determine the quantity of volatile acids in the fat of the sample, and thereby to ascertain whether the sample is genuine butter, or, if not, with how much foreign fat it has been adulterated. Five grams of the clear melted fat (freed from curd, salt, and water, as previously explained) are weighed into a glass flask. An alcoholic solution of potash is added, and the mixture heated. Then dilute sulphuric acid is poured into the flask. The result of these treatments is to set the fatty acids free from their previous combination with the glycerine. The flask is now connected to a condensing arrangement, and the liquid heated to boiling. The "volatile" acids distil over with the steam, whereas the other fatty acids (chiefly oleic and palmitic acids), being fixed or non-volatile, remain behind in the flask with the glycerine and sulphuric acid. Next, the condensed "volatile" acids are collected in a receiver as they distil over, and their precise quantity is ascertained by running standard "deci-normal"

alkali into the receiver until the acidity is exactly neutralized. The point of neutrality is easily seen by adding to the acid liquid a few drops of what is called an "indicator" (a coal-tar dye termed "phenol-phthaleïn" is generally used), which shows a sharp change of colour the instant all the acid has been neutralized by the alkali.

The "**Reichert number**" is the number of cubic centimetres of the standard alkali required to neutralize the volatile acids obtained from 5 grams of the fat. English butters made from the mixed cream of several cows have a mean Reichert value of 29, and the *minimum* value adopted in this country is 24. Smaller values, however, may be obtained under special circumstances from the butter of *individual* cows, when the number may run as low as 20. Margarine containing no butter gives a Reichert number of about 1 to 2. Mixtures of butter and margarine give values lying between 2 and 24, say; the exact figures depending upon the quantity of margarine added, and also upon the actual Reichert number of the original butter. The range of the values for genuine butter may be taken—putting aside very exceptional cases—as from 21 to 33.

It is this wide range that, as in the case of milk and other natural products, gives rise sometimes to so much difficulty in deciding whether a particular sample is genuine or not. A little consideration will show that a butter with a high Reichert number of 33 could be mixed with quite a considerable quantity of margarine without reducing the value below 24, the minimum adopted. As regards the causes of these variations, they are probably due, wholly or in part, to differences in feeding and treatment of the cows, as well as to different physiological conditions

Dutch Butters.

of the latter in the periods of calving and lactation. The first points are well illustrated by the case of certain Dutch butters reported upon in 1902 by Dr. van Rÿn, the Director of the Maastricht Station for Agricultural Experiments. Samples of Dutch butters have on several occasions been declared by English and other analysts to be adulterated with margarine, whilst the exporters have maintained that they were pure and genuine butter beyond any possible question. The Dutch Government therefore caused Dr. van Rÿn to examine the matter. He was to ascertain whether the differences might not be accounted for

by variations in the composition of the butter-fat, brought about, for instance, by changes in the methods of feeding the cattle, or by any other cause. The English chemists had chiefly relied upon the very low "Reichert values" which the Dutch butters had yielded, and these low values had occurred almost exclusively in the autumn months. Dr. van Rÿn consequently examined some hundreds of samples as regards their Reichert values. These samples were taken in the last four months of the year by a special official, from butter churned in his own presence. The results were published in 1902, and the Dutch Government chemist claimed that they proved low percentages of volatile acids in the butters to be produced by keeping the cows at pasturage until late in the year. It will be easily understood that with the approach of winter grass would become poorer and less plentiful, and that the cows might be too much exposed to cold; so that the explanation is by no means an unreasonable one. As soon as the cows were stabled, and therefore differently and better fed and protected from bad weather, the proportion of volatile acids began to increase. Without giving too many figures, it may be said that the results published by van Rÿn¹ show that during the four months in question about one-half of all the Dutch butters analysed by him yielded "Reichert values" below 25, and a few of the individual results gave figures even below 20. The averages of all the analyses for the separate months were as follows:—September, 24.8; October, 23.7; November, 25.2; December, 26.6. Thus, in November and December, when the cows are presumably all stabled, the "Reichert values" begin to rise. Of course the Dutch farmer, knowing this, has his remedy in stabling his cattle earlier. But this does not affect the point that a perfectly genuine butter may, under certain conditions, give a very low figure for volatile acids. The justification for taking 24 as the minimum Reichert value of genuine butter lies in the fact that ordinary commercial butter is practically never made from the milk of a *single* cow; and Dr. van Rÿn's own figures for October show that the average of a *number*, even in the lowest month, is practically 24.

Of the latest scientific opinion as to the chemical and physical effects of different cattle-foods on butter, an interesting summary

¹ *The Composition of Dutch Butter.* By J. J. L. van Rÿn.—Baillière, Tindall, & Cox; 1902.
VOL. III.

is given in an official report by Dr. Thorpe, Principal Chemist of the Government Laboratory. Green fodder tends to produce butter of low melting-point, and comparatively rich in volatile acids; mangel-wurzel also gives butter with a high percentage of volatile acids. Hay and silage, on the other hand, tend to give butter with a high melting-point.—(Mayer.) The volatile acids decrease in amount when no cereals are given.—(Vieth.) Oats, decorticated cotton-cake, beans, and peas are found to be beneficial in their effects on butter, but linseed-meal, grains, Paisley-meal, and foods containing a large proportion of sugar are best discarded, or at least reduced to a minimum.—(Spier.) Cotton-seed tends to produce a butter of high melting-point, with a consequent diminution in the volatile acids, but with no change in the specific gravity of the fat or its colour.—(Lupton.) Attempts are occasionally made to influence the amount and nature of the fat in milk by the use of foods containing fat. The testimony as to the value of such foods in augmenting the amount of milk-fat is conflicting; but the weight of the evidence goes to show that, although in certain cases fat may have an indirect beneficial effect, nevertheless in the case of a normally fed animal it has no contributory action on the amounts of the glycerides secreted. Baumert and Falke have, however, stated that not only is butter-fat greatly changed in character through feeding with various fats, but the alteration is always characteristic of the fats used—that is, the butter-fats produced by feeding cows with sesamé, cocoa-nut, or almond-oil exhibit, on analysis, the same characteristics as are found in artificial mixtures of butter-fat with these three oils. According to Bartlet, gluten food containing much oil produces soft butter, yet when free from fat the gluten will not have the hardening effect of cotton-seed meal; soft butter cannot be attributed to an excess of fat or to a deficiency of nitrogenous food. Hills tried the effect of adding various oils to food, and found that with cotton-seed oil the butter was hard and of good quality; linseed-meal rendered it soft and sticky, whereas maize-oil made it soft and oily. In this connection the results of certain feeding experiments made at the Wye Agricultural College, at the instance of the Board of Agriculture, are of importance in relation to the search for certain vegetable oils in butter, as indicative of the presence of oleo-margarine. The samples of butter produced by the cows so

Effect of the
Cow's Food
on Butter.

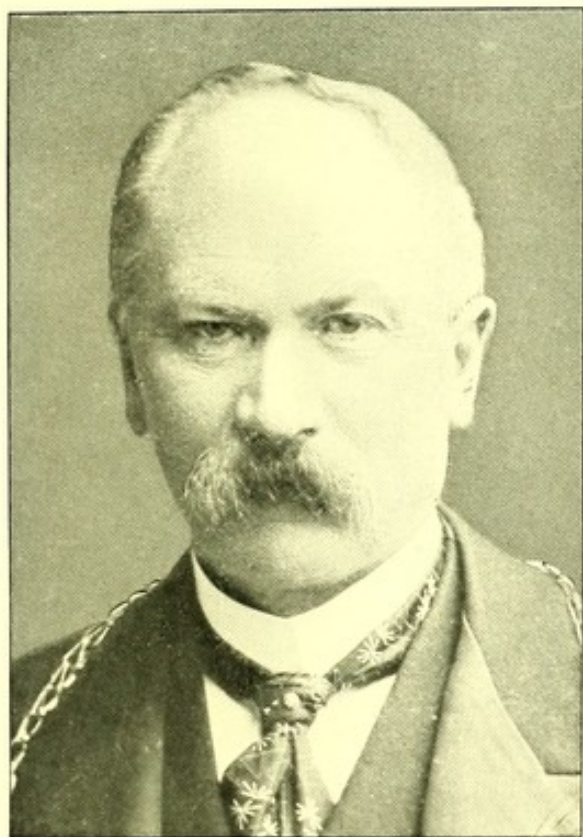
Sir THOMAS H. CLEEVE is chairman and managing director of the Condensed Milk Company of Ireland, Ltd., and senior partner of the firm of Cleeve Brothers, Limerick, London, and Liverpool, with extensive interests in British Columbia. He was High Sheriff of the City of Limerick 1899-1900, and was created Knight in 1900 on the occasion of the visit of Queen Victoria to Ireland. He is a Deputy-Lieutenant for the City of Limerick, and takes an active interest in civic affairs, being a member of the Limerick Town Council.

Mr. J. D. COPEMAN is one of the best-known men in the British provision trade, having been for eighteen years chairman of the Home and Foreign Produce Exchange, Hibernia Chambers, London Bridge—that is, the London Provision Exchange, of which he was the founder. When he retired from business, in 1894, he was the last surviving partner in the well-known firm of Yeats, Acocks & Copeman, which came to an end after existing over a hundred years. No other partners were ever in the firm besides those named.

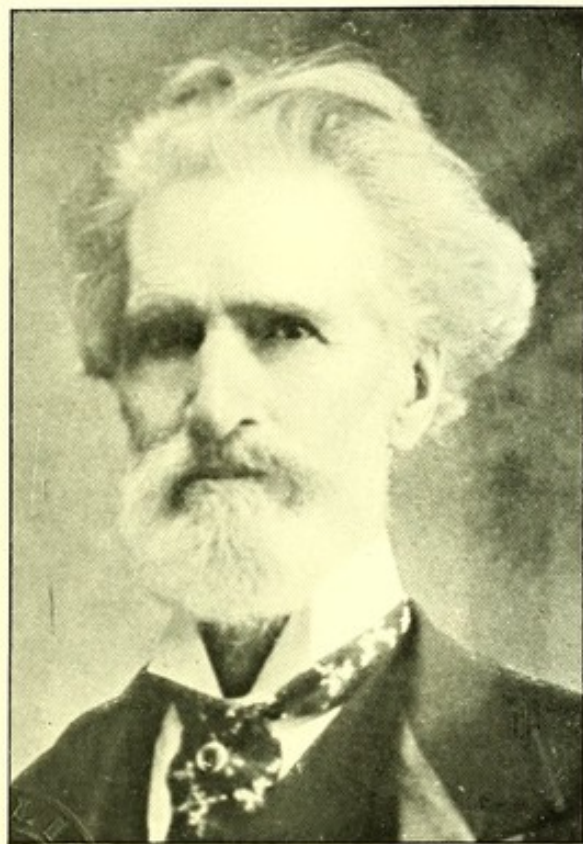
Mr. J. SHORLAND APLIN, chairman of Aplin & Barrett, and The Western Counties Creameries, Ltd., of Yeovil, is an authority on English Cheddar cheese and on butter, having for several years been a judge at the London show of the British Dairy Farmers' Association, and also at Dublin. There is perhaps no more competent judge of dairy produce.

Mr. JOHN KELLITT, J.P., Wavertree, Liverpool, has been for many years a leading retail grocer and provision merchant, being chiefly associated with the grocery business in his own shops, and with the provision trade through his connection with the important firm of Fowler Brothers, Limited, of which he was long a director. He has been one of the most active members of the Grocers' Federation, and is president of the Benevolent Fund connected with it.

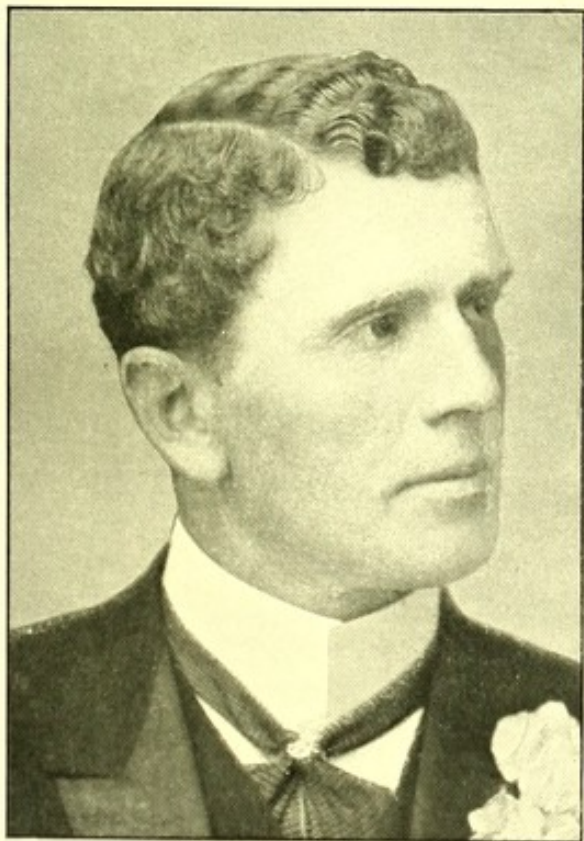
LEADING MEMBERS OF THE TRADE



SIR THOMAS H. CLEEVE, J.P.



J. D. COPEMAN



J. SHORLAND APLIN



JOHN KELLITT, J.P.

fed were tested at the Government Laboratory. It was found that:—

1. Cows fed on cotton-seed cake give a butter which shows a reaction for cotton-seed oil.
2. The above is true even when only a small quantity is given, and increases with continuous feeding up to a certain limit which cannot be passed.
3. The reacting substance passes into the milk within twenty-four hours, and continues several days after the food is stopped.
4. The intensity of the reactions varies with different cows, but does not in any case indicate a greater amount than 1 per cent of cotton-seed oil in the butter.
5. Feeding on cotton-seed cake gives a butter which, on analysis, shows results tending to diverge still more widely than usual from those yielded by margarine, thus making it easier to distinguish between this and a mixture of margarine and cotton-seed oil.
6. Feeding with sesame-cake gives no reaction for sesame-oil in the butter, even after it has been continued for two months.

This last observation, Dr. Thorpe points out, is of importance in view of the compulsory use of sesame-oil in the manufacture of margarine in Germany and Belgium. As sesame-oil may be readily detected by comparatively simple tests, the presence of such margarine in butter may be easily recognized.

A word as to handling butter. The retailer in a small way of business will find it desirable not to lay in too much stock at a time. It is a great point to sell always butter which will please the customers and keep their custom. When Handling Butter. butter has once lost its sweetness it is dear at any price, and there are few customers who will not owe their grocer a grudge if he sells them what their palates disapprove, however cheap the butter may be. A country grocer will seldom find it wise to keep more than a fortnight's supply in his cellar, even if the consequence of keeping short supply may occasionally be that he has to pay 2s. a cwt. more on a consignment. Before buying butter quoted at a low figure it is well to have a single cask or basket forwarded as sample; the little extra for carriage will not be thrown away if it saves a disappointment in quality. When butter has really "gone off", so as to have a nasty "twang", the prudent course will sometimes be to dispose of it at once to a confectioner, biscuit-maker, or sweet manufacturer. If still fairly good it may be saleable at a reduced price. The firm who supplied the butter will in some circumstances make an allowance. In April and May country grocers often get overstocked with farmers' fresh butter, and find

the keeping of it a problem. Cold storage (see chapter thereon) is the best means when available. Or if ice can be procured, butter may be kept for weeks by squeezing all the butter-milk out of it, and then packing it in large pieces, with ice all round it. Farmers and others sometimes use a machine which reduces the fresh butter to ribbons; these are sprinkled with salt, bunched up, and passed again through the worker; and when the process has been several times repeated, so that the whole of the butter has been uniformly salted, the butter is placed in stoneware "crops", levelled off, and a layer of salt put on the top—to cover. In packing the butter into the crops a wooden beater should be used so as to consolidate it thoroughly. The crop should be filled to within about half an inch of the top and covered with a linen or cotton cloth, and pure fine salt put on so as to exclude all air. Another successful plan is to salt the butter mildly, make it up into pound rolls, and wrap each in muslin; then immerse them in a crop containing strong brine (made by dissolving as much salt as possible in boiling water and using when cold), taking care that all the rolls are beneath the surface. But potters of butter often find their efforts defeated because the butter has been made from cream overripe, or insufficiently ripe, or churned at too high a temperature, or because the butter-milk has not all been extracted. Keeping butter means having it at a low temperature—38° or 40° F., so that bacterial development cannot take place. Salted butter taken from the crop may be improved by being immersed in water at about 68° or 70° F. and then worked, so as to expel some part of the superfluous salt. If tubs which have been used before for butter are used for storing, instead of the preferable stone crops, they should be washed out thoroughly with hot soda and water. New tubs have to be soaked for several weeks in running water to remove the resinous matter from the wood, which would otherwise spoil the flavour of the butter. It is for this reason that in Canada and other colonies the butter-packers now very generally use boxes treated with paraffin-wax, an odourless and almost tasteless substance, which is forced into the boards by passing them under hot rollers. To prevent the formation of mould—a tiny fungus which grows in butter and butter packages under certain conditions, dampness being favourable to it—a Canadian practice is to rinse the inside of all butter packages with a strong brine of

salt to which formalin has been added in the proportion of an ounce of formalin to a gallon of brine. But formalin is not quite the thing for everybody to handle. The approved package for butter is that of white Danish beechwood, duly purified; and the casks containing butter should be kept in a cellar as cool and dry as possible—it is quite a mistake that butter may be kept sweet by water or that dampness will not injure it. In turn-
 ing out the tubs the salesman should be careful that Turning Out
and Cutting Up.
 his slab is clean. The slab, slicer, and beater should be scrubbed every morning with soap and boiling water, and the slicer and beater may be kept in cold water. A cask of butter is usually cut through the middle horizontally, and the upper half then divided vertically, and the two halves placed with the cut surface outwards for appearance' sake. Use a wire for the large cutting; and when cutting pounds or half-pounds with the knife, be careful to avoid having small bits left over. If an ounce or so too much has been cut off, the grown-up customer will often take it if asked.

3. MARGARINE, &c.

Margarine, or, more strictly, oleo-margarine, was formerly known as "butterine"; but the first term is now the official and universally-accepted designation. It was originally prepared about the time of the Franco-German war by a French savant named Mège-Mouriès, and its discovery presents a somewhat curious analogy with that of beet sugar. Just as this latter product, which has now so largely ousted cane sugar, was discovered by a French chemist at the direct instigation of the first Napoleon, so margarine, which has become in some respects so formidable a competitor with genuine butter, was discovered in the following century by another French chemist at the instance of Napoleon III. The motives of the emperors, however, were widely
 different in the two cases. Those of Napoleon I Napoleon III
and Margarine.
 were mainly patriotic, the idea being to render France independent of other countries in the matter of sugar-supply; whereas those of the last Napoleon were largely humanitarian, the object in view being to obtain a wholesome cheap substitute for butter for the use more particularly of the poorer inhabitants of Paris

and other large cities. M. Mège-Mouriès carried out his commission of discovery most successfully. By experimenting upon various animal fats he eventually found that a very good and wholesome butter-substitute could be obtained from beef-fat, the product having many of the essential qualities of butter, and being practically free from the peculiar flavour which ordinary raw fat possesses. In 1872, or three years after Mège-Mouriès had been requested by the emperor to investigate the matter, the sale of the new product was sanctioned by the Paris authorities; and since then the manufacture of substances which are called "margarine" has extended from France to the United States, Germany, Austria, Holland, Russia, and this country, until it has assumed relatively enormous proportions.

But an important distinction must now be noticed. The original French product was made from the best qualities of beef kidney-fat (*i.e.* best beef-suet); and although, no doubt, the sale of the new substitute was largely helped by the substance being termed "butterine", and by its being purposely made to resemble butter, yet it was certainly itself an excellent cooking-fat, of appetizing flavour and of good keeping properties; so that it soon displaced inferior qualities of butter, and a considerable demand arose for it. As a result, the supply of good fresh beef-fat began to run short—at all events in Europe. In 1885 it was calculated that 150,000 head of cattle would yield only about 3000 tons of "butterine" by the original Mège-Mouriès process; that is, about as much as was annually turned out at that time by a single large continental factory. The lack of material led to the gradual abandonment of the original method of production. To increase the yield the fat was first melted at a higher temperature than previously, and submitted to a greater pressure, so that more of the harder parts of the suet were extracted for use as "butterine". Then, partly to counteract this hardness, and partly to still further increase the yield, the manufacturers began to mix other animal fats and vegetable oils with the beef-suet. Pork-fat and veal-fat, cotton-seed, earth-nut, sesame, and cocoa-nut oils were only a few of the substances proposed and used. Thus, in the course of time, the manufacture of margarine—at least in some countries—has changed very considerably from the original method. The

From Animal
Fats to
Vegetable Oils.

product is not now in all cases, or even in many, a pure animal fat. It may be, and usually is, a mixture of fatty and oily substances having both a vegetable and an animal origin. As the vegetable fats are usually considered to be less easily digestible than the animal products, the change is not an improvement from the dietetic point of view, even if the ingredients are always pure and wholesome. In the United States, where animal life is plentiful, there has been less inducement than in Europe to use any objectionable admixtures. Of course it is not to be inferred from this that such admixtures are not employed. Nevertheless, oleo-margarine, as manufactured in the best-class Chicago factories, where the operations are on a very large scale, and where too much capital is involved to allow of offending the consumers' prejudices unnecessarily, would certainly appear to be a cleanly and a wholesome article.

The following is given as a summary of the method of manufacture adopted in such a factory. The beef-fat is first freed as far as possible from fleshy fibre, and then minced fine in a large "hasher" or mincing-machine. From this it passes to large melting-tanks, jacketed with hot water, in which tanks it is melted at a temperature which is not allowed to rise above 102° F. When properly melted and settled, the fat gives a clear yellow oil, any water, skin, fibre, and other débris sinking to the bottom, whilst a thin scum of lighter impurities rises to the surface. After this scum has been skimmed off, the yellow oil is run into wooden vessels; and as it begins to cool down, the stearin, or harder part of the fat, commences to deposit from the oil in a more or less crystalline or granular condition. The refined fat is then removed to a press-room and kept at a temperature of 80° to 90° F. for a time, during which period a further quantity of stearin settles out. To remove this stearin the oleo-margarine is filtered through cotton cloths, and ultimately the last portions of the oil are pressed out of the residual stearin by means of a press. The stearin is left behind in the press-cloths as a solid white cake, and is eventually used for candle-making. At this stage the oleo-margarine has no flavour of butter, and is, in fact, quite tasteless. It is therefore churned up with milk in order that it may acquire a butter flavour. Then it is coloured with annatto, and rolled with ice. Finally it is

How
Margarine
is Made.

salted and made up into pounds, or packed into kegs for export; or it may be further worked up with other substance into "butterine", essentially as described below.

A process which has been used in this country is the following, which will serve as an example of the method of manufacture when vegetable oils are used as well as animal fats:—Ox-fat, from which everything that is discoloured has been removed, is heated to a temperature of about 120° F. A clear sweet-flavoured fat is obtained, which is subsequently mixed with a certain proportion of pure vegetable oil, such as cotton-seed, nut, or olive oil. The mixture, which melts at a lower temperature than butter-fat, is cooled quickly, so as to prevent granulation as much as possible. It is then churned up with new milk, and subsequently salted and packed.

In France, one of the modern methods most frequently employed for the production of margarine and its further conversion

French and
Belgian
Manufacture.

into "**artificial butter**" is the process described below. With no considerable alteration this may be taken as typical of general French and Belgian practice. Beef-fat, quite fresh and of excellent quality, is ground up between toothed cylinders, which tear open the enveloping membranes of the fat. It is then heated to about 113° F. in a steam-jacketed vessel with one-third of its weight of water and one-thousandth of carbonate of soda, being meanwhile well stirred to separate the membranous tissue and cause it to fall to the bottom. When completely melted, the fat is decanted off from the *débris* and mixed with 2 per cent of salt to assist the clarification. It is then kept melted and still for two hours, by which time it has become a clear, limpid, yellow oil with rather agreeable odour; this oil is decanted from any further sediment and allowed to cool down. When at a temperature of 77° F. the semi-solid mass is pressed in a hydraulic press, the solid stearin then largely remaining behind. The **oleo-margarine** thus obtained constitutes cooking-fat (*graisse de ménage*), and can be employed just as it is. In this condition it has the advantage of keeping a long time without turning rancid. To prepare "artificial butter" from this fat, 30 parts of the melted margarine are introduced into a churn with about 25 parts of milk and a nearly equal quantity of water in which has been macerated one-tenth part of cow's udder. A

little colouring matter ("rocou") is also included. This mixture is churned for about fifteen minutes. Under the influence of the mammary pepsin (a kind of ferment) contained in the udder, combined with the agitation of the churn, the oleo-margarine forms an emulsion with the water and the milk, and then constitutes a thick "cream" like that which is obtained from milk. On continuing the churning, the emulsion gradually agglomerates, and eventually, after about two hours' shaking, becomes converted into the artificial butter. This is washed first in the churn with cold water, and again after removal, the "butter" being worked up with a machine much as in the preparation of ordinary butter.

Sugar and yolk-of-egg are sometimes added, in order to impart some of the properties of butter to the margarine.

A good deal of oleo-margarine is produced in Holland. It appears, however, to be largely used, not for consumption as pure oleo-margarine, but for making "*mixed butter*", "*artificial butter*", or, as the product has often been termed, "Dutch butter". That is, it is worked up with milk and various oils, and either with or without genuine butter in addition. The proportions in which these materials have been used are said to be as follows:—

Milk ...	...	...	...	...	15 to 35	per cent.
Margarine ...	...	...	...	...	40 to 70	"
Oil ...	...	...	...	...	13 to 35	"
Butter (in the lower qualities)	...	...	...	...	0 to 0.5	"
„ (in the best kinds)	...	...	...	...	10 to 20	"

In this country, however, all such "mixed butters" are expressly included as "margarine" by the Margarine Act of 1887, which stipulates as follows:—

The word "margarine" shall mean all substances, whether compounds or otherwise, prepared in imitation of butter, and whether mixed with butter or not; and no such substance shall be lawfully sold, except under the name of "margarine", &c.

Of course, when the quantity of butter contained in these compounds is considerable they are really rather more like adulterated butter than anything else. There is no doubt that much of this margarine has been sold in this country as butter, to the prejudice of the Dutch reputation. It should, however, be men-

tioned that a new butter law came into force in Holland in 1901, enacting stringent measures against the exportation of adulterated butters.

From what has been said, it will be gathered that the preparation of good margarine from fresh, clean, wholesome animal fats is a useful manufacture against which nothing can be urged; and which, in fact, has been beneficial in allowing these fats to be widely utilized as a cheap and fairly efficient substitute for inferior butter. It meets a public want, and increases our available supply of food. Quite possibly it may be inferior to butter from the physiological point of view, since the latter substance is the natural fat of milk, which for a time at least is the principal food of the young, and may therefore be presumed to be more digestible, or in some other way more suitable as a food, than the meat-fats which are consumed by older persons, and which correspond more nearly to the chief margarine fats. Moreover, its flavour is not equal to that of high-quality butter. But even so, good margarine is a wholesome and useful substance. Sold under its proper name, there can be no objection to its sale. Only when sold as butter, or mixed with it for sale as butter, can margarine be looked upon as a spurious article. In other cases its inferiority to butter is counterbalanced by its lower price.

Margarine consists essentially of fat and water, with a little salt. The various principal makes do not vary much from one another in general composition, although the ingredients employed may vary a good deal. Thus, in the four following samples the fat ranged only from about 86 to 87½ per cent, and the water from about 10½ to 12½:—

COMPOSITION OF VARIOUS MARGARINES

	French.	American.	Austrian.	Hamburg "mixed butter".
Water	12.6	11.2	10.7	10.3
Fat	86.2	87.2	87.5	85.9
Other organic matter, ash, and salt	1.2	1.6	1.8	3.8
	100.0	100.0	100.0	100.0

Although the total quantity of fat is not very different in the various margarines, its nature may vary considerably, since suet,

oil, or butter may each or all furnish their quota to the fat. It has already been pointed out under the head of BUTTER, that butter differs from margarine in that it contains a rather large quantity of "volatile" acids, chiefly butyric acid. In margarine, unless it has been made up with butter, there is practically no butyric acid. On the other hand, margarine contains a considerable quantity of stearic acid, of which there is only a very small amount in butter. We may show the matter thus:—

	Butter.	Margarine.
Butyric acid ...	A fair quantity ...	Little or none
Stearic acid ...	Very little	Large quantity

In addition, it may be said that while both butter and margarine contain palmitic and oleic acids (combined with glycerine, as is the case with all fats), yet butter as a rule contains much the larger quantity of both these acids. Of course it will be understood that when a margarine is made up with butter it to this extent approaches the true butter character. Margarine Analysis.

The foregoing remarks apply typically to the oleo-margarine basis obtained from meat-fat, without the addition of butter. Following is a more complete analysis of a commercial margarine:—Water, 12.0 per cent; stearin, 38.5; olein, 25.0; palmitin, 18.3; butyrin, &c., 0.3; casein, 0.7; salts, 5.2.

German margarines are required by law to contain 10 per cent of sesame-oil as a tell-tale ingredient—*i.e.* for the purpose of assisting in their identification when mixed with butter. They very frequently contain cotton-seed oil, as do the Dutch margarines also. In fact, the great bulk of the margarine imported into this country is made up with cotton-seed oil, as the following return of the Government Laboratory will show:—

Country.	Total Samples.	Containing—			Coloured with Coal-tar Dyes.
		Cotton-seed Oil.	Sesame-Oil.	Boric Preservative.	
Holland ...	99	72	—	80	80
Germany ...	25	23	25	22	25
France ...	5	—	—	4	—
Belgium ...	2	—	—	—	2
United States ...	1	—	—	—	—
Totals ...	132	95	25	106	107

From this table we gather that most of the imported margarine comes from Holland, is usually made up with cotton-seed oil, contains boric preservative, and is artificially coloured with a coal-tar yellow. The samples from France and the United States consisted of the raw oleo-margarine base, intended for working up with oil, &c., in this country.

Margarine must not contain more than 10 per cent of butter-fat. Section 8 of the Sale of Foods and Drugs Act, 1899, reads thus:—"It shall be unlawful to manufacture, sell, expose for sale, or import any margarine, the fat of which contains more than 10 per cent of butter-fat", &c. In view of any prosecutions which might arise under this section, a committee of the Society of Public Analysts was appointed to confer with the Principal of the Government Laboratory as to the best methods of analysis and interpretation of the analytical results obtained. The committee agreed to make the following recommendations:—(1) That the proportion of butter-fat should be deduced from a determination of the amount of the "volatile acids" as ascertained by the Wollny modification of the Reichert-Meissl process. (2) That no presumption against the margarine, in regard to its content of butter-fat, should be raised unless the Reichert-Wollny number exceeds 4. (3) That the amount of butter-fat in margarine, when it exceeds the legal limit of 10 per cent as determined by the method described, shall be assumed to be as follows:—

Reichert-Wollny Number of Margarine.	Percentage of Butter-fat in the Margarine-fat.
4.0	10
4.3	11
4.6	12
4.9	13
5.2	14
5.5	15
5.9	16
6.2	17
6.5	18
6.8	19
7.1	20

The method of determining the Reicher-Wollny number has already been described (see under BUTTER), and also various tests for distinguishing between butter and margarine.

Margarine is imported in tubs, firkins, boxes, casks, fancy baskets, and crocks of all sizes from 14 lbs. upwards.

Other imitation butters and butter substitutes are: *Ghee*, a liquid butter largely made in India from the milk of buffaloes and cows, twice boiled and bottled with salt and betel-leaf; *Shea Butter*, a vegetable tallow obtained from seeds or nuts of the "butter-tree" (*Bassia parkii*), a wild forest tree growing in the interior of West Africa; *Cocoa* (or *Cacao*) *Butter*, a sweet vegetable fat or tallow with a chocolate odour, obtained by heating and grinding the beans of the theobroma cocoa, and used for the inner contents of chocolate creams, also consumed by Hindoos and others as a substitute for animal fat; *Coker-nut* (or *Cocoa-nut*) *Butter*, also known as *Copra Oil*, a white buttery oil, obtained in the East Indies and Pacific isles from the ripe kernels of the milky coker-nut, and used in tropical countries (when it is fluid) as a substitute for animal fat, also for burning in lamps, for soap-making, for making oleo-margarines, &c.; *Kokum Butter*, a tallowy substance obtained from the seeds of *Garcinia indica*, and frequently mixed with ghee; *Dika Butter*, a dark, cocoa-flavoured, oily substance yielded by the crushed kernels of the ibo-tree found in West African forests; *Mahwa Butter*, derived from the Indian mahwa plant, and used chiefly for making soap and candles; *Nutmeg Butter*, expressed from heated nutmegs or mace; also *Albene*, a vegetable fat without colour, taste, or smell; *Nucoline*, *Vegetaline*, *Cottolene*, &c. *Copra Butter*, the edible grease made from copra or coker-nut oil, is made in considerable quantities at Marseilles, and is so refined and bleached as to be capable, it is said, of being mixed with, and even sold as, ordinary butter. The manufacture is a trade secret. According to a United States consul at Marseilles the same article, somewhat differently prepared, is sold under the various names of "vegetaline", "cocoaline", and "cocose". In Mannheim coker-nut butter, manufactured from the kernel of cocoa-nuts, is sold under the name of "palmin". It is used by cooks as a substitute for butter and lard. It is generally white in colour and almost tasteless. It melts at about 80° F., and is of the consistency of mutton or beef tallow. It is said to contain more than 99 per cent of vegetable fat, with only a small trace of water; to "keep" for three or four months in a cool room, and to be more wholesome than ordinary fats used for baking and cooking. Coker-nut

Imitation
Butters and
Substitutes.

Vegetable
Butters.

butter is generally sold in square packages wrapped in parchment paper, but a small quantity is sent out in hermetically sealed tin cases during hot weather. It is sold throughout Germany at the uniform price of 8*d.* per lb. The kernel of the coker-nut—imported in long narrow strips, known as the “copra” of commerce—is subjected to various refining processes which separate the vegetable fat from the free acids and other substances. The fat is then placed in centrifugal machines, whereby the water, &c., is separated, and in the latter stages the product is stated to resemble ordinary fresh butter. “Vegetable butter” is a preparation of the same kind made at Warrington. It is a pure white, semi-transparent solid, rather thicker than lard, and without smell. At 80° F. it melts to a clear liquid. “Nucoline” is a similar edible fat made in London by a firm who claim to have been refining cocoa-nut butter for some years before the manufacture was commenced at Marseilles—so that the invention of this particular butter substitute is a subject of doubt. But there is no doubt that in Great Britain, France, Germany, and the States the article is largely made and consumed in various forms.

4. LARD

The raw material from which genuine lard is made is the fat of the hog. In this country the portions used for lard-making are, more especially, the so-called “back fat”, lying immediately under the skin and enveloping the whole body; and the interior fat which lies along the ribs and kidneys, and which is generally known as “leaf”, “flare”, loin-fat, or kidney-fat. In America, however, lard is obtained from any fatty parts of the animal. The quality of the fat varies with the part of the pig from which it is taken. That from the exterior envelope is more easily melted out than the leaf or flare fat, and gives a softer lard. Moreover, the season of the year, bringing with it, as it changes, differences in feeding and in the rate of respiration, induces quite notable changes in the consistency of the fat; so that in the summer it is generally of softer texture than in the winter. In fact, January and February are well recognized, especially in America, as the best months in which to collect the fat and prepare the lard, in con-

sequence of the greater firmness of the fat at this season. Still, soft and greasy fats are also met with in winter, and not infrequently. Such are generally attributed to particular methods of feeding. That diet does certainly exercise influence upon the fat is shown by the fact that pigs fattened exclusively on acorns always yield a rather yellowish lard. The largest yield of lard, and the best quality as regards consistency and appearance, is given by the leaf-fat of young but well-grown pigs.

In this country lard-making is generally a simpler operation, and on a smaller scale, than in America, especially as regards the grading of the products. The "rendering" may be How Lard is Made. done in open vessels, heated either over a fire or with a steam-jacket; or it may be done in closed vessels heated by steam under pressure. As a rule it may be said that the first two methods are used in England and the last in the United States; but the rule is not without some exceptions. The kind of vessel used is very far from being unimportant, because the different qualities of lard depend largely on the temperature at which the fats are rendered, and these temperatures depend on the vessel employed.

In "rendering" on the small scale, the fat is freed as far as possible from skin and flesh, and then cut up into small cubes by hand or in a machine. This divided material is then usually washed with water until the washings are colourless, and removed to the melting-vessel, which may be of tinned copper heated by direct fire, or of enamelled iron heated by a steam-jacket. During melting the fat is kept well stirred, and when quite clear and free from water it is poured through strainers into the storage-vessels. In order to prevent fissures forming whilst the lard is setting—which would admit air to the interior and prejudice the keeping qualities—the cooling lard is kept stirred until it becomes semi-fluid and opaque. Sometimes a little ultramarine or pearl-ash is added, during rendering, to improve the colour of the lard; and occasionally a little powdered alum is mixed with it to make it set firmer. The residues of flesh-tissues and fat-membrane left on the strainer and in the copper are generally further heated and pressed in a "greaves-press", the solid portions which remain behind being known as "greaves" or "scratchings". These are used as a foodstuff in poor localities; or, when obtained on a large

scale, they are employed for the manufacture of yellow prussiate of potash on account of the nitrogen which they contain.

For rendering lard with steam under pressure, as is typically practised in the large hog-slaughtering establishments of North America, a rendering-vessel made of boiler-plate or steel is employed. This vessel is generally like a closed vertical cylindrical boiler with conical ends, and fitted with lids which can be screwed down air-tight. A common size of vessel is about 11 feet long and 4 wide. After the "renderer" has been filled with the fatty materials and the lids closed, steam at the proper pressure is admitted, which rapidly heats up the fat and causes the melted lard to exude. The condensed water falls to the bottom, and is run off through a tap. When the process is finished, the lard is drawn off, and the solid residue or "tankage" is withdrawn through the bottom aperture, pressed, dried, and utilized as a fertilizer. In addition to these closed tanks, steam-jacketed open "kettles" are also largely used in the United States—different qualities of lard being given by the different temperatures employed for the rendering.

Dr. H. W. Wiley, the American Government chemist, describes the kinds of lard produced in the States as follows (Bulletin No. 13, Division of Chemistry, United States Department of Agriculture):—

"According to the parts of the fat used and the methods of rendering it, lard is divided into several classes:

"(1). **Neutral lard** is composed of the fats derived from the fresh leaf, taken in a perfectly fresh state. The leaf is chilled, reduced to a pulp in a grinder, and passed at once to the rendering-kettle. The fat is rendered at a temperature of 105° F. to 120° F. Only a part of the lard is separated at this temperature, and the rest is sent to other rendering-tanks to be made into another kind of product. The lard obtained as above is washed in a melted state with water containing a trace of sodium carbonate, salt, or a little dilute acid (as required). The lard thus formed is almost neutral, containing not more than 0.25 per cent of free acid; but it may contain a considerable quantity of water. This neutral lard is used almost exclusively for making butterine (margarine).

"(2). **Leaf Lard.**—The residue unrendered in the above process

is subjected to steam-heat under pressure, and the fat thus obtained is called leaf lard. Formerly this was the only kind of lard recognized by the Chicago Board of Trade, and was then made of the whole leaf.

“(3). **Choice Kettle-rendered Lard, Choice Lard.**—The quality of lard required for making butterine does not include all of the leaf produced. The remaining portions of the leaf, together with the fat cut from the backs, are rendered in steam-jacketed open kettles, and produce a choice variety of lard known as ‘kettle-rendered’. Both leaf and back fat are passed through a pulping machine before they enter the kettle. Choice lard is thus defined by the regulations of the Chicago Board of Trade:

“‘Choice lard to be made from leaf and trimmings only, either steam or kettle rendered, the manner of rendering to be branded on each tierce’.

“(4). **Prime Steam Lard** is made as follows:—The whole head of the hog, after removal of the jowl, is used for rendering. The heads are placed in the bottom of the rendering-tank. The fat from the small intestines and heart is also used. In houses where ‘kettle-rendered’ lard is not made, the back-fat and trimmings are also employed. When there is no demand for leaf lard the leaf is also put into the rendering-tank with the other parts of the body mentioned. It is thus seen that ‘prime steam lard’ may be taken to mean the fat of the whole animal, or only parts thereof. It is thus defined by the Chicago Board of Trade:

“‘Standard prime steam lard shall be solely the product of the trimmings and other fat parts of the hog rendered in tanks by the direct application of steam, and without subsequent change in grain or character, except as such change may unavoidably come from transportation. It shall have proper colour, flavour, and soundness for keeping, and no material which has been salted shall be included. The name and location of the renderer and the grade of the lard shall be plainly branded on each package at the time of packing.’

“This lard is passed solely on inspection, the inspector having no authority to supervise the actual rendering.

“(5). **Guts Lard.**—This term, as applied to lard-making, means that everything inside of a hog goes into the rendering-tank, with the exception of the intestines, liver, lungs, and the non-fatty part of the heart.”

The term “**Refined Lard**” in America has long been used to denote a low-class product composed chiefly of cotton-seed oil and

lard stearin. This product is now, however, more generally called "**compound lard**" or "**lard compound**". Since the addition of cotton-seed oil is liable to render the lard too soft, the article is often mixed with hard stearin obtained from beef-fat by hot-pressing out the softer portions (which latter are used for making margarine). A good deal of this "lard" was imported into this country some years ago, but very little appears to reach here at the present day. American lard is imported in kegs and pails. **First quality keg lard** corresponds to the "prime steam lard" described above (4). A certain amount of lard is also sent us by Denmark. Of the home-produced article, Irish and Wiltshire are two of the most popular brands, the former being put up in bladders, kegs, blocks, and in tins for export. Waterford lard is the favourite Irish make, but that from Belfast has a good reputation.

Pure lard is white or nearly white in colour, possesses a faint, characteristic odour, and has a slightly sweetish, fatty taste.
Properties of Lard. When wrapped into cakes with cloth and submitted to pressure at a temperature of 32° F., a considerable proportion (about 60 per cent) of limpid, pale-yellow oil is forced out; this is "**lard oil**", which is used for lubricating purposes. The solid residue left in the press is called "**lard stearin**"; it is used for soap and candle making, and in America for the preparation of "**compound lard**".

Lard is liable to turn rancid on prolonged exposure to the air. If it is stored at the time in coppered or lead-glazed vessels, the acid produced by the rancidity may dissolve copper or lead and render the lard more or less injurious to health. A dry, cool room is the best place for the storage of lard; damp cellars are objectionable, and a too warm atmosphere accelerates the production of rancidity. Earthenware or stoneware vessels are perhaps the best for keeping lard in; but they should not be glazed with a "soft" lead glaze, as this is easily attacked if the lard should turn rancid.

To test whether a lard has dissolved copper or lead from a vessel proceed as follows:—Warm some of the lard in a test-tube with pure colourless acetic acid, cool the mixture, and pour off two small quantities of the acid liquid into two clean tubes. To one of the quantities add a drop or two of solution of yellow prussiate of

potash: if a dark-brown coloration is produced, this shows the presence of copper. To the other quantity add a drop or two of solution of potassium chromate; a lemon-yellow precipitate shows that lead was contained in the lard.

Lard is essentially a mixture of three substances called olein, palmitin, and stearin. Of these, the olein is the softest, and is the chief constituent of the "lard oil" which is pressed out as above described. The stearin is the hardest. The three substances mentioned are themselves compounds of glycerine and three fatty acids, viz. oleic, palmitic, and stearic acids respectively. The total quantity of glycerine contained in lard is about 6 to 8 per cent, and the total amount of the three fatty acids about 93 to 95 per cent. Since lards rendered by different methods, or obtained from different parts of the animal, or at different seasons of the year, show considerable differences in quality, it follows that the chemical composition of these lards varies to a notable extent. It is this variation that sometimes makes it difficult for an analyst to say for certain whether a particular lard has been stiffened with beef fat or not. For the same reason, whenever a single figure is given—as it sometimes is in books—for "the" melting-point of lards, or as "the" specific gravity, "the" iodine value, and so on, the figure is useless except as a very rough indication, because perfectly genuine lards have very different figures on account of their differences in composition. That the range is rather a wide one is seen from the following figures of the analyses of genuine English lards:—

			(1) Very soft lard, from back-fat.	(2) Medium lard, from shoulder-fat.	(3) Hard lard, from leaf-fat.
Olein	...	...	81.7 per cent.	74.2 per cent.	61.9 per cent.
Palmitin	...	...	11.4 "	13.5 "	20.2 "
Stearin	...	...	6.9 "	12.3 "	17.9 "
			100.0 "	100.0 "	100.0 "
Ether deposit	...	...	Nil.	2.2 per cent.	7.9 per cent.
Melting-point	...	...	29.5° C.	33.5° C.	45.0° C.
Solidifying-point	...	...	23.3° C.	27.2° C.	32.0° C.
Iodine value	...	...	70.4 per cent.	64.0 per cent.	53.4 per cent.
Specific gravity at 38° C.	...	...	.9067	.9055	.9038

Thus the soft lard contains about 20 per cent more olein than hard leaf lard, and its melting-point is lower by 15½° Centigrade.

In the United Kingdom the three chief forms of adulteration of lard now met with are: (1) **Water**, which may be incorporated with the lard to increase its weight, but which is nowadays not often found except in small quantities left in the lard through carelessness. (2) **Cotton-seed oil** (or other similar oil such as sesamé, when cheap enough), which is used in making the so-called "refined lard" or "compound lard" in America. (3) **Beef (or mutton) fat**, which is used both with the cotton-seed oil in "compound lard", and also with genuine but soft lards in order to stiffen them. In addition to these there are occasional falsifications in the shape of such substances as alum, chalk, starch, excess of salt, cocoa-nut oil, &c.; but these are only of sporadic occurrence, and are of little importance.

To detect **water** in lard, a quantity of the sample may be put into a dry test-tube or conical wine-glass, and carefully melted. On leaving this to stand in a moderately warm place for a time, the water settles out into a distinct layer at the bottom of the tube or glass. If a graduated tube is used, the proportion of water can be approximately read off. **Cotton-seed oil** can only be detected with certainty by an experienced operator, as appearances may sometimes be obtained which are liable to lead a novice astray. The method used, however, is as follows:—A small quantity of the fat is melted in a test-tube, mixed with amyl alcohol and an alcoholic solution of silver nitrate, and then heated in hot water for some time. If cotton-seed oil is present the mixture turns brown. **Beef fat** ("beef stearine") is perhaps the most frequent adulterant of lard. Only an expert chemist could hope to detect the relatively small quantities (5 to 10 per cent) of beef fat usually added, but the principle can be made clear in a few words. A measured quantity of the melted lard is placed in a glass tube, and dissolved by adding seven times its volume of ether. The corked tube is then placed in a bath of water, and so kept at a temperature of 13° C. for twenty-four hours. At the end of this time a quantity of white crystals will be found to have deposited¹ from the ether-solution: these crystals, after pouring off the liquid, can be weighed. Now, if the lard is pure, the crystals are of a feathery or "plumose" character; but if the lard contains beef fat they are more or less rounded and nodular in form; and

¹ Very soft lards may give no deposit, or only mere traces. See the analyses given above.

moreover there is a greater weight of them that there would have been if no beef (or mutton) fat had been present. The crystalline deposits in the two cases differ also in one or two other points, *e.g.* in their microscopic appearances and in the temperatures at which they melt. Where experience is required, and where an inexperienced analyst might err, is in forming a judgment upon these crystals—especially in certain particular cases. On the one hand, it will be readily understood that, with only a very small admixture of beef fat, the crystals approximate more or less closely to the feathery kinds obtained from pure lard. On the other hand, a genuine but “hard” lard, containing a high percentage of stearin, yields crystals approximating to those obtained from a lard adulterated with beef fat. A practised eye, however, can distinguish between the two with certainty.

English lard comes upon the market in tins of 14 lbs. and 28 lbs. each; in $\frac{1}{2}$ -cwt. boxes containing 1-lb., 2-lb., 7-lb., and 14-lb. packets, with parchment covers; in crates of four 14-lb. parchment-lined boxes; in barrels of $1\frac{1}{4}$ ^{Weights.} cwt., which contain a certain number of bladders according to size, viz. barrels of 50 to 70 bladders, of 40 to 50, of 30 to 40, of 20 to 30, of 10 to 20, and of 10 bladders and under in each barrel. *Irish*, bladdered, in barrels, 1 cwt. 1 qr.; kegs, from 50 to 56 lbs. *Hambro'* and *Danish*, bladdered, in barrels, 1 cwt.; kegs, from 40 to 56 lbs. *American*, tierces, 280 to 336 lbs. net; barrels, 2 cwts.; half-barrels, 1 cwt.; bladdered, in barrels, 1 cwt. 1 qr.; tins and pails, 14 to 28 lbs. *Canadian*, barrels, 1 cwt. 1 qr. In the cabled quotations for American lard, as published in the newspapers, a “point” means a cent, equivalent to an English halfpenny; a hundred cents to the dollar.

5. CHEESE

Something like a hundred different varieties of cheese are known; but it is, of course, not necessary to enumerate them all here. For our present purpose it will suffice to mention only those cheeses which have any vogue in this country, with perhaps a brief reference to some of the chief Continental products not usually handled here.

Cheeses are conveniently divided for trade purposes into two classes, "hard" or "firm" cheese, and "soft" varieties. Of the hard kinds, some are pressed, others unpressed. The principal British makes of cheese are the following:—

Hard.—Cheddar, Cheshire, Cotherstone, Cottenham, Derby, Dunlop, Gloucester, Leicester, Loaf Cheddar, North Wilts, Somerset, Stilton, and Wensleydale. Of these, Cheddar is the typical pressed cheese, and it is the most important kind produced in this country. Cheshire, which comes next to Cheddar in importance, is likewise a pressed cheese, as are also Derby, Leicester, and Gloucester. Indeed all these are but variations of the Cheddar type. Stilton, Cotherstone, and Wensleydale are unpressed firm cheeses, all of which are "ripened" by the aid of the blue mould which grows in veins within them.

Soft.—Caerphilly, Cream Cheeses, New Forest, Surrey, Victoria, and York. Some of the Continental soft cheeses are also now made to a certain extent in this country, as, for example, Brie, Camembert, and Gruyère.

Of foreign varieties the following may be mentioned:—

Hard.—American Cheddar, Bra, Cacio-Cavallo, Edam, Emmen-thaler, Gisler, Glarner, Gorgonzola, Gouda, Gruyère (Emmen-thaler), Parmesan, Port de Salut, Roquefort, and Schabzieger.

Soft.—Bondon, Brie, Camembert, Coulommiers, Gervais, Gournay, Livarot, Neufchâtel, Pont l'Évêque, and Stracchino.

No hard-and-fast division can be drawn between the soft and the hard cheeses; in a few cases a cheese which one person calls soft another will term hard. Generally, a cheese with a more or less smeary substance would be classed as soft; and one that was friable and dry would be considered a hard cheese.

The foregoing classification—into hard and soft, British and foreign—is useful enough; but a better arrangement is one depending upon the chief differences of manufacture. Such a list is the following:—

(I). **Soft Cheeses.**—These are obtained by coagulating the milk with rennet at a low temperature (below 86° F.), and the period of coagulation lasts for a comparatively long time. Examples: Brie, Bondon, Camembert, Coulommiers, Gervais,

Neufchâtel, and Pont l'Evêque, made in France; and Straccinino, made in Italy.

(II). **Hard Cheeses.**—These are produced by coagulating the milk at a higher temperature (86° to 95° F.), and may be subdivided as follows:—(i) **Cheese made from milk and cream:** Stilton. (ii) **Made from whole milk:** Cheddar, Cheshire, Dunlop, and Wensleydale, in England; Port de Salut, made in France; Emmenthaler or Gruyère, made in Switzerland; Edam (sometimes), in Holland; Gorgonzola and Cacio-Cavallò, in Italy. (iii) **Cheese made from partly skimmed milk:** Derby, Gloucester, Leicester, and, sometimes, Cheddar, in England; Parmesan, in Italy; Edam (generally), in Holland; and Gruyère, in Switzerland. Roquefort is a hard cheese made from sheep's milk. Hard cheeses are also made from a mixture of milk and margarine.

(III). **Sour-milk Cheeses.**—These are generally made from skim-milk and butter-milk, sometimes with cream added, but are not coagulated with rennet. The milk is allowed to become sour, and then the curd is separated by warming to about 100° – 120° F. Examples: Cream cheeses, in England; Glarner and Schabzieger, in Switzerland; Caraway cheese, in Germany.

By far the greater proportion of cheese is made from whole milk. For some descriptions, however, skimmed or partially-skimmed milk is used, while, in the preparation of a few special kinds, whole milk enriched by the addition of cream is employed. Cow's milk is used in this country and in America; but on the Continent that of the ewe and of the goat is also brought into requisition, and the cheese is, moreover, sometimes flavoured with various herbs and spices. Briefly, the object of the cheese-maker is to separate the casein of the milk in the form of curd, together with as much of the milk-fat as possible; then to dry these to a greater or smaller degree, according to the consistency of cheese required; and finally by certain "ripening" processes to develop the particular flavour characteristic of the brand desired. The separation of the casein is usually effected by the action of rennet on the milk. This separates the milk into whey and curd; the curd is then finely divided, pressed to remove the whey and to consolidate it, and, generally, salted. From this curd cheese is produced by ripening,

Cheese
Manufacture.

which is due partly to the growth in it of certain bacteria and fungi, and partly to the action of an "enzyme" or chemical ferment natural to milk.

Rennet is an enzyme (chemical ferment) produced in the stomachs of mammals; it is especially abundant in the young while still suckling. A small quantity of it will readily curdle a considerable volume of milk. It is usually prepared from the fourth stomach or "vell" of the calf, and in modern dairying is met with in the form of "extract" or of "powder"; but formerly, as to some extent still, it was customary for the cheese-maker to prepare his own extract, as required, from the dried and salted "vells" kept in stock by grocers in cheese-making districts. The process now used is to cut up the dried material into small pieces and macerate it in a 5-per-cent salt solution containing boric acid; after some days a further 5 per cent of salt is added, and the liquid filtered; this forms "extract of rennet". By adding yet more salt to this extract the rennet is precipitated, and "rennet powder" produced. Rennet acts most effectively upon the milk-casein at a temperature of about 106° F., and the curd produced near this temperature is very firm. At lower temperatures (60° to 70°) the curd is quite soft and flocculent. It has already been pointed out that this difference results in the production of the two different classes of cheese, hard and soft.

On account of the number of systems, and the diversity of practice, anything like a complete description of cheese-manufacture is here out of the question. A short paragraph, however, will be devoted to each of the principal stages of general production, and then some of the important individual kinds of cheese will be dealt with rather more fully. As a rule, the following seven stages occur in cheese-making, although they do not always come in the same order:—

Stages of Cheese-making. (1). "**Ripening**" the Milk.—Milk coagulates best with rennet when slightly sour or "ripe"; and the quantity of rennet required depends upon the amount of acidity. Hence the milk is frequently allowed to stand at a favourable temperature in order to sour a little before use; or the evening's milk is mixed with that of the next morning; or, if still too sweet, a small quantity of sour whey is added as a "starter". The requisite degree of acidity is not the same in all systems: in some it is very well-marked,

in others scarcely noticeable; but in the latter case the necessary fermentation occurs later on.

(2). **Coagulating the Casein.**—After the milk has been brought to exactly the required temperature by heating and mixing, the proper quantity of rennet extract is carefully stirred into it. This causes the milk to gradually become syrupy, then gelatinous, and finally to set into a firm curd. The stirring is not continued beyond the exact point of curdling, which is often ascertained by dipping a clean glass slip into the milk and then holding it up to the light, when the incipient clotting of the curd becomes readily visible. The vessel is then covered up to keep it at a uniform temperature, and allowed to stand for a time. For soft cheeses the temperature employed is lower, and the time required for coagulation longer, than for hard cheese; but as a rule from 20 to 40 minutes are required, although in exceptional cases as much as $1\frac{1}{2}$ to 2 hours may elapse before the separation of the curd is completed. The greatest care and attention are demanded at this stage, as the quality of the cheese largely depends upon having a perfectly uniform coagulum. If the curdling is too rapid, the curd may become so firm that it cannot be properly worked afterwards; if too slow, some of the fat may separate out and make the curd patchy.

(3). **Separating the Curd from the Whey.**—This is effected either by removing the curd in small quantities to suitable draining-vessels, and expressing the liquid, or else by cutting the curd into small fragments of about the size of peas, or less, by means of curd-knives. The division of the curd allows of the more ready escape of the whey, which is afterwards drawn off from the partly-consolidated curd. The extent to which the whey is removed from the curd has a great influence upon the quality and texture of the cheese. The more whey there is left in, the more does fermentation go on. Different systems carry the separation to different degrees, according to the end in view. In some the curd is heated or "scalded" to render the product firmer, and facilitate its separation from the whey.

(4). **"Ripening" the Curd.**—After draining off the whey, the curd is turned over frequently to keep its moisture uniformly distributed, and maintained at the proper temperature required for the development of acidity ("ripening"), according to the

system practised. The degree of this acidity is tested by means of litmus-paper, by noting the flakiness of the curd, and by testing to see how it pulls out when it is pressed against a bar of hot iron and then drawn away.

(5). **Salting.**—The main object of this is to check the fermentation and bring it under control; for if allowed to proceed unhindered the fermentation would make the product too acid, and produce other undesirable results. Salt also helps to harden the curd and to dry it. Boron preservative is sometimes used as the antiseptic instead of, or together with, the ordinary salt. In the case of large cheeses, the curd is “crimmed” or ground up, and the fine salt thoroughly incorporated with it. Where the cheeses are small, the salt is applied to the outside after the cheese has been moulded.

(6). **Moulding.**—Whether salted or not, the curd is next brought to the proper temperature to allow of fermentation proceeding at the desired rate, and is then filled into moulds—*e.g.* hoops lined with cloth. The hoop is next placed in a press if the cheese is to be pressed. Where, however, the curd will consolidate sufficiently without it, pressure is not employed. In the making of Cheddar a pressure of about 10 cwts. is gradually added during the first two hours or so, eventually reaching 1 to 1¼ ton by the third day.

(7). **“Curing” or Ripening the Cheese.**—In its present state the curd is true cheese, but is insipid, indigestible, and not a palatable article of food. It is therefore placed for a longer or shorter time—generally several weeks and sometimes months—in a well-ventilated but not draughty curing-room, the temperature of which is carefully regulated according to the requirements of the particular system in use. Here the substance of the cheese undergoes a peptonizing process, at the instance partly of the rennet, partly of the various micro-organisms present—*e.g.* bacteria and mould-fungi—and partly of the enzyme or chemical ferment natural to the original milk. The net result of these agencies is to give us a cheese which, when ripe enough for eating, contains the curd in a more or less peptonized and fermented state, whereby it is made more readily digestible; and which, further, has now acquired the characteristic flavour of the particular kind of cheese yielded by the system employed.

The flavours, more especially, are due to the action of bacteria and fungi. Special organisms give rise to special flavours: thus the "blue mould" which helps to characterize Stilton is a growth of the common fungus *Penicillium glaucum*; and in Camembert are found, amongst others, a white mould, *Penicillium candidum*; a micrococcus, *M. meldensis*; and a bacillus, *B. fermentis*. At present, however, comparatively little is certainly known about the precise kinds of bacteria which produce any particular flavour, because a large number of microbes are found in cheese during the ripening process, and it has not yet been determined in many cases which of these are essential to the production of the flavour, and which are accidental.

How Flavour
is Produced.

Partly during the ripening process, and partly after, the cheeses are subjected to special treatment in order to improve their appearance for the market. They are scraped and brushed; the surfaces are polished; they are coloured externally with annatto and other colours; rubbed over with oil, wine, beer, and other liquids; they may be ironed with a hot flat-iron, or smoked in the smoke of a wood fire. Small soft cheeses with oily surface are often packed in tin-foil; this keeps the cheese firm, gives it a better appearance, retains the odour, and facilitates the preservation of the cheese in a sound condition. Sometimes the tin-foil contains lead, which is more or less taken up by the cheese; but experiments have proved that the lead is confined almost completely to the outer portion of the rind, and the cheese is consequently not poisonous unless the rind is eaten. Regard for "appearances" is also responsible for the fact that most of the better kinds of cheese are coloured with artificial colouring-matters. These are generally either alcoholic solutions of saffron, or solutions of annatto in alcoholic soda; and they are added to the milk at the same time as the rennet. The saffron makes the curd of a golden-yellow colour, and the annatto reddish-yellow. Carrot-juice and coal-tar yellows are also used.

There is a general idea that certain kinds of cheese can only be produced in particular districts. This is quite a mistake; or, at most, it has only a small basis of justification. A Cheddar-maker could produce his cheese in Holland;

Cheeses and
Districts.

Brie cheese can be, and is, made in Reading; the same milk can be turned into either Stilton or Gruyère. But of course certain

districts are more associated with special makes of cheese than others are, and the makers in these districts naturally become more expert in the production of their speciality than dairymen in other localities are likely to be. The nature of the soil in any neighbourhood may, however, slightly affect the mineral constituents of the milk, and thus to a certain small degree influence the character of the cheese. Moreover, it may happen that the special organisms required for the ripening of a particular kind of cheese are by chance absent from some specified locality, in which case it is necessary to "inoculate" either the milk or the ripening-room with the organism in question before the cheese can be successfully produced there. And again, the average temperature at one place may be more generally suitable for cheese-making than that at another. With these reservations it may be said that locality is of no consequence. Given the same quality of milk, and dairymen of equal skill, the French cheeses could be made as well in England as in France. In this connection it may be mentioned, that whilst the English farmer probably obtains a net price of about 5*d.* per gallon for his milk when used for cheese-making, and the Dutch and Italians not much more than 3*d.*, the French farmer will not infrequently make from 10*d.* to 1*s.*—at all events as far as the leading varieties of cheese are concerned.

A pound of Cheddar is usually produced from about 10 to 11 lbs. of milk—say, roughly, 1 lb. per gallon. The exact quantity will, of course, depend upon the quality of the milk: the richer the milk the better the cheese and the more of it.

We now proceed to describe some representative cheeses of the more important varieties, dealing first with the class of **HARD CHEESES**.

Cheddar is made with a mixture of morning's and evening's milk, coloured with annatto, or with the juice of carrots or marigolds. It is curdled at 80°–90° F. in about an hour, the curd cut up, further heated or "scalded" to develop acidity, the whey drawn off, and then the curd covered with a perforated board and weighted to press out remaining whey. Afterwards it is broken down and worked up with salt, pressed a little, sewn up in cloth, placed in a perforated cylindrical mould, and put under the press for a time. The breaking down of the

curd and pressing is repeated several times to ensure uniformity of drying, and finally the cheese is left in the press under great pressure for several days. It is then soaked in brine, or salt is rubbed into it, in order to form the rind; sewn up again in linen, and put in the ripening-room, where it is turned over daily until dry, and afterwards two or three times a week until ripe. Every now and then it is rubbed over with butter. As a rule it is ripened enough to be ready for sale after three or four months if of small size; average cheeses are at their best in six to ten months; and the largest sizes may require nearly two years. Cheddar cheeses are cylindrical in shape, and a common size is about 10 inches deep by 14 in diameter. The weight of the smaller sizes is usually 18 to 22 lbs.; an average cheese will weigh about 60 to 70 lbs.; and the largest may be 1 to 1½ cwt. A "Loaf Cheddar" is commonly about 14 lbs. in weight. The best kinds of Cheddar are of firm, wax-like consistency, whilst having at the same time a more or less porous texture. It is a fine-flavoured cheese, and among the foreign varieties may be compared to Parmesan as regards quality. A certain proportion is made pale, *i.e.* without the addition of colouring-matter.

American (or Canadian) Cheddar does not greatly differ from English as regards the manufacture. It is made either from whole milk or from a partially-skimmed article, and great stress is laid upon the aeration of the milk after milking.

The new make of Cheddar reaches the markets in the early part of the year—say from January to April.

The practice in the Cheshire district varies a good deal, at least three different systems being followed. **Cheshire** cheese may be made by a quick, a medium, or a slow ripening process; the first is most generally employed, but the Cheshire. other two give the best quality of product. The curd is ground twice, so that it is much finer than required for Cheddar. In this case the object of grinding finely is to produce a cheese with granular, crumbly texture. A further difference is that, after salting, the curd is frequently warmed for a day or so in a "cheese-oven", in order to facilitate the fermentation and develop a little acidity. The hoops used for moulding the curd are perforated, and through the holes skewers are thrust from

time to time to assist in removing the free whey from the crevices of the curd. After being placed in the curing-room the cheese requires about four months to ripen. Cheshire cheese, taken all round, is of rather lower standard of quality than Cheddar. Both the flavour and the odour are, as a rule, more pungent than in Cheddar of the same age: this is no doubt due to the higher degree of fermentation produced by the Cheshire process. Generally the taste is slightly sweet, and this is thought by some to be due to a high proportion of milk-sugar left in the curd on the Cheshire system. The texture of Cheshire cheese, unlike the wax-like solidity of Cheddar, is loose and flaky, or crumbly: this, however, is a point aimed at in the making, since in the county and surrounding districts Cheddar is looked upon as too hard for the popular taste. The cheese is generally coloured a brick-red with annatto to meet the consumers' demands for a high-coloured article, but the practice has nothing to commend it, and sometimes leads to loss through the uneven distribution of the colouring giving the cheese a patchy and unsightly appearance. Quick or "early ripened" Cheshire has low keeping qualities, and requires to be disposed of as soon as ripe. The medium and late ripened varieties will keep for some months. Some of the cheese is made upon a combination method, the Cheshire-Stilton system. By this process the texture, shape, and general character of the Cheshire are retained, but the special Stilton flavour is imparted to the product by means of the blue mould, *Penicillium glaucum*. In size and shape Cheshire cheeses are generally similar to the Cheddar, the heaviest cheeses ranging from 100 lbs. up to as much as 200 lbs. each.

Cacio-Cavallo, the typical cheese of southern Italy, is chiefly made at Asso Romano, Abruzzi, Puglie, and Calabria; also to some extent in Lombardy. Made from the milk of Italian sheep, it is highly palatable and nutritious, and a table delicacy, if well prepared, as it usually is; inferior sorts possess a slight but obnoxious odour of the sheep.

Cotharstone cheese is made in Yorkshire, and in shape and appearance is a copy of the Stilton. Its method of manufacture is also somewhat similar, though it may differ in the details. By some this cheese is regarded as a rival of, or even preferred to, the Stilton; but as its production and con

sumption are little more than local, it is not a cheese that is generally known outside the county of broad acres.

Cottenham is a cheese made from new milk, and produced in the neighbourhood of Cottenham in Cambridgeshire. It has a local reputation for flavour and consistency. The cheese somewhat resembles Stilton both in taste and in appearance, but is flatter in shape.

Derbyshire cheese is more flaky than the Cheddar variety, and more solid than the Cheshire. When well made it is about equal in quality to the latter; but as a rule it is somewhat inferior. Most of the British cheese factories which make cheese on the American system are in the Derbyshire district; but the true "Derbyshire" cheese is made by a method more or less akin to the Gloucester and Leicester systems. It is a small cylindrical or flat and thin cheese of pale colour, and generally of rich, buttery quality. "Derby Goudas" are a variety shaped like the Dutch Gouda.

Dorset cheese is made much in the same way as the Derby, Leicester, and Gloucester products, the two chief aims being to produce a mellow cheese, ripened with blue mould. It carries rather more water than average Gloucester, but its texture is more inclined to that of Cheddar than to flakiness. "Blue-veiny" Dorset is a cheese of some local repute.

Dunlop cheese was formerly pretty generally made in Scotland, and especially at Dunlop, in Ayrshire; but the Cheddar system is now the one most frequently employed, and "Scotch Cheddar" has earned a reputation of its own. The Dunlop is a rather rich cheese, similar in general quality to Derbyshire or Gouda, but larger in size. It is round in form, and may weigh from 30 to 60 lbs.

Edam is a round (globular) cheese chiefly made in North Holland, and exported in large quantities almost all over the world. The town of Edam produces the cheeses in great numbers, but those prepared in the neighbourhood of ^{Edams.} Hoorn are considered the finest. Good cheese of this variety, and scarcely inferior to that produced in Edam itself, is prepared in the district of Beemster Alkmaar. The finest quality of Edam prepared is a small variety called "präsent" cheese. In size, Edam cheeses as a rule vary from about $4\frac{1}{2}$ to 6 inches in

diameter; and they weigh from $4\frac{1}{2}$ to 9 lbs., though occasionally heavier ones are met with which range up to 25 lbs. or so. The smaller kinds are divided into May, Summer, and Autumn cheese, of which the first kind range from $4\frac{1}{2}$ to 11 lbs. in weight, the second about $3\frac{1}{2}$ lbs., and the last $4\frac{1}{2}$ lbs. Efforts to secure uniformity were made in 1903. For export, the cheeses are coloured bright red, sometimes yellow, and sometimes blue and red. Good Edam cheeses will keep good for years. Skimmed or partly-skimmed milk is generally used in the preparation of this cheese, but whole milk is also sometimes employed.

Gloucester is more solid than Derby, and less flaky, being rather more like Cheddar. Both "single" and "double"

Gloucesters. Gloucester are made. About these, consumers have very erroneous notions, the most common being that "single Gloucester" is made from whole milk, whilst the "double" is prepared from milk having a double proportion of cream. In reality the difference between them is simply one of thickness and weight. The "single" or "Berkeley" is from 2 to 3 inches thick, and weighs about 14 lbs.; the double is 4 or 5 inches in thickness, and may weigh something like 24 to 28 lbs. or more: both sizes are some 16 inches or so in diameter. Double Gloucester is not so much made at the present time as formerly. Partially skimmed milk, or the creamed evening's milk added to the whole milk of the next morning, is generally used for Gloucesters. The whey is extracted by pressing, after which the curd is put through a curd-mill and into the press, salt being applied on the outside. Gloucester cheeses are flat and level, with well-defined edges, and a clear yellow tint, showing blue-mould through the covering of paint. After the first month's curing, in order to give them a distinctive appearance they are brushed over with Indian-red or Spanish-brown, or a mixture of both with small beer, which gives them a pale vermilion colour. The idea seems to have been that by this means the public could always be guided to the real article. A good Gloucester keeps well and is of delicate flavour, much milder than Cheshire.

Gorgonzola cheese is chiefly made in northern Italy (Lombardy), not, as is sometimes supposed, from goats' milk, but from the milk of the cow. To a considerable extent the cheese

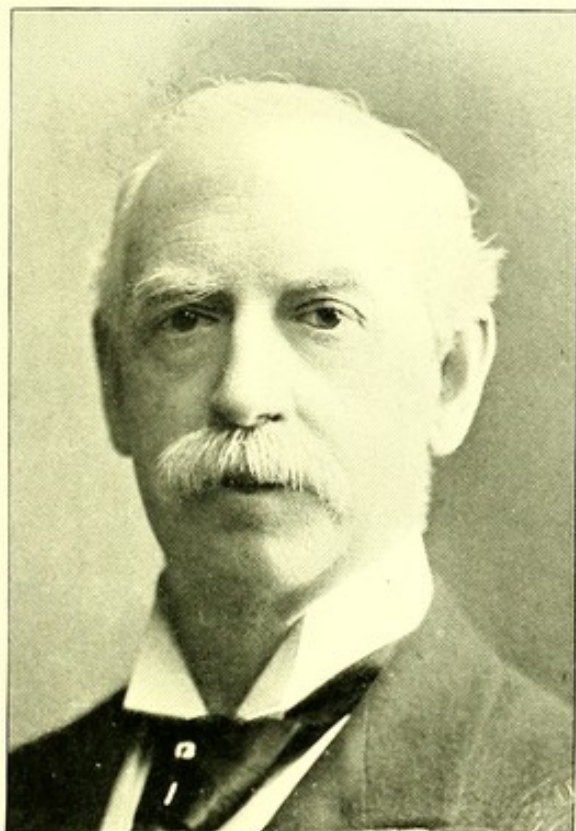
Mr. W. F. MOORE, managing director of the old established firm of Hugh Moore & Co., Limited, Dublin, is one of the best known men in the grocery and drug trade of the midland counties of Ireland. For many years he took occasional journeys to the larger towns on behalf of his firm, and thereby made a wide circle of personal friends. To many a struggling tradesman Mr. Moore has been a tower of strength, and his friendly counsel and advice and practical assistance are ever at the service of the members of the trade. In the social and philanthropic work of Dublin Mr. Moore has taken a leading part; and his interest in education is very keen. He was one of the founders of St. Andrew's College.

Mr. CHARLES BLAKE, managing director of the Home and Colonial Stores, Ltd., was born in London in 1852, and has been associated with that colossal business for a number of years. He resided for many years in Beckenham, Kent, in which district he has served on the Urban Council since 1897. He was elected chairman of that authority in April, 1904, and is a Justice of the Peace for the County of Kent.

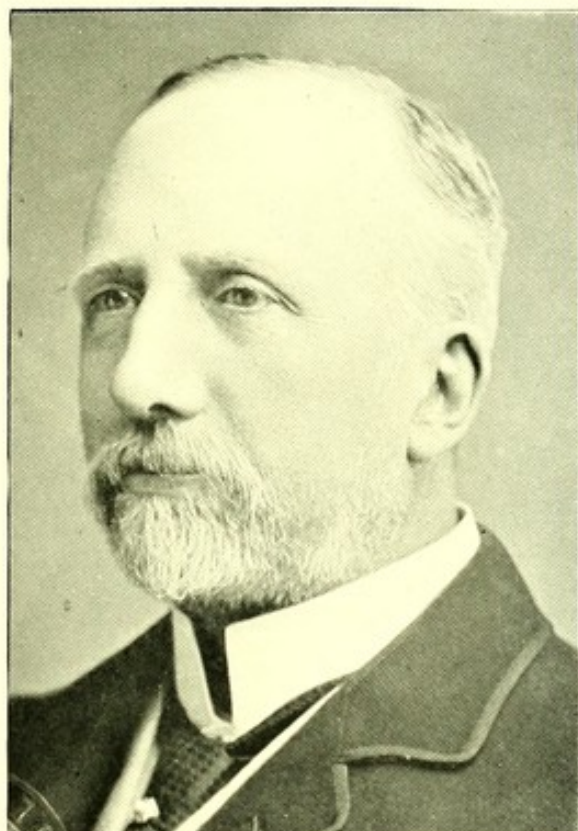
Mr. WILLIAM DAVIDSON, senior partner of the firm of John Laird & Co., one of the oldest provision houses in Glasgow, was born in Sandford, Lanarkshire, in 1852. He went to Glasgow in 1867, and after serving an apprenticeship to the retail grocery trade, accepted a situation with John Laird & Co., with a view to getting on "the road". During the past twenty odd years, under his control, the business has been greatly extended. Mr. Davidson has given most of his spare time to church and temperance work, especially amongst the young.

Councillor J. J. HOLDER, of Brighton, is a member of one of the largest wholesale provision houses in the south of England, and is one of the best-known men on the London markets. Mr. Holder has been throughout a strong supporter of the Grocers' Federation: for two years he filled the important position of chairman of the General Purposes Committee, and was president in 1901; and he is a trustee of the Federation Benevolent Fund.

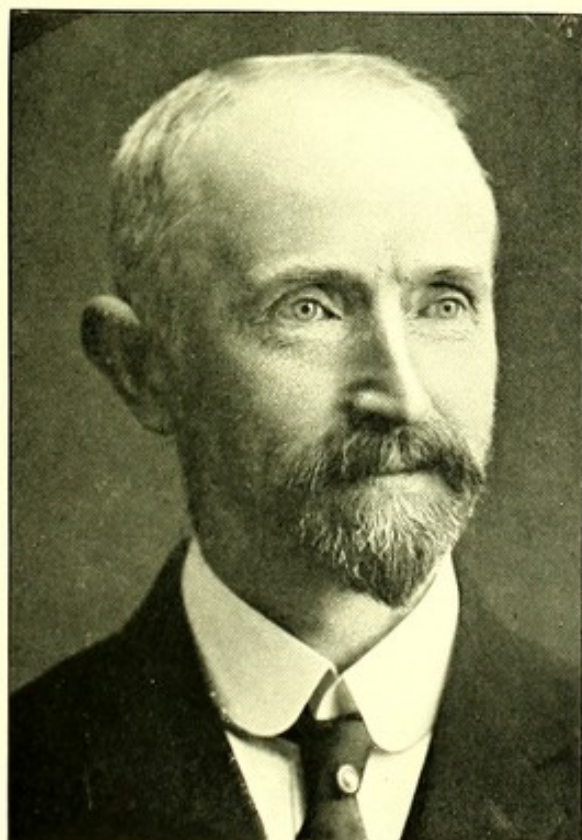
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is partly made by small farmers, and then sold to merchants, who finish the ripening in cellars and caves acquired for the purpose. Gorgonzola is made from two curds of different age: one warm, fresh, and sweet, the other cold, a day or so old, and having a slight acidity. These curds are put in alternate layers in the shaping-mould, beginning and finishing with the warm curd. The idea in this is that the arrangement allows of mould-organisms growing at the junctions of the alternate layers—*i.e.* in the interior of the cheese. In some French districts crumbs of mouldy bread are mixed with the curd before shaping. When firm the cheese is removed from the shaping-mould, and after drying for a few days becomes covered with a fine white growth of fungus. It is then placed in caves or cellars to ripen. If after the salting is completed the texture of the cheese is too close to allow of the free development of the fungus, metal skewers are run through it here and there to admit the air necessary for the growth of the mould. In the caves the cheeses are laid upon shelves covered with straw, and the temperature of the cave is kept at about 55° F. The ripening may take several months, various fungi growing meanwhile upon the crust. A reddish mould is seen on some of the better qualities, and in imitation of this a mixture of brick-dust and flour is said to be sometimes rubbed over the inferior kinds.

Gouda, a flat Dutch cheese, is not unlike Cheddar when well manufactured. But, just as is the case with Edam, the great bulk of the cheese is of the second quality as regards both texture and flavour. As a rule it is not so salt as Edam. Both pale and red coloured varieties are met with. **Factory Gouda** is a Friesland cheese made from skimmed or partly-skimmed milk, and is therefore not so rich as the foregoing. **Derby Gouda** is a variety of Derbyshire cheese shaped like the Dutch Gouda.

Gruyère or **Emmenthaler**, the best and most famous of the Swiss cheeses, is manufactured chiefly in the canton of Berne. The name "Gruyère" is of somewhat wider application than "Emmenthaler", since the former is used in France, and more or less in this country, to denote generally any of the Swiss hard cheeses made from whole milk; whereas

the term "Emmenthaler" strictly denotes one kind alone. "French Gruyère" is the principal cheese used in France. Whole milk, or a mixture of whole and slightly-skimmed milk, is used for making Emmenthaler. The morning's milk is heated to about 106° F. in copper kettles, and the cream of the previous evening's milk is then thoroughly mixed with it, the operation being easily performed on account of the milk being hot. Afterwards the cool, skimmed evening's milk is added, and the whole coagulated with rennet, the quantity of the latter being arranged to produce the required thickening in about half an hour. Saffron is added as the colouring; and the curd, after cutting and again heating, is pressed in a mould-hoop, at first lightly, and then with rapidly increasing pressure. On removal from the press, the cheese is kept for 24 hours in an airy room, then brought into the cheese-cellar and treated with dry salt. The large "eyes" characteristic of Gruyère cheese are due to gas-producing bacteria, and the treatment as regards manufacture and curing is arranged so that the action of these bacteria should neither begin too early nor go on too long for the cheese to attain its proper condition. The formation of the "eyes" may begin almost immediately after the cheese is removed from the press; but as a rule it may be about 20 days before they are formed. From 8 to 12 months in the cheese-room are required by the largest size of cheese before it is perfectly ripe. Emmenthaler cheeses are of millstone shape, and the largest kinds may weigh as much as one hundred-weight, or more. Some of the varieties have a strong and peculiar taste, but the best quality should possess a mild, piquant, nutty flavour; should be free from fissures and cracks; its "eyes" should be of regular size, and uniformly distributed at a distance of about two inches from one another. The "eyes" should have a dull glitter internally, but should not contain drops of liquid. Cheeses which are "puffy" in appearance and of more or less distorted shape often contain large internal cavities, and in course of time assume a peculiar soapy flavour. Such puffiness is due to, or at least is favoured by, faults in the preparation and treatment of the cheese.

Lancashire cheese is made upon much the same system as Derbyshire. It is a palatable article when properly ripened; softer and of mellower flavour than Cheddar.

Leicester cheese is more flaky than Derbyshire, but less so than Cheshire. Practically it is intermediate in quality between them. The curd is not scalded; and, like the Derby, it is not mixed with salt, but the cheese is salted from the outside. As a rule the cheeses are matured slowly.

Parmesan is a rather expensive cheese, largely produced in Emilia and Parma. It is made from partially-skimmed milk, and, as is the case with Gorgonzola, it is not as a rule completely cured by the Italian farmers, but sold by them Parmesan. in an unfinished state to the large merchants who own cheese-caves and curing-cellars, and who complete the ripening and preparation for market. The curing process for the best varieties is said to take three years or more. The milk is curdled at a high temperature (120° F.), and saffron is used for the colouring. When about a fortnight old the outer crust is cut away, the new surface brushed over with oil, and one side of the cheese coloured red. Parmesan when kept long becomes hard, and is often grated or powdered and sold as "grated Parmesan" in bottles.

Port de Salut is a delicate variety of cheese, popular on the Continent and appreciated in this country, especially in London. The British cheese most like it is perhaps Caerphilly. Port de Salut. Port de Salut is a partially-pressed cheese, circular in form, flat, and about an inch thick. The interior is mellow or creamy, but of firm consistence, and is dotted with holes throughout. Formerly the manufacture was a secret of the Trappist monks, but in recent years a good number of Normandy farmers have taken up the production; of whom, however, comparatively few turn out the article in its greatest perfection. In making Port de Salut, the partly-drained curd is slightly pressed in a mould, to remove traces of whey, and then ripened slowly at a low temperature (54° F.). This keeps it more or less moist and soft, and produces a mellow cheese of mild, nutty flavour. The size of cheese usually sold in this country weighs about 5 lbs.

Roquefort is a famous cheese, made from sheep's milk, and is the only one of this kind that is largely placed on the world's market, although many are made for local consumption in Italy Roquefort. and Hungary. The making of Roquefort is known to have been carried on in the caves at the village of that name as

far back as the Norman Conquest. It was formerly confined to the neighbourhood of this village, but at the present time is carried on in several departments of France—Aveyron, Hérault, Lozère, Gard, and Tarne. The cheeses are ripened in the rock caves of the narrow mountain passes, chiefly cut out of the Jurassic limestone, which are found in the districts indicated; and they are believed to owe their peculiar properties at least partly to the naturally cool and continuous currents of air which circulate through the caves in question. The pressed curd is placed in layers in a perforated cylindrical mould, and between each two layers is placed a layer of mouldy bread-crumbs. In this way the spores of the moulds are conveyed into the interior of the cheese, and by their action the ripening is effected. The mass is weighted, lightly at first and afterwards more heavily, and finally it is put in the press. After drying for ten or twelve days in cloth, the cheese is carefully removed during the night-time into the caves, where it is salted and allowed to ripen, being from time to time scraped or cleaned with a machine. The ripening process takes from one to two months, and is accelerated by piercing the cheeses, by means of a machine, with long fine needles. Roquefort cheeses are cylindrical in form, about 3 inches high and $6\frac{1}{2}$ in diameter, and average about $4\frac{1}{2}$ lbs. in weight. When well ripened they are friable in appearance, neither soft nor oily; also they are permeated with grayish-green patches of fungoid growth. The cheeses most valued are those prepared so as to be ready for sale from September to December. The best are called *Crème de Roquefort*, and the genuine cheeses are usually marked “Société” on the outside, to distinguish them from the imitated cheese made from cows’ milk.

Stilton is a Leicestershire cheese, the first of the kind having been produced in the Melton-Mowbray neighbourhood. Of course Stiltons—and good ones—are now made in various countries; still, they are not always very successful imitations of the cheese which became famous, a century ago, at the Bell Inn, Stilton, on the great north road from London to Edinburgh. This cheese was made by Mrs. Paulet of Wymondham, a relative of the landlord of the “Bell”, who dispensed it to travellers at the rate of half-a-crown a pound. Where the cheese was made, and by whom, was for some time

Stilton
and its
Manufacture.

kept secret; but eventually the secret became known to, and the cheese made by, a number of persons.

Stilton is the principal cheese of the blue-moulded class made in this country. (Others are Wensleydale and Cotherstone.) Formerly genuine Stilton was a "double-cream" cheese—*i.e.* only the cream of the evening's milk was added to that of the next morning for making the cheese—but it is now generally made from good, perfectly fresh whole milk, not enriched by added cream. It differs from Gorgonzola in being made with salted curd, as well as in some other respects. One method used in the manufacture—the "two-curd" method—is to put thin layers of fresh curd layer by layer into cloths to drain from whey, the cloths being frequently gathered together at the four corners to facilitate the expulsion of the liquid. When sufficiently firm, and after standing all night, the curd is cut up and exposed to the air in order to render it slightly acid. A fresh curd is also prepared in the meantime; both are crumbled up and mixed with salt; then the two are mixed together and filled into perforated moulds to drain and dry. After a few days the cheese is taken from the mould and bound round with calico, a clean bandage being put on daily at first, and then it is set on the draining-shelf until the crust has begun to form. The cheese is then removed to a cool, rather damp "coating-room" for about a fortnight until the wrinkled coat has become firm, when it is placed in a cool, airy storing-room in order to ripen. To complete the ripening process several months are required. In another method—the "wet-curd" process—the curd is allowed to stand in its own whey for some time before draining off the latter; this is believed to have an appreciable influence upon the subsequent fermentation.

In the two-curd process, mould-spores fall upon the curd which is exposed to the air, and the mixing of this with the fresh curd ensures that the spores are distributed through the body of the cheese, ready to develop into mould at the surfaces of contact when the cheese is set to ripen.

The chief characteristics of a good Stilton are its "marbling" of blue-mould, its rough, wrinkled crust, its mellow texture, and its characteristic flavour. It is not pressed in the moulding, as Cheddar is. In the manufacture of the two cheeses the chief

differences are: (i) For Stilton, rennet is used in smaller quantity, and is added to perfectly fresh milk, whereas for Cheddar it is added to milk which is slightly acid. (ii) The Cheddar curd is scalded to develop acidity; not so the Stilton curd. (iii) The Cheddar requires upwards of a ton pressure; Stilton is not pressed. It is said that the best Stiltons are only produced from May to September, when the grass is in good condition.

Wensleydale cheese is a Yorkshire product, of rather more than local reputation. It is curdled at a high temperature, about forty minutes being taken for the coagulation of the milk, or, in some cases, an hour. The curd is partially "scalded" after renneting and cutting, and it is hooped while still moist. Formerly the cheeses were salted by floating them in brine for three or four days, but in modern practice this method is being discarded, and the dry salt is directly mixed with the ground curd. Two shapes of Wensleydales are made—one flat, the other resembling Stilton, though often much distorted. The latter sort of Wensleydale is a blue-mould cheese, much after the Stilton character; but the mould is distributed throughout the substance of the cheese instead of in veins as in true Stilton. It has a soft texture and a mellow flavour. The flat-shaped Wensleydales are ripened more quickly and have less of the Stilton quality than the cylindrical variety. Wensleydale cheeses are of generally small size; the largest rarely exceed 20 lbs. in weight, and the smallest may be about 7 lbs. each.

Wiltshire cheese is of two chief classes. One, shaped either like Gloucesters, or deeper and of the diameter of Cheddars, is made practically on the Gloucester system, but with a second heating of the curd as practised in Cheddar-making: this increases the fermentation, and so makes the texture and flavour different from those of Gloucester. The second class is the "Wiltshire Loaves", small cylindrical cheeses of about 9 inches diameter. These are prepared without a second heating, and are essentially similar to Gloucester in make.

We now come to the class of **SOFT CHEESES**, which includes the following:—

Brie cheese is made from whole milk, and is allowed to ripen before use. Thin slices of curd are placed in the moulds, and the

wey allowed to drain off. The curd rests on a straw mat, and after some hours the mould is turned over on to another such mat, the cheese showing the markings of the mats on both sides as a number of little points, which eventually be- Brie and
Bondons. come covered with mould. When firm enough, the cheese is taken from the shaping-mould and carefully dredged over with very fine salt, after which it is placed in a drying-room for a few days until covered with white mould; then into another room, where it remains some three or four weeks and becomes coated with blue-mould outside, whilst the curd has in the meantime become somewhat yellowish throughout. By this time it is sufficiently ripe to be saleable. Brie is a round, flat cheese, which in this country is generally sold of one size only. Abroad, however, it varies from about three-quarters of an inch to an inch in thickness and from 8 to 12 inches in diameter. A Brie, weighing $1\frac{1}{2}$ lb. or a little more, generally sells retail for about 1s. 6d.

Bondon cheeses of two kinds are made in France, one from whole milk (*Bondon à tout bien*), and another from skim milk. For the fat cheeses, the curd separated from the whole milk is set to drain in willow baskets covered with fine cloth. After twelve hours' draining it is removed in the cloth to a perforated vessel, covered with a wooden cover, and weighted. The pressed curd is then removed and thoroughly worked, after which it is filled into small tin moulds of about the size of a tea-cup, finally pressed with a stamp, and trimmed off with a spatula. It is then taken out of the mould, salted, drained overnight, and set to ripen on straw in the ripening-room. In about a fortnight or three weeks the cheese becomes covered with a bluish-green mould; it is then again pressed and turned from time to time; and eventually, after a further three weeks or so, moulds again appear on its surface. The cheese is then ready for sale, but is at its best a fortnight later. Bondons (which are practically the same as *Neufchâtel*s, but made chiefly in the Seine-Inférieure) are small cheeses of cylindrical shape, about 3 inches high and 2 in diameter, and weighing about 4 ounces when fresh. They sell for 2d. to 3d. each by retail, and are valued as table cheeses.

Caerphilly is a favourite Welsh soft cheese something after the Port de Salut type, but less firm in texture. They are largely made in Monmouthshire and Somersetshire.

Camembert is largely made in the French province of Calvados. Most of that imported into this country is made from partly-separated milk. The curd from this is drained in perforated cylindrical moulds, turned from time to time, until firm enough to be removed, after which it is salted and placed in the drying-room. Here, first white-mould and then blue-mould are allowed to develop, and the final ripening takes place in a carefully-ventilated, cool, dry room. A Camembert cheese generally weighs about 11 ounces, and sells for 6*d.* or 7*d.* by retail.

Coulommiers cheese is made upon the Brie system, and in the district which gives its name to the cheese. In form it resembles the Camembert, but is thicker, and of rather smaller diameter. It may be sold either new—say a week old—or after ripening for a few weeks.

Gervais is a small cheese of the Bondon type, but made from a mixture of new milk and cream. It is used in the fresh condition, and is very popular in Paris.

Limburger is a Belgian cheese of the soft class, which is allowed to ripen before use.

Neufchâtel cheese is mentioned under "Bondon". One kind of fresh Neufchâtel cheese is said to be made from the whole cream, thickened by heating, and then pressed into a small mould of cylindrical shape.

Pont l'Evêque cheese derives its name from a village near Havre. It is a square or oblong flat cheese of nearly an inch in thickness and about a pound in weight. This product is an unpressed cheese, but is firmer in texture than a Brie or Camembert, and has a rather tough crust. It is ripened before being used.

Schabzieger is a Swiss sour-milk cheese, in the making of which the milk is allowed to turn sour, and the curd is then separated by heating. It is a small, strong-flavoured cheese, generally sold retail for about 4½*d.* or 5*d.*

Cream Cheeses may be made either from the whole cream or from a mixture of milk and cream. In the first case, thick cream, best obtained from the milk by means of a separator, is kept for about three days in a clean earthenware vessel at a temperature of about 60° F. By the end of this time fermentation will have thickened the cream, which is then placed in

a linen bag and hung up to drain off the whey. In two days or so the soft curd thus obtained is pressed in the bag to force out more of the whey, first by hand, and then in a light press for about twenty-four hours, with gradually increasing pressure. After this the curd is removed from the bag, and kneaded to uniform consistency with a wooden knife. Finally it is pressed into a mould lined with butter-muslin, when it is ready for use. If made from a mixture of milk and cream—of which the milk may be from one-fourth to one-half of the whole—essentially the same process is followed, but the coagulation may be hastened by the use of rennet, or of acid, and the curd is salted. The cream cheeses made in this way contain less fat, and in texture and flavour are more purely cheese-like than the first variety; but the whole-cream product is the more generally popular article. The United States standard is 50 per cent of fat for whole-cream cheese. **St. Ivel**, **York**, and **Cream Gouda** are makes of cream cheese. Some of the soft cheeses previously mentioned—*e.g.* Gervais and Fresh Neufchâtel—are also essentially cream cheeses, when used in the fresh condition. “St. Ivel” is a cream cheese with a Cheddar flavour, introduced recently by a Yeovil company. “Royal” is another cheese of the same kind.

Soya cheese is a so-called vegetable cheese made from the Soya plant or oleaginous pea of China and Japan.

Margarine Cheese, or “Filled Cheese”, is cheese made from skimmed milk, but to which oleo-margarine is added to replace the abstracted butter-fat. It is produced to some small extent in this country, but America and Holland are probably the two countries which make most. The legal definition of margarine cheese is contained in section 25 of the Sale of Food and Drugs Act, 1899, and is as follows:—“The expression ‘**margarine cheese**’ means any substance, whether compound or otherwise, which is prepared in imitation of cheese, and which contains fat not derived from milk”. By section 5 of the same Act, the provisions of the Margarine Act, 1887, as amended in the Act of 1899, extend to the sale of margarine cheese. There is no legal definition of skim-milk cheese. Many of the standard varieties of cheese already dealt with are made from skimmed or partially-skimmed milk, or from a mixture of whole milk and skimmed milk. Naturally, such cheese contains less fat

Imitation
Cheese.

than when whole milk alone is used. The difference is not very considerable where the milk is partly skimmed; thus while an ordinary fat hard cheese such as Cheshire or Gruyère will contain about 30 to 33 per cent of fat, a hard cheese made from partly-skimmed milk, such as Gloucester or Edam, will contain about 23 to 25 per cent. On the other hand, a cheese made from separated milk may contain practically no fat—say from 1 to 3 per cent. For instance, in the Report of the Principal Chemist, Government Laboratory, 1902, it is stated with regard to imported cheese that “the amount of fat in several samples was very small, falling as low as 1.0 per cent in one sample, and 2.3 per cent in another”. Hard cheeses such as these—*i.e.* made from separated milk—are liable to be tough, and are not reckoned as very digestible. Their chief recommendations are that they are cheap, portable, and easy to store. Such cheeses feel dry and crumbly when rubbed between the fingers, whereas a piece of rich cheese feels smooth and soft.

The qualities which cheese ought to have may be summed up as follows:—(1). *Richness*.—A proper proportion of fat to correspond to the casein, combined with a mellow, plastic condition of the curd, brought about partly by moisture and partly by fermentation. In milk the amount of butter-fat is variable, and, other things being equal, it may be said that the richer in fat the milk is, the better the quality of cheese it will make. A rich cheese can easily be distinguished by its soft and unctuous feel when rubbed between the fingers. (2). *Digestibility*.—Different systems produce cheeses differing in digestibility, as also do the various methods of working the same system. The fermentation process effects a kind of semi-digestion of the cheese during the curing, rendering it much more easy of assimilation than it would otherwise be. If this process is not properly carried out, the cheese is more or less indigestible, and liable to discourage the consumer's use of cheese altogether. (3). *Good Flavour and Odour*.—To some extent, of course, what constitutes good flavour is a matter of individual opinion. One class of customers prefers mildness in flavour, another likes pungency. But in either case the cheese should contain nothing objectionable to the particular class for which it caters; for in the judgment of the consumer the taste and smell are everything. He will patronize a fine-flavoured

article only. Whatever be the nutritive value of a cheese, if good flavour be absent no faith in its nutritious properties will induce him to purchase it regularly, if he has any choice in the matter. A new cheese should have a sweet flavour without disagreeable bitterness, and with a delicate quality suggesting the nutty taste into which it will ultimately develop. (4). *Good Keeping-quality*.—This depends partly upon the original soundness of the milk, partly on the class of cheese, and partly on the conditions of storage. Different systems of cheese-making give different degrees of keeping-quality; in some, long preservation is aimed at; in others, where the cheese is intended for early consumption, the keeping properties are a secondary matter. Most of these latter kinds, however, fetch higher prices, and the risks of spoiling and of uncertain demand are thereby covered. The others may be of relatively lower market value, but they are safer to stock, and within certain limits improve by keeping. (5). *Good Texture and Consistency*.—A firm and close-cutting cheese is less risky in handling, and more economical in use, than one of loose texture. On the other hand, a cheese should not be dry, hard, and chippy; nor should it be tough, nor soapy. (6). *Freedom from Undesirable Substances*.—Poisonous properties may occasionally develop in cheeses which have ripened too quickly, or which have become over-ripe. Certain kinds of bacteria may have flourished in the cheese under these circumstances, giving rise to the formation of toxins, which latter may exercise more or less poisonous effects when the cheese is eaten. Soft cheeses and sour-milk cheeses, more especially, are liable to this defect. (7). *Convenient Size and Shape*.—These are not without importance; cheeses of a soft character would bulge and become misshapen if made in large sizes; whilst the harder varieties are preferably not made too small lest they become too dry. The cheeses should be portable and conveniently handled without undue risk of breakage. Many inferior cheeses, of faulty texture or unsatisfactory firmness, show a bulging and distortion of form; and this is what is referred to in the old cheese-maker's maxim, "A good cheese is never of an ill shape". At the Kilmarnock cheese show (the largest in Great Britain) the judges' scale of points, reckoning 100 for a perfect cheese, is:—For flavour, 40; for body and texture, 40; for colour, 12; for finish and set-up, 8.

As regards the naming of varieties of cheese from their size and shape, it may be remarked that although trade customs ascribe certain shapes and sizes to particular makes of cheese, yet there is no actual *necessity* for these makes, or for any make, to be of any particular form or weight. A Stilton might be globular and an Edam cylindrical: what really determines the variety of the cheese is the system under which it is produced. The form is a detail which can be altered at will.

Except in a broad, general way, the commercial value of cheese does not depend much on its chemical constituents.

Cheese Chemistry. Flavour, and not nutriment, is the chief criterion in buying and selling cheese. The following analyses will serve to give an idea of the average composition of cheeses:—

(1). HARD CHEESES.

			Whole-milk.			Partly-skim.	
			Stilton. Per cent.	Cheshire. Per cent.	Gruyère. Per cent.	Gloucester. Per cent.	Dutch. Per cent.
Water	...	...	32	35	37	37	37
Fat	...	...	35	33	28	23	25
Proteids ("curd")			26	26	31	34	32
Lactic acid, &c.	...		3	2	} 4	2	} 6
Ash	...	...	4	4		4	
			100	100	100	100	100

In these it will be noticed that the whole-milk cheeses have the fat either greater than the proteids or not much less, whereas in the cheeses made from partly-skimmed milk the proteids are appreciably greater than the fat.

(2). SOFT CHEESES.

			Brie. Per cent.	Camembert. Per cent.	Bondon. Per cent.
Water	...	...	50	45	55
Fat	...	...	28	30	21
Proteids ("curd")	...	...	18	} 20	15
Lactic acid, &c.	...	...	—		2
Ash	...	...	4	5	7
			100	100	100

The point about these is that they have a large percentage of water, and therefore relatively small proportions of fat and curd.

(3). CREAM CHEESES.

			English. Per cent.		Gervais. Per cent.		Fresh Neufchâtel. Per cent.
Water	...	...	31	.....	42	.....	35
Fat	...	...	63	.....	49	.....	42
Proteids ("curd")	...	...	5	.....	8	.....	13
Lactic acid, &c.	...	...	} 1	.....	1	.....	{ 7
Ash	...	...		.....		.....	{ 3
			100	.....	100	.....	100

As a result of an inquiry instituted by the Board of Agriculture, it was found that the average composition of a large number of ripe Cheddar cheeses was as follows:—Water, 35.6 per cent; fat, 31.3; curd, &c., 29.1; mineral matter (ash), 4.0.

The **weights** of cheese average as follows:—English Cheshire, from 56 to 112 lbs.; Cheddar, 60 to 100 lbs.; Derbys, 28 to 30 lbs.; Double Glo'sters, 28 lbs. (four Double Glo'sters weigh 112 lbs., and eight "Singles" the same); Wiltshire Loaf, 8 to 9 lbs.; Stiltons, 10 to 14 lbs.; Canadian and American (in boxes), 40 to 80 lbs.; Cheddar Shapes, 90 to 100 lbs.; Colonial (single cheeses), 40 to 70 lbs. New Zealand cheeses are usually packed in crates containing two cheeses to four cheeses each, weighing from 120 to 180 lbs. Dutch cheese is imported "loose". One thousand (1000) Dutch round (or Edam) cheeses are equal in weight to about 2 tons, and the same number of "flat" (or Gouda) cheeses weigh as nearly as possible 5 tons.

In handling cheese see that slab and all utensils are kept clean, and for cutting use a wire or patent cutter rather than a knife. The "paler" should be thin, sharp, and well-tempered, and scrupulously clean. When out of order it should be put in oil and rubbed hard till clean, not emieried. As far as practicable cheese should be kept in a cool, preferably dark place, fairly well ventilated, and dry, but not too dry. It should be away from strong smells. A damp and cold cellar is not recommended. Temperature should be 50° to 55° Fahr. Rich cheeses do not keep so well as those that are poor in fat. A good deal depends also upon the separation of the whey; if this is well removed, most hard cheeses will keep good even for years. If, on the other hand, too much whey has been left in, it affords favourable breeding-ground for the bacteria which bring about

Handling
and Storage.

decomposition. New cheese in store should be turned over once or twice a week. The cold storing of cheese is dealt with in the chapter on COLD STORAGE.

The common cheese-mite, *Acarus siro*, may occur in enormous numbers in hard cheeses which have been carelessly treated in the store-room. In time it converts the cheese into a dry powder, made up of little more than the skins of the mites and the products of their feeding. Rubbing the cheese over several times with oil, or with strong brine, will destroy the mites, if done early enough. When mites have begun to show, the cheese should be frequently swept. For maggots or "jumpers" the remedy is to clear the parts affected and keep the cheese well dried up with rice-flour. Stilton cheese often requires to be brushed daily and the shelves swept, care being taken that the *débris* of one shelf is not swept on to another. If each shelf is half an inch wider than that below it this is facilitated.

6. BACON AND HAMS

When Lord Brougham said he hoped to see the day when every man in the kingdom would read Bacon, Cobbett, bluntly practical, remarked that it would be to better purpose if his lordship would use his influence so that every man in the kingdom might *eat* bacon. Looking at the figures given in our introductory chapter on SOURCES OF SUPPLY, one would think there can be now but few men in the kingdom who do not eat bacon pretty regularly. The sides of bacon and hams come into our ports and to our provision merchants' shops in ever-increasing quantities, and the cry is still "they come". In England also we have important bacon factories, chiefly in the south, and pre-eminently in Wiltshire; in Ireland the factories are also most numerous in the south, Limerick being the chief centre there, whilst Belfast is a not unimportant centre in the north. Besides the factory bacon we have in England famous bacon-curing in such counties as Yorkshire, Cumberland, Berkshire, Hampshire, Warwickshire, and Somersetshire; with Wigtown, Dumfries, Ayr, and Kirkcudbright in Scotland; in fact a certain amount of "home-cured" or "farm-cured" bacon is produced in most of our shires by farmers,

pork-butchers, and cottagers. But although most provincial provision-dealers are occasionally in a position to handle the locally-cured bacon or hams, our readers are mainly concerned with these articles as produced in the modern factories. Real "York hams" are still sold on the London market, but certainly a great many of the "jambons de York" sold on the Continent are goods which never were nearer the Ridings than is the city of Dublin. For the present purpose we may leave the "home-cured" varieties out of the question, and treat the ham and bacon handled by grocers and provision-dealers as being those products which are consigned to the wholesale provision firms in our chief ports, such as London, Liverpool, Glasgow, Bristol, and so on; are quoted on "the market", as, for instance, at the Home and Foreign Produce Exchange at Hibernia Chambers, London Bridge; and are bought by the retailer subject to the rules of that corporation or the corresponding one in the port concerned.

A word or two first about the **bacon pig**. The old-fashioned bacon pig was very different from the modern one. He was by comparison enormous in size, overloaded with fat. The bacon-curer nowadays seeks for a pig with little bone, short neck and short head, a smaller pig altogether. In this country the chief breeds of pigs for bacon are, in the approved order, the Large White Yorks, Middle White Yorks, Berkshire, Tamworth, and Small White Yorks. Official experiments at one of the United States agricultural stations some years ago showed that the Large Yorkshires were the breed which produced meat most economically. It was ascertained that the average cost of producing 100 lbs. of pork worked out as follows for the various breeds experimented upon:—(1) Large Yorkshires, 8s. 7d.; (2) Tamworths, 9s.; (3) Tamworth Poland, China cross, 9s. 2d.; (4) Yorkshire Poland, China cross, 9s. 3d.; (5) Yorkshire, Berkshire cross, 9s. 5d.; (6) Poland-Chinas, 10s. 5d. The following conclusions were deduced from the experiments:—(1) That the gains made by well-fed swine increase with advancing age for several months subsequent to the birth period; (2) that the swine of the lard-producing types are not more cheaply grown up to the age of 196 days than swine of bacon-producing type; (3) that pork can be made more cheaply from swine of the Yorkshire and Tamworth breeds than from the Poland-Chinas, or what may be termed

The Bacon Pig.

lard types. The "Poland-China" is an American breed unknown in this country, but the result of the experiments in regard to the Large White Yorkshires tallies with the opinion of authorities here. In Ireland the Congested Districts Board and the Department of Agriculture which succeeded it, as well as private organizations, have given much attention to the breed question in relation to the bacon industry. The Irish Pig Improvement Association states that the pig which as a rule commands the highest price is an animal which though well finished is not over-fat, and which turns the scale dead-weight at about 12 stones (stone = 14 lbs.), the live-weight being rather less than 16 stones. This is the "bacon" pig required for the London long-side singed bacon trade. For the ham and middle trade of Ireland the pig used is a small plump one of about 8 stones dead-weight, called a Berwick. The price per cwt. for these is usually about the same as for the bacon pig. Hogs of an intermediate class, between $8\frac{1}{2}$ and 11 stones dead-weight, rarely command so high a figure as either bacons or Berwicks, being called in the trade "six-sides". The highest weight usually killed at the factories is 13 stone, an "over-weight" hog; those weighing more fetch 2s. or 3s. per cwt. less, as the bacon made from them fetches considerably less money in the British market.

The foods which have been found suitable for producing good bacon are:—Potatoes (cooked), milk, barley-meal, oatmeal and crushed oats, pollard-bran, wheat (ground), rye-meal, and Indian corn (used sparingly) ground and cooked. The fact that the pigs are largely fed on separated milk is said to be one reason why Danish bacon is liked in England. In Cumberland, Yorkshire, and the Midlands it has long been a custom with the cottagers to give their pigs skimmed milk for a month or so before killing. On the other hand, the large proportion of Indian corn (maize) given to the "hogs" in the United States is held to account for the fact that the States bacon is not so economical in use, the fat melting away more in the cooking than does the fat of some other bacon; whilst on the other hand, the feeding of the Canadian pigs to a considerable extent on pea-meal is supposed to have improved greatly the quality of the Canadian bacon. But no doubt climate and other local peculiarities must be taken into account when one is considering the best breeds and the

Pig-feeding
for Bacon.

best feeds for pigs intended to be turned into bacon. What is required is, as we have seen, a well-bred pig of about 168 lbs. dead-weight, and this pig may be produced in seven months from birth—the old pig is out of fashion for good reasons—in modern bacon-curing. According to a bacon-curing authority, the perfect bacon pig is neat in the head, light in the neck and shoulders, deep in the region of the heart and well sprung in the ribs, thick in the loin, stout in the thighs, short in the leg, and long and silky in the hair. A good pig has a cheerful temper, a rather chubby head, not too large, soft and elastic skin, and bristles or hair soft and fine, hair usually showing leanness. It may be observed that butchers and farmers commonly speak of pigs alive as weighing so many “score”, the score being 20 lbs. They are also referred to, as in the above quotation from Ireland, by the “stone”, which is 14 lbs.; but in newspaper quotations of prices, the Smithfield stone of 8 lbs. is often used! Wiltshire “lean sizeable” and “sizeable” sides are produced from pigs weighing about 8 scores (160 lbs.) dead-weight.

The development of the bacon industry in Denmark is a matter of quite recent years. Little or no attempt had been made before 1850 to improve the old Danish breed of white pigs. But when at about the middle of the century the great change took place in the agriculture of Denmark, and the production of milk took precedence of the growth of grain, the necessity of utilizing the skim-milk as food gave an impetus to pig-breeding. As the native pig was not a very promising subject, importations of a larger breed were made from Holstein and Mecklenburg. It was soon learnt that the latter had been improved by crossing with pigs from England, and thereupon the Danish breeders themselves began to import specimens of the better types of English swine, notably Berkshires and Middle Whites. These exercised a highly ameliorating influence upon the Danish pigs, especially in the islands, and by 1871 quite half of the boars in service in Denmark were of English origin. Towards 1880 Great Britain began to be a buyer of Danish bacon, and by 1887 this country had become the principal market for the product. The English buyers demanded longer sides and more lean meat than had hitherto satisfied German purchasers. Consequently the Danish breeders had to resort to the use of the

Danish
Bacon.

English type known as the Large White for breeding purposes, and this breed has since been dominating the Danish herds. There are some eighty-eight recognized centres of breeding for the native type, and thirteen centres for the Whites (or Yorkshires). Hence there are to-day in Denmark two types of swine, but the object kept steadily in view is to develop the native breed to such a point of perfection as shall render the Yorkshires superfluous. In 1870 the export of pigs did not exceed 50,000 per annum, but with the expansion of the dairy industry the number rose. The animals were all consigned to Hamburg, a large proportion being there slaughtered for the English market. In 1887, however, Germany suddenly closed her ports to this trade, in view of the possible introduction of a disease of swine believed to exist in Denmark. The effect was the establishment in the latter country of a large number of abattoirs for pigs, with a special view to the supply of the British market, and the result has been that for years past we have received over a million cwts. of Danish bacon per annum.

It is the establishment of the modern type of bacon-factory which has contributed most largely to the development of the bacon industry, whether it be in Denmark, America, or at home. A bird's-eye view of the manufacture of the famous Wiltshire bacon at one of these factories is given by Mr. Rider Haggard:—"First," says Mr. Haggard, "we were taken to the pens, where we saw a great quantity of hogs, mostly crossed Tamworths and Yorkshire Middles, with some Berkshires which had been bought in at the weight of five-score pounds, to be fattened on barley-meal and milk to the desired average of nine-score, or 180 lbs. The barley fed to the swine is ground at the factory, and is given unsalted, mixed with the skim-milk. The pigs are bought in at about 50s., and after about eight to twelve weeks' fattening reach a value of about 75s. Next we went to the slaughter-pens, whence—when their time comes—the wretched animals are caught up by some devilish machinery and, hanging head downwards, travel along oiled bars to meet their doom in the pit—an awful place which I will not describe. Bereft of life, they still travel on at the rate of sixty an hour till they fall into an iron framework that runs on rails into the mouth of a veritable inferno of furnace, where

Where
"Wiltshire"
comes from.

they remain for half a minute while every scrap of hair is burned off their bodies. Out they come again brown and naked—this scorch, I should say, is a peculiarity of Wiltshire bacon, and takes the place of the ordinary scalding—and then slide along the endless iron bar to another department, where they are cleaned. Next the bar brings them, their decapitated heads perched between their hams, to the weighing-machine, where they are weighed, so that each owner may receive his price. After this and the branding with the trade-mark 'Royal Wilts' they go to the vast cooling-chamber, where they are chilled by the ammonia process with chloride of calcium brine, at a temperature of from 40° to 45°. Now, reduced to sides, they are salted and treated by the injection of brine with a special force-pump. Here they remain three weeks being cured, after which they migrate to the smoke-chamber, where they hang for three days over a smouldering heap of elm sawdust. Then at length they are ready for sale, and within another fortnight or month have all been converted into rashers of bacon. The by-products are lard, sausages of various degree, chaps, trotters, graves, and black puddings. Everything is made use of except the brains, even the stomachs, which are sold for pepsine. A speciality of this factory is the curing of the famous Bradenham hams. We saw it in process, each of them lying in an earthen vessel of its own, but the details of that cherished art we did not see or hear, as it is a trade secret of the first water. Its discoverer was a butler in the time of Queen Elizabeth, and until bought by the present proprietors it was handed down from father to son in a single family."

Bradenham
Hams.

How the same kind of work is done at Chicago, the great centre of the American hog-packing industry elsewhere referred to, is well described by Mr. J. Foster Fraser in some newspaper letters written in 1902, which we will also take the liberty to quote:—"There were overhead galleries, and along them came the scurry of many feet. Animals were being driven to the slaughter-houses. The stench sickened. In crowded covered pens where the pigs were men sprayed the animals to keep them cool. When the pigs were released from the pens they ran past two government inspectors, watching for disease. A healthy pig ran with a swaying head. A sick pig ran straight. Like a dart any ill pig was fixed upon, a tag stuck through its ear, and the

brute turned on one side. It would afterwards be killed under the eye of the law. If then the pork was found healthy it was passed. If not, it was turned into fertilizer, and what the sale produced was handed to the owner of the animal.

A Picture
from Chicago.

The pigs, squeaking with fright, are driven along a sort of gutter. Five or six at a time are let through a doorway into a sort of pound, where there is a great wooden wheel always on the turn. A pig is seized, and in a trice a chain is round one of the hind legs, and the wheel, revolving, hauls the pig up in the air. Another and another is caught and fastened. There is a succession of wriggling, screaming swine being hoisted. As the wheel descends it slips each chain to a travelling pulley which carries the pigs past the killers, big, burly men, and each man selects his animal, and with a plunge of the knife cuts a throat. The pit streams blood, and men with brooms brush it into a channel, and it flows off to barrels. Each man cuts the throat of about twenty pigs a minute. Death soon comes. And now, until the cooling-room is reached in thirty-two minutes, the carcass passes a procession of 150 men, each having something to do. It is very little for each. The brute is past in a moment. But it is something definite which each man, according to his duty, attends to, and nothing else. The carcass drops into a bath of scalding water; a cradle lifts it out, and another chain grips the legs, and the body is dragged through a tube filled with wire-brushes; heavy springs make a vigorous pressure, and nearly all the bristles are removed. The body drops on a moving platform. One man scrapes the bristles from under one leg; a second the bristles from under another leg. Again there is the clamp of a chain and the carcass goes on its way suspended. A man rips the stomach, and twenty men in turn extract certain parts of the entrails. A man gives a sweep of the neck with his knife; the next man gives another slash; the third man catches the head as it falls and pitches it on one side; the next slices a paw; the next finishes the operation and cuts it off. So past 150 men. Then the carcass reaches the cooler, a great chill chamber, which made me shiver when I entered it. And not one pig, but dozens of pigs are all going through the same operation at the same time. The cutting up does not take place for two days. Men strike at the carcasses with knives

three-parts as long as swords, and with a slash and a cut a ham is made, and the pieces over go flying into a tub close by. The finest hams are for the English market. An Englishman knows good ham and bacon. The American doesn't. Waste? There is no waste. All those morsels cut off to trim the hams and bacon sides go for sausages. I went into the sausage-room. In big saucers, with a rocking blade, were all the bits thrown and chopped fine. Men were moving about with wheel-barrow loads of the meat. It was pitched into machines. Men fixed rapidly the skins on the nozzles, and the sausages came out in apparently endless flow. Girls seized it, and with the adroitness of conjurers tied knots, which made the ordinary-sized sausage."

In such wise, nowadays, does the breakfasting British public get its indispensable rasher, and the picnicker his succulent sausage!

The modern process of **bacon and ham curing** is described by Mr. Loudon M. Douglas in a paper printed in the journal of the Royal Agricultural Society of England (1898). After the weight of the hog has been ascertained the head and fore-feet are severed, the kidney fat and vertebral column removed, and the sides disconnected and allowed to cool in the hanging-house for six to twelve hours, after which they are placed in a chill-room for about twelve hours, until the meat registers on a meat-testing thermometer 40° F. (the chill-rooms being two degrees lower). The blade-bones are now removed and the sides trimmed and taken to the cellars. The sides are laid on benches and pumped in about seventeen places with a pickle testing 100° on the (Douglas) salinometer at 60° F. The pumping pressure should be 40 lbs. per square inch, as indicated on an ordinary pressure-gauge. The sticks of the pump-needle are all into the flesh parts, the thin flank not being pumped at all. The pickle used consists of 55 lbs. salt, 5 lbs. saltpetre, 5 lbs. dry antiseptic, and (in winter only) 5 lbs. of pure cane-sugar. These ingredients are made up to 20 gallons with fresh water, and stirred until the whole are dissolved. The pickle is then allowed to settle until clear, and is better if it is boiled and skimmed. In any case the clear pickle is run into the cellar, and is not used until it is of exactly the same temperature as the cellar. Immediately after the sides are pumped they are laid down rind downwards,

and covered lightly with an equal mixture of dry antiseptic and fine saltpetre. On top of this is laid a heavy layer of salt. The sides are "stacked" one on top of the other, and the thin flank, or belly portion, is kept up by means of oak staves. The pickle, therefore, which naturally forms, collects in a sort of saucer formed by the ribs. The stacks are not meddled with until their cure is complete, which is in ten days for 9-score and twelve days for 10-score pigs. After that time in salt the bacon is "struck", and, according to the market to be supplied, is drained, washed, trimmed, and sent off.

Much of the bacon consumed in England is *smoked*, and many factories have facilities for smoking. The smoke-stores want a good deal of watching and care, and should always be under a competent man. Cured bacon is drained from seven to ten days, and is then washed, wiped, and trimmed. It is then dusted over with pea-meal, and hung in the smoke-store for three days at a temperature of 85° F. The smoking material used is oak saw-dust. After the bacon is smoked it is packed up in bales with clean barley or wheaten straw between the sides, and is sent out.

Hams are cured on the same principles as bacon, but require careful treatment, and the method is a little different from that above explained. After being cut from the chilled sides they are placed in a tank of pickle made as for bacon, and allowed to remain until next day, when they are taken out and pressed to "purge" the blood out of the chief vein. They may then be "pumped" or not, but Mr. Douglas recommends pumping the blood-vein with an antiseptic pickle at a low pressure. The same mixture of antiseptic and saltpetre is sprinkled over the cut surfaces, and the ham is laid in a bed of salt, shank pointing downwards. Covered with the salt it is left for three days, then taken up and again pressed in order to remove any remaining blood from the vein. The ham is then again laid down in a salt bed and covered with fine salt, in which it is left for about fifteen days. The general rule for curing is to allow one day for every pound weight, adding three clear days for the purging. In most bacon factories where hams are cured they are also dried—an operation conducted slowly at a temperature of 80° F. When pale dried hams are wanted quickly they are dried in the smoke-stores at

a temperature of 95° F. for three days. Ham curing is limited, of course, by the necessity of disposing of the rest of the side from which the ham is removed. As the hams bring a high price in wealthy cities like London or Paris, it pays to sell the ham separately and convert the rest of the side into "Cumberland cut" bacon or "Irish rolls", the latter being a mode of using the side which remains after the ham and shoulder and all bones have been removed. In Cum- Large Hams.
berland and Yorkshire and some other parts of England very large pigs are grown, and very large hams, heavily salted, are made. It is therefore sometimes a practice to remove the whole of the ribs as well as the backbone and sell these as fresh meat, as "ball rib", spare rib", and "ribs" or "bones".

With regard to **methods of curing**, elaborate tests were made with the carcasses of 137 hogs at the large experimental laboratory of the Copenhagen Agricultural College, special comparison being made between (1) the ordinary method above described; (2) the "injection" method, whereby brine is pumped from the pig's heart through the arteries and veins, the killing having been effected by a shot in the brain; (3) the "Auto-cure" method. The verdict was that the injection method gave a smaller, Modern Curing.
and the Auto-cure a larger out-turn than was obtained by the ordinary method, although results varied with the latter at different factories. The *Auto-cure* was a method first shown at the Paris Exhibition of 1867, and since developed. When the bacon has been cut and cooled and the brine injected as in the ordinary process, it is placed in a large iron cylinder capable of holding some 240 sides. The cylinder is then closed and a partial vacuum created, the object being to draw out any harmful gases from the tissue of the bacon and to open its pores, and so render the meat more susceptible to the action of the brine. After the vacuum has been maintained for an hour the cylinder is filled with brine. A pressure of eight or nine atmospheres is applied, and the bacon in the brine is subjected to this for six hours. The brine is then run out and the bacon removed (it is on a truck in the cylinder), strewn with salt, and placed in a cooling compartment to ripen further for two to five days. The plant and machinery employed in this process (in Denmark) are, of course, expensive.

The *branding* of bacon and ham consists of burning the curer's name or mark into the skin, cast-iron brands being used, heated in a coke fire or stove. In the case of bacon the branding may be done before the meat is chilled or after the whole curing process is completed. Hams are usually branded on leaving the smoke-store. Branding has a well-recognized value on the market, the meat which is thus marked being taken as of the best selections, while "unbranded" may be inferior selections or meats from which the original brand has been removed. The glossy appearance of some smoked hams is produced by rubbing a little vaseline over the skin.

Speaking generally, Cumberland and Home-cured bacon and
 Brands hams are salty and full-flavoured, while Irish, Danish,
 and Stock. Wiltshire cut, and American are mild cured. Tastes vary as to which is the better, the salt or the mild; just as they vary in regard to the smoky flavour which is preferred by many in the London district but detested by many in the Midlands. The grocer or provision-dealer will, of course, be guided in his selections by local preferences. But all the bacon he sells should be good of its kind—not too fat, yet fat enough, and the fat firm and pinkish, the lean tender and well distributed, the rind thin. The "trier", or sharp-pointed skewer, pushed into the meat, should smell sweet and without taint on withdrawal. If the fat looks yellow it is a sign of "*reastiness*"—a deteriorated condition which customers are pretty sure to resent.






"We usually have in stock", says a good price-list before us, "bacon from America, Canada, Denmark, Ireland, and other countries, each kind differing in price; yet, as we only purchase the finest brands from each country, the lowest priced bacon or hams we keep may be relied on as being the best possible meat of its kind. These choice mild-cured meats we receive weekly, and our customers are requested to note this, as some firms tempt consumers to purchase large quantities at a time, while we advocate the purchase of only sufficient quantity of mild-cured bacon as will last consumers from ten to fourteen days from time of purchase. We would particularly call attention to the choice mild-cured bacon and hams we import from Ireland. We believe there is no better in the world. Thousands of tons are being sold under fancy names at fancy prices as English Wiltshire

bacon. We, however, import and sell Irish bacon for what it really is, at a moderate price, and our immensely increasing sales prove that customers appreciate both the quality and the price." Although the prices are necessarily inapplicable except to the time of their publication, the following extract from another price-list of bacon and hams may also be quoted as affording a comparison for the tyro's guidance:—

Bacon—

						<i>s.</i>	<i>d.</i>
Rolled	Boneless, Short Shoulders, Pale	...	...	per cwt.		39	0
"	"	"	Smoked	...	"	40	0
	Large Shoulders, 2 <i>s.</i> per cwt. less.						
Middles, Canadian or States	Smoked	...	...	"		49	0
Rolled	Boneless, Sides, lean selection, Pale, Dried	...	...	"		51	6
Rolled	Boneless, Sides, Smoked Breakfast Bacon	...	...	"		52	6
	Larger Sides, 2 <i>s.</i> per cwt. less.						
Fore-Ends	Bacon	...	...	...	"	38	0
Gammons	...	...	...	...	"	59	0

Bacon (Smoked)—

acon (Smoked)—						Sides.		$\frac{3}{4}$ -Sides.	Middles.		
						<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>
	Unbranded Lean	...	...	...	...	52	0	62	0	64	0
	Lean Selection	...	...	...	...	58	0	68	0	70	0
	Choice Lean	...	...	...	...	61	0	71	0	73	0
	Very Choice Selected	...	...	...	...	64	0	74	0	76	0
	Denny's Full Branded, or other Extra Selection	...	...	...	...	68	0	78	0	80	0

Hams—

						<i>s.</i>	<i>d.</i>
Picnic	...	...	...	...	per cwt.	38	0
Long Cut, mild cure, smoked,	12 lbs. average	...	...	"		48	0
"	"	"	10 lbs.	"	"	54	6
"	"	specially selected,	10 lbs. average	"	"	58	6
Cooked, ready for table, skinned	...	...	...	per lb.		0	9
"	"	"	boneless	...	"	0	10
Compressed Ham, 6-lb. tins, 12 in case	...	...	...	"		0	9

Before discussing the detail of cutting up bacon and hams, however, we must say something of the "cuts" recognized in the trade. Of these there are many, if all the local usages were admitted, but the following is a list of the principal: ^{About} "Cuts".—Wiltshire sides, Cumberland sides, London cut sides, short clear middles, long fat backs, shoulders, Irish sides, Birmingham sides

Stafford sides, long rib middles, short fat backs, Cumberland hams, Wiltshire hams, Irish hams, York hams. The pigs used for the Cumberland hams and bacon are very heavy and fat. The "*Cumberland cut*" is a side with the ham absent, but the shoulder and fore-leg left in, also the ribs left in. In the "*Wiltshire cut*", now so generally adopted for Danish, Irish, &c., bacon as well as Wiltshire, the ham is also left in, but the shoulder-bone, or "blade-bone" is taken out. In the "*Birmingham*" and "*Stafford*" cuts the ham is removed, also the ribs, the pigs used being larger than those ordinarily used for the Wiltshire cut. "Wiltshire cut", by the way, is understood as not necessarily meaning that the bacon is Wiltshire bacon, or even the bacon of imported pigs (Irish *e.g.*) killed and cured in Wiltshire; it is a term applied simply to the fashion in which any bacon is cut and trimmed, and is therefore liable to be misused to deceive the public. Taking the Wiltshire cut side, we have it further divided into "fore-end", middle, and "gammon". The "*gammon*" is the part which, had it been removed and trimmed to something like a circular form before the side was cured, would have been the ham. The "*fore-end*" is, of course, the opposite or shoulder end. The "*middle*" is the part left when the fore-end and gammon have been removed. These three parts are again subdivided. There are also variations and combinations. Thus the Wiltshire curers send out not only Wiltshire-cut sides, which are practically the whole half of the pig except the head, but also "gammon-less sides", "three-quarter sides", and "middles"; the gammon-less sides being the whole side minus the gammon or ham, and the three-quarter sides being the whole sides minus the fore-end. "Drafts" are clear or boneless American bellies, white-dried, and are familiar in the Midlands. *Rolled* bacon consists of the ribless and boneless middles, well washed and hung for a day or two, then rolled tightly, commencing with the belly portion and finishing with the back-length outermost, the whole being then bound round tightly with string. *Bath chaps* are pigs' cheeks, chaps, or "chops", cured or smoked for cooking whole. When this is not done the butcher sometimes divides the head, selling the two upper jaws, triangular in shape, as the "eye-piece", whilst the two lower jaws, which are fatter and more meaty, are called the "chawls" (*i.e.* jowls). The *Chine*

Trade Terms.

of bacon is a term variously applied in some districts, but correctly means, we believe, a country or farmer's cut of bacon in which both sides of the "chine", or upper backbone were left in; it is not often seen nowadays. In *Hams* the terms quoted above require little definition. The "Picnic" is a small ham, the Cumberland a large one; the York ham is also large and full-flavoured, while the "York-cut" ham is quite a different article, hailing from anywhere but York. The "Bradenham" we have already referred to. Some hams are cut short or round like a clock-face; others are "long-cut", and are so spoken of, as the Devonshire long-cut, which is simply the ham cut to that shape as a speciality manufactured—both smoked and pale-dried—in Devonshire. The *English ham*, as a rule, has a short hock and a good plump thickness of meat; a skewer pushed into it under the bone should have a pleasant smell when withdrawn. **Sugar-cured** hams are liked in some districts, and some French official experiments have resulted in a favourable report upon a method whereby powdered sugar is used instead of salt for meat-preserving. It forms around the meat a solid crust which removes very little water from it and does not alter its taste; and all that is necessary before using the meat thus preserved is to immerse it in water. In the ordinary method of sugar-curing hams the fresh meat is rubbed thoroughly with salt and then placed on a stone slab or sill where it can drain. This is repeated each day for four days. The fourth day the ham is rubbed with a mixture of saltpetre and common salt, about a pound of saltpetre and a handful of salt to 70 lbs. of meat. Brown sugar and molasses mixed—1 lb. of each—are then rubbed over the hams every day for a fortnight, and finally they are hung up in oak smoke. A colonial method is to rub the fresh meat well with powdered sugar, and then place the ham in a kind of pickle of sugar and molasses, in which it is left undisturbed for some weeks. When cooked, the meat resembles fresh pork in appearance, but tastes like ham, but a little sweeter than the ordinary.

Bacon becomes *tainted* by the development in it of bacteria, due to various causes. The modern mild-cured article is very perishable, and when Continental bacon arrives too late for the weekly London sales (Friday), and has to be "held over",

the consequences are sometimes disastrous. Overheating of the bacon sides in the smoke-chambers, or their being hung in these chambers too near the smoke, is also apt to cause putrefaction to set in. **Tainted Bacon.** The use of dirty hanging-hooks is another cause; sometimes a short cord is used with a loop, into which hooks can be put when necessary. As regards the earlier stages in the manufacture, the means to avoid taint are: a careful killing, more especially a careful and efficient "bleeding", of the hogs; great cleanliness during the further handling of the bacon; the preliminary cooling must take place in fresh air, and the sides must not hang too close; the surroundings of the factory must be clean, and all traces of dried-up or rotting refuse must be removed; the cooling in the cooling-rooms should be promptly brought down to 4° C.; good water must be used for the brine, and old brine must only be added with great caution. In warm weather the transit by rail must take place in white isolated cooling carriages, and there should be cooled compartments at the wholesale warehouses.

Regarding **weights and sizes**, the wholesale dealers classify the best branded Irish bacon as lean sizable, prime sizable, lean stout, prime stout, and lean sixes; "sixes" being a term **Weights and Sizes.** used in the baled bacon trade to indicate that the bale contains six smaller sides to make up about the same weight as the ordinary bale of four larger and heavier sides. English smoked bacon is cut in sides, "gammonless", "three-quarters", and "middles", each classified into lean sizable, sizable, medium, stout medium, and heavy. "Fores" and "gammons" are classed into sizable, stout, and medium. In the Irish, Danish, Dutch, and Swedish bacon the bale of "sizable" bacon weighs from 1 cwt. 3 qrs. to 2 cwts. 1 qr. net; "sixes" weigh from 2 cwts. 1 qr. to 2 cwts. 3 qrs.; stout sizable, from 2 cwts. to a quarter more; and "heavy", from 2 cwts. 2 qrs. to 3 cwts. Canadian bacon in No. 1 "selection" averages 36/42 lbs. to 58/62 lbs.; No. 2 selection, 46/50 lbs. for sizable, and the others in proportion, "heavy" being over 62 lbs. Canadian pea-fed bacon and American sides, middles, shoulders, and legs are imported in boxes of about 4 cwts. to 6 cwts. net; while New Zealand bacon comes in wooden cases, containing six sides each, and weighing 3½ to 4 cwts. gross. The weights of individual sides

and hams may vary, of course, from 20 lbs. to 100 lbs. a fitch, or 7 lbs. to 70 lbs. a ham; in their preferences as regards weights, as well as in regard to flavour, different districts have distinct characteristics. Thus, in Liverpool, in the poorer quarters, "Cumberland-cut" hams averaging 20 lbs. to 30 lbs. will be sold; while in the better-class neighbourhoods the taste is for the same cut averaging 30 lbs. to 40 lbs. In bacon, Liverpool takes, as a rule, "prime" weights, 56 lbs. to 60 lbs. per side, and "stout" of 70 lbs. to 75 lbs. London, on the other hand, commonly requires lighter weights in the Wiltshire-cut Danish or Irish bacon than does Liverpool, for the reason that the Londoners seem to prefer the leaner "selections". But in London tastes of all kinds are to be found, and assuredly no place in the world has such a range of choice in the matter of provisions. For example, while the "Jambon de York" accepted with gusto by the Parisian gourmet is a jambon of any-^{"Jambons de York."} where but York or Yorkshire, and the real Yorkshire ham is so little seen elsewhere that even experts in the trade sometimes say there is no longer any such thing as a real York ham, the writer recently had the assurance of a Tooley Street provision-merchant that he sells, all the year round in London, thousands of York hams made and cured in Yorkshire. In the price-list of a tiptop London provision-house one may find the names of not merely York hams, but Westphalian hams, Spanish hams, Somersetshire sugar-cured hams, Bradenham hams, Virginian peach-fed hams, Strasbourg bacon, Faringdon brawn, and so on. "*Real* Wiltshire bacon", by the way, is especially emphasized in a Piccadilly price-list before us—showing how much importance attaches to a name!

We come now to the important subject of the **handling and cutting up** of bacon and hams by the retailer. In the first instance, however, it may be well to mention yet one other matter which the retailer—at any rate the ^{Bacon-drying.} retailer not in a large way of business—does not ordinarily perform for himself, viz. the drying. The proper drying-room is a room set apart for that purpose, if not specially built, heated all round by steam-pipes, and kept at a temperature of 85° to 90° F. The bacon received is first washed and then dried by hanging in the drying-room for about a week—not more. Hams taken out of cellar are first washed in warm water, and then (in order to

take out wrinkles) dipped, knuckle-end first, in boiling water, the water, however, being kept off the lean surface; afterwards the hams are hung for several days to dry. Most grocers, however, buy their bacon and hams already smoked and dried, or green and dried; in which case all that is necessary is to hang the meat in an airy place, after carefully weighing and noting the weights as received. The sides of bacon, by the way, are usually hung up, not higgledy-piggledy, but arranged in lefts and rights for neatness.

Shrinkage in drying is thus a question which some may think concerns the wholesale dealer rather than the ordinary retailer;

but it is so easy to lose a great deal of money by in-

Shrinkage.

attention to shrinkage in retailing provisions that this point must be carefully noticed by every man who aspires to conduct his business on sound principles. Several public-spirited members of the grocers' associations have given special consideration to this subject for the benefit of their fellow-members, and in such a way have helped to remove a state of ignorance that has often been the cause of disaster in handling provisions. Mr. Rutherford, president of the Liverpool Grocers' Association, writes as follows:—

In arriving at the loss on borax or salt-packed meats there are several factors to be considered. For instance, square shoulders and long-cut hams do not lose so much as New York shoulders and American-cut hams, the latter being pickle-cured meats. From careful observations of different packers' goods, taken at various seasons of the year, the average shrinkage in drying (after hanging a week) ranges from 7 lbs. to 10 lbs. per cwt., according to the season of the year and the cure of the goods. Bellies and shoulders lose rather more in drying than bacon and hams. It should be particularly noted that this calculation is based upon seven days' drying only; should the goods continue hanging longer they will lose on an average 3 lbs. to 5 lbs. per week per cwt., but it is very injudicious to keep American provisions hanging longer than a week, because the depreciation in quality after that time is very marked, especially in borax-packed goods.

Retailers often calculate the drying of hams and bacon in a rule-of-thumb way, reckoning that "a farthing a pound will dry bacon", and on this basis they estimate their profits. Upon reflection it is obvious that if it takes a farthing a pound to dry bacon at 28s. per cwt., it must necessarily cost two farthings to dry it at 56s., the loss being calculated on the pounds of meat. For instance, if a cwt. at 28s. loses 9 lbs., which at 3d. per lb. is equivalent to 2s. 3d. in money, 9 lbs. loss at 56s. amounts to 4s. 6d. Another error frequently made in these calculations is that of adding the loss in shrinkage to the cost of a complete cwt., instead of adding it to the cost of the weight which remains after drying. If a cwt. of bacon costing 56s. in the boxes loses 10 lbs. in drying, the 102 lbs. left will cost 56s.; consequently on

this basis the cost of the cwt. would be 61s. 6d., not 61s. If for convenience it be necessary to adopt a rough-and-ready method, add a halfpenny per pound to the price of all American meats costing in the box below 56s. per cwt., if sold within seven days.

Owing to the fluctuating character of the prices, it is difficult to illustrate how the profit on bacon, hams, and shoulders may be calculated with any degree of certainty. A good plan is to keep in mind the following rules:—First ascertain the dry cost of the bacon, hams, &c., then add a seventh of the cost, and let this be the minimum price you must receive for the whole, getting as much more, of course, as the circumstance of your particular trade will admit. For instance, if the dry cost of a side of Cumberland-cut be 5¼d. per lb., a seventh added will bring the price to 6d. per lb. This would be exactly 12½ per cent on the turn-over, which would in most cases show a net profit of 2½ per cent, calculating the average working expenses in a provision shop at 10 per cent on the turn-over. Considering the losses arising from waste, over-weights, &c., connected with the bacon trade in shops where there is much slicing, or where small cuts are sold, this is the smallest profit that should under any circumstances be tolerated. If competition be so keen that such a minimum profit cannot be realized, then either cease selling bacon or give up the shop, because such business can only result in loss—possibly disaster.

Handling
Bacon—
Cost and
Price.

To illustrate the seriousness of not carefully noting the loss in drying—if eleven boxes of bacon, weighing 5500 lbs., be hung up for seven days and then re-weighed, it will be found that about 500 lbs., which would represent one complete box, have been lost in shrinkage. In rolled bacon the loss is proportionately more startling, for out of five boxes the loss in drying and boning would represent about one box. The loss in rolling and drying bacon varies according to the weather and the cure. The average loss from boning is 10 lbs. to 12 lbs. per cwt., drying 7 lbs. to 10 lbs. per cwt. Taking the mean of these calculations and estimating the loss at 20 lbs. per cwt., or calculating 92 lbs. when rolled at the box cost of 112 lbs., it works out as follows:—Bacon costing in the box—30s. 6d., Liverpool terms, will cost 4d. per lb. rolled and dried; 34s. 6d., 4½d.; 40s. 3d., 5¼d.; 44s., 5¾d.; 48s., 6¼d.; 51s. 9d., 6¾d.; 55s. 6d., 7¼d.; 59s. 6d., 7¾d.; 63s. 3d., 8¼d. No account has been taken of labour and twine, as they stand against the value of the bones. A simple way to quickly ascertain the cost of dry rolled bacon is to add one-fifth on the cost of the box price. This will be found near enough for ordinary practical purposes. Smoked bacon costs 1s. 6d. per cwt. over dry price. “C.i.f. terms” are approximately 1s. 6d. on 50s. per cwt. over Liverpool terms. “Box weights” are approximately 1s. on 50s. per cwt. over Liverpool terms.

Mr. Hawthorne, president of the Northampton Grocers' Association, compiled for that society statistics showing from actual weights the shrinkage of bacon, hams, &c., in the drying of which no artificial heat was used. Thus, eight “drafts” or bellies of bacon, which averaged 14 lbs. each when unpacked, lost in a week 9 lbs. 3 ozs., in a fortnight 12 lbs. 4 ozs., in a month 14 lbs. 13 ozs., in five weeks 15 lbs. 12 ozs. Ten “backs”, averaging 11¾ lbs. when unpacked, lost in a week

How money
is lost.

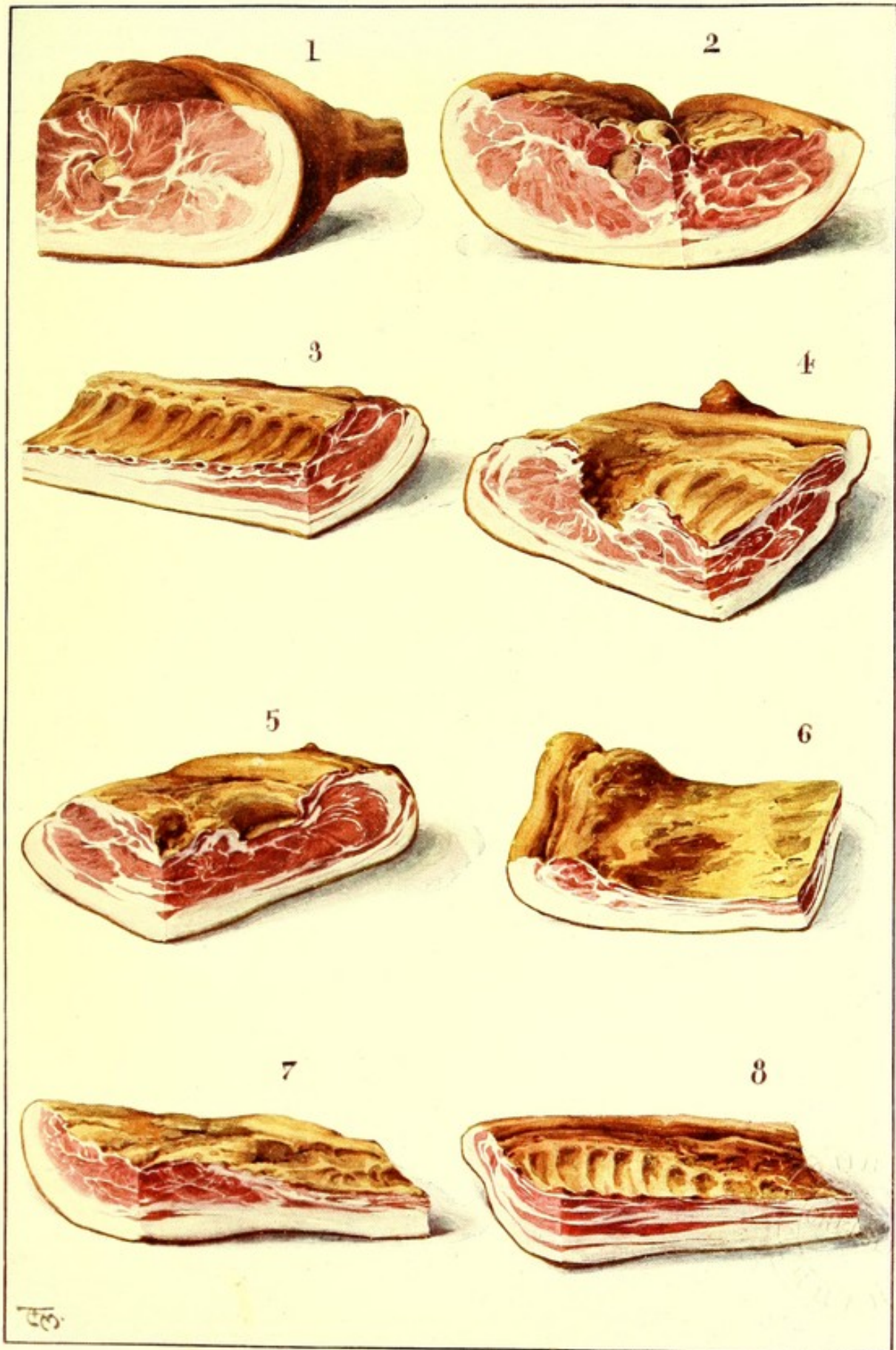
8 lbs. 12 ozs., in a fortnight 12 lbs. 3 ozs., in a month 15 lbs. 4 ozs., in five weeks 16 lbs. 14 ozs. Sixteen "picnics", averaging 7 lbs., lost in a week 9 lbs. 12 ozs., and in five weeks 23 lbs. 9 ozs. Ten New York shoulders, averaging $11\frac{1}{4}$ lbs., lost in a week 9 lbs. 12 ozs., and in a month 18 lbs. 8 ozs. Three Stafford middles, averaging $37\frac{3}{4}$ lbs., lost in a week 7 lbs. 4 ozs., and in five weeks 13 lbs. 13 ozs. Eight hams, averaging $15\frac{1}{4}$ lbs., lost in a week 7 lbs. 2 ozs., in a fortnight 10 lbs., in a month 13 lbs. 14 ozs., in five weeks 15 lbs. 14 ozs., and in six weeks 17 lbs. 9 ozs. Ten hams, averaging $11\frac{1}{4}$ lbs., lost in a week 8 lbs. 6 ozs., and in six weeks 18 lbs. 15 ozs. A dozen hams, averaging $9\frac{1}{2}$ lbs., lost in six weeks no less than 20 lbs. 7 ozs. These figures are ample to show the necessity for taking shrinkage into account in estimating the price at which ham and bacon must be sold to show a profit on cost. Clearly, moreover, that price should be increased every week that the meat is unsold and subject to such shrinkage, if the provision-dealer's "profit" is not to grow "fine by degrees and beautifully less", until it altogether disappears!

We have already had the principle established for us that when the *dry* cost of the bacon or hams has been ascertained, Cutting up for Profit. one-seventh should be added, and the aggregate of these should be the minimum price charged for the whole when sold retail, whilst as much more should be charged as circumstances permit. This means that the poorer parts of the bacon or ham should be sold at the minimum price and the prime parts for more. But obviously a great deal depends on the mode of cutting up, and it is here where the expert provision hand proves his value. The object is, of course, to cut up the meat in such a manner as that there shall be as much of the prime parts and as little of the poorer as may be; and this by no means depends wholly on the meat itself, clever cutting has much to do with it. A normal side of Wiltshire cut weighs 59 lbs. If the ham or hind-end is taken off square it forms what is called the "gammon", which is subdivided into the "cushion" (with hock) and the "corner". The fore-end is also cut off square, and subdivided into fore-hock and "collar", or, as it is called in some parts of the country, the "pole". The middle, or portion remaining, is now divided along its length and transversely into three under pieces (with the belly) and two back pieces; the

BACON CUTS

The art of cutting up a side of bacon is one to which every "provision hand", and not less so the grocer, his employer, has to give very close attention if serious waste is to be avoided at the counter. Various ways of practising this art, and hints to be observed in it, are given in the text of the accompanying chapter. The "Bacon Cuts" in use vary somewhat in different parts of the country, but those we illustrate may be regarded as fairly representative. Many grocers give a coloured plate such as this in their price lists, to afford a guide to the customer in ordering bacon.

BACON CUTS



1. Gammon Hock.
5. Collar.

2. Corner of Gammon.
6. Thin Streaky.

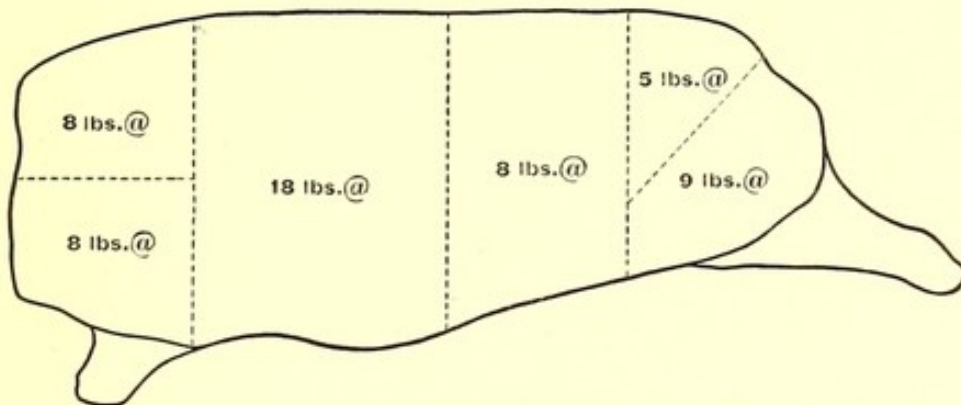
3. Back and Ribs.
7. Loin.

4. Fore Hock.
8. Thick Steaky.

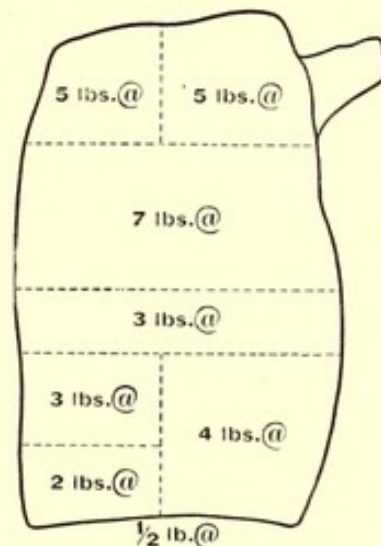
under pieces being the "thick streaky", "thin streaky", and "flank"; and the back pieces being the "back and ribs" and the "loin". In our normal side of 59 lbs. the weights of these portions are thus:—

Fore hock	9 lbs.	Collar	7 lbs.
Thick streaky	6 "	Back and ribs	9 "
Thin streaky and flank ...	7 "	Loin	8 "
Cushion with hock	9 "	Corner	4 "

The 6 lbs. of "thick streaky" may again be subdivided into 2 lbs. of "top" and 4 lbs. of "prime"; the 7 lbs. of collar may be subdivided into 2 lbs. of "end" and 5 lbs. of "prime"; and the 9 lbs. of back and ribs may be subdivided into 2 lbs. of "top end" and 7 lbs. of "back prime". The weights of the whole



sides, and of the different portions separately contained in a side, vary considerably; but the provision hand will nevertheless find it a useful practice to plan out his cuts by diagram and to notice frequently how each turns out. A Liverpool provision house sends out to its branches rough diagrams such as are here shown. These sketches and the weights marked are only approximate; the



managers are asked to alter them to their own method of cutting up. Information is given thus: "This week Danish bacon costs 8½d. dry. C. C. bacon costs 8d. dry. A. C. hams cost — dry." Forms are supplied to be filled up thus:—

DANISH BACON

		£	s.	d.	
.....lbs.	@.....				
.....lbs.	,,				
.....lbs.	,,				
.....lbs.	,,				
.....lbs.	,,				
.....lbs.	,,				
.....lbs.	,,				
.....lbs.	,,				
56 lbs. realizes ...					
57 lbs. @..... costs ...					
GROSS PROFIT ...					or.....per cent.

If sides of bacon and hams did not vary it would be possible to draw up a normal diagram and scale of prices and work by these automatically, increasing retail prices all round by, say, a halfpenny for every 4*d.* per cwt. rise in the wholesale price, or by putting a penny on the better pieces and leaving the others to sell cheaply. But obviously the trade hardly admits of such easy automatic rules in practice. An Oxford retailer, Mr. Strange, drew up a scale which he gave by way of illustration to the Oxford Grocers' Association. Assuming the side of bacon to weigh 50 lbs. he took the costs as follows:—At 56*s.*, £1, 5*s.*; at 60*s.*, £1, 7*s.* 9*d.*; at 63*s.*, £1, 8*s.* 1½*d.*; at 67*s.*, £1, 9*s.* 10½*d.*; at 70*s.*, £1, 11*s.* 3*d.*; at 77*s.*, £1, 14*s.* 4½*d.*; at 81*s.*, £1, 16*s.* 1½*d.*; at 84*s.*, £1, 17*s.* 6*d.*; at 86*s.*, £1, 18*s.* 4½*d.* The selling price worked out something like this:—

Cut.	Weight.	Per lb.		Per lb.		Per lb.	
	lbs. ozs.		£ s. d.		£ s. d.		£ s. d.
Gammon ...	11 14	9 <i>d.</i>	0 8 11	8 <i>d.</i>	0 7 11	7½ <i>d.</i>	0 7 5
Loin ...	6 2	1 <i>s.</i>	0 6 1½	11 <i>d.</i>	0 5 7½	10 <i>d.</i>	0 5 1½
Ribs ...	7 10	1 <i>s.</i>	0 7 7½	11 <i>d.</i>	0 7 0	10 <i>d.</i>	0 6 4½
Streaky ...	5 7	11 <i>d.</i>	0 5 0	10½ <i>d.</i>	0 4 9½	9½ <i>d.</i>	0 4 0
Flank ...	2 2	5 <i>d.</i>	0 0 11	5 <i>d.</i>	0 0 11	5 <i>d.</i>	0 0 11
Top ribs...	2 0	8 <i>d.</i>	0 1 4	8 <i>d.</i>	0 1 4	8 <i>d.</i>	0 1 4
Top streaky ...	1 10	8 <i>d.</i>	0 1 1	8 <i>d.</i>	0 1 1	8 <i>d.</i>	0 1 1
Collar ...	6 3	8½ <i>d.</i>	0 4 4½	8 <i>d.</i>	0 4 1½	7½ <i>d.</i>	0 3 10½
Fore-hock ...	7 0	5½ <i>d.</i>	0 3 2½	5½ <i>d.</i>	0 3 2½	5 <i>d.</i>	0 2 11
	50 0		1 18 7		1 16 0		1 13 4½

The following are other examples from various sources:—

Gammon:	Corner	...	5 lbs. at $8\frac{1}{2}d.$	...	...	£0	3	$6\frac{1}{2}$
	Centre	...	5 " $9\frac{1}{2}d.$	...	...	0	3	$11\frac{1}{2}$
	Hock	...	5 " $6d.$	...	...	0	2	6
Back:	Thick end	...	3 " $8d.$	...	...	0	2	0
	Ribs	...	6 " $9d.$	...	...	0	4	6
	Loin	...	6 " $9\frac{1}{2}d.$	...	...	0	4	9
Streaky:	Flank	...	4 " $4\frac{1}{2}d.$	...	...	0	1	6
	Prime	...	7 " $8\frac{1}{2}d.$	...	...	0	4	$11\frac{1}{2}$
Fore End:	Collar	...	$7\frac{1}{2}$ " $7\frac{1}{2}d.$	...	...	0	4	$8\frac{1}{4}$
	Hock	...	$7\frac{1}{2}$ " $5\frac{1}{2}d.$	...	...	0	3	$5\frac{1}{4}$

						£1	15	10
Cost,	56 lbs. at 56s. per cwt.	...	...	...	...	1	8	0
Profit	...	...	...	...	...	£0	7	10

8 lbs. 0 ozs.	Shoulder at $6d.$	...	...	...	...	£0	4	0
4 " 0 "	Neck at $7d.$	...	...	...	...	0	2	4
4 " 0 "	" at $7\frac{1}{2}d.$	...	...	...	...	0	2	6
4 " 0 "	Corner gammon at $11d.$	...	...	...	...	0	3	8
3 " 0 "	Middle " at $1s.$	...	...	...	...	0	3	0
7 " 0 "	Knuckle at $7d.$	...	...	...	...	0	4	1
2 " 0 "	Top of back at $10d.$	...	...	...	...	0	1	8
2 " 0 "	Loin at $1s.$	...	...	...	...	0	2	0
12 " 8 "	Back at $11d.$	...	...	...	...	0	11	$5\frac{1}{2}$
11 " 0 "	Streaky at $11\frac{1}{2}d.$	...	...	...	...	0	10	$6\frac{1}{2}$
3 " 0 "	Thin streaky at $10d.$	...	...	...	...	0	2	6
3 " 0 "	Flank at $7d.$	...	...	...	...	0	1	9

						£2	9	6
Cost,	$63\frac{1}{2}$ lbs. at 75s.	...	...	...	...	2	2	$6\frac{1}{2}$
Profit	...	...	...	...	...	£0	6	$7\frac{1}{2}$

lbs. ozs.		£	s.	d.
15 1	Back at $11d.$	...	0	13 10
1 11	Top of back at $8d.$	...	0	1 $1\frac{1}{2}$
1 9	Top of streaky at $8d.$	...	0	1 $0\frac{1}{2}$
1 11	Bottom " at $9d.$	...	0	1 $3\frac{1}{2}$
10 10	Prime " at $11\frac{1}{2}d.$	...	0	10 2
3 13	Flank at $7d.$	...	0	2 3
10 15	Gammon at $8d.$	...	0	7 $3\frac{1}{2}$
3 3	Corner gammon at $10\frac{1}{2}d.$	...	0	2 $9\frac{1}{2}$
6 13	Shoulder at $6d.$	...	0	3 5
6 13	Neck at $7d.$	...	0	4 0
			2	7 $2\frac{1}{2}$
Cost,	62 lbs. 3 ozs. at 73s.	...	2	0 $6\frac{1}{2}$
Profit	...	...	0	6 8

lbs. ozs.		£	s.	d.
3 0	Streaky at $10d.$	...	0	2 6
9 10	" at $11\frac{1}{2}d.$	...	0	9 3
2 0	Back at $10d.$	...	0	1 8
2 8	" at $1s.$	...	0	2 6
16 0	" at $11d.$	...	0	14 8
8 8	Shoulder at $6\frac{1}{2}d.$	...	0	4 $7\frac{1}{2}$
10 4	Neck at $7\frac{1}{2}d.$	...	0	6 5
10 0	Gammon at $8d.$	...	0	6 8
4 2	Corner gammon at $11d.$	...	0	3 $9\frac{1}{2}$
3 0	Flank at $7d.$	...	0	1 9
			2	13 10
Cost,	69 lbs. at 75s.	...	2	6 $2\frac{1}{2}$
Profit	...	...	0	7 $7\frac{1}{2}$

lbs.		£	s.	d.
7	Hough (hock) at 5 <i>d.</i>	...	0	2 11
1 ½	Slipper at 7 <i>d.</i>	...	0	0 10 ½
1 ½	End of collar at 6 ½ <i>d.</i>	...	0	0 10
5 ½	Collar at 7 ½ <i>d.</i>	...	0	3 6 ½
1 ½	Brisket at 7 ½ <i>d.</i>	...	0	0 11 ½
2	Top ribs at 8 ½ <i>d.</i>	...	0	1 5
4	Prime streaky at 8 ½ <i>d.</i>	...	0	2 10
3	Thin end at 7 ½ <i>d.</i>	...	0	1 10 ½
12	Black prime at 10 <i>d.</i>	...	0	10 0
3	Flank at 5 <i>d.</i>	...	0	1 3
1	Oyster at 7 <i>d.</i>	...	0	0 7
1 ½	Lean long back at 11 <i>d.</i>	...	0	1 4 ½
3	Corner gammon at 9 <i>d.</i>	...	0	2 3
6	Middle at 10 <i>d.</i>	...	0	5 0
4	Knuckle at 5 <i>d.</i>	...	0	1 8

		1	17	4 ½
Cost, 56 lbs. at 60 <i>s.</i>	...	1	10	0
Profit	...	0	7	4 ½

lbs.		£	s.	d.
7	Hough at 5 ½ <i>d.</i>	...	0	3 2 ½
1 ½	Slipper at 7 <i>d.</i>	...	0	0 10 ½
1 ½	End of collar at 7 <i>d.</i>	...	0	0 10 ½
5 ½	Collar at 8 <i>d.</i>	...	0	3 8
1 ½	Brisket at 8 <i>d.</i>	...	0	1 0
1 ½	Top ribs at 8 ½ <i>d.</i>	...	0	1 1
4	Prime streaky at 9 <i>d.</i>	...	0	3 0
3	Thin end at 8 <i>d.</i>	...	0	2 0
12	Prime back at 11 <i>d.</i>	...	0	11 0
3	Flank at 5 <i>d.</i>	...	0	1 3
1	Oyster at 7 <i>d.</i>	...	0	0 7
1 ½	Lean long back at 1 <i>s.</i>	...	0	1 6
3	Corner gammon at 9 <i>d.</i>	...	0	2 3
4	Middle at 1 <i>s.</i>	...	0	4 0
6	Knuckle at 6 ½ <i>d.</i>	...	0	3 3

		1	19	6 ½
Cost, 56 lbs. at 68 <i>s.</i>	...	1	14	0
Profit	...	0	5	6 ½

lbs.		£	s.	d.
7	Hough at 5 ½ <i>d.</i>	...	0	3 2 ½
1 ½	Slipper at 8 <i>d.</i>	...	0	1 0
1 ½	End collar at 7 ½ <i>d.</i>	...	0	0 11 ½
2	Prime collar at 9 <i>d.</i>	...	0	1 6
3 ½	Split collar at 8 <i>d.</i>	...	0	2 4
1 ½	Brisket at 8 ½ <i>d.</i>	...	0	1 1
1 ½	Top ribs at 9 <i>d.</i>	...	0	1 1 ½
4	Prime streaky at 9 <i>d.</i>	...	0	3 0
3	Thin end at 8 ½ <i>d.</i>	...	0	2 1 ½
3	Prime back at 1 <i>s.</i>	...	0	3 0
9	Back at 11 <i>d.</i>	...	0	8 3
1	Oyster at 8 <i>d.</i>	...	0	0 8
3	Flank at 5 ½ <i>d.</i>	...	0	1 4 ½
1 ½	Lean long back at 1 <i>s.</i>	...	0	1 6
3	Corner gammon at 10 <i>d.</i>	...	0	2 6
5	Middle at 1 <i>s.</i>	...	0	5 0
5	Knuckle at 6 ½ <i>d.</i>	...	0	2 8 ½

		2	1	4
Cost, 56 lbs. at 72 <i>s.</i>	...	1	16	0
Profit	...	0	5	4

lbs.		£	s.	d.
6	Hough at 5 ½ <i>d.</i>	...	0	2 9
2	Slipper at 8 <i>d.</i>	...	0	1 4
1	End collar at 7 <i>d.</i>	...	0	0 7
3	Prime collar at 9 <i>d.</i>	...	0	2 3
3	Split collar at 8 <i>d.</i>	...	0	2 0
1	Brisket at 8 ½ <i>d.</i>	...	0	0 8 ½
2	Top ribs at 10 ½ <i>d.</i>	...	0	1 9
11 ½	Back at 1 <i>s.</i>	...	0	11 6
7	Prime streaky at 9 <i>d.</i>	...	0	5 3
2	Thin end at 8 <i>d.</i>	...	0	1 4
2	Flank at 5 ½ <i>d.</i>	...	0	0 11
1	Oyster at 8 ½ <i>d.</i>	...	0	0 8 ½
2	Lean long back at 1 <i>s.</i>	...	0	2 0
2 ½	Corner gammon at 10 <i>d.</i>	...	0	2 1
6	Middle at 1 <i>s.</i>	...	0	6 0
4	Knuckle at 6 <i>d.</i>	...	0	2 0

		2	3	2
Cost, 56 lbs. at 76 <i>s.</i>	...	1	18	0
Profit	...	0	5	2

lbs.	ozs.	£	s.	d.
4	1	Top shoulder at 7 <i>d.</i>	...	0 2 4 ½
4	13	Shoulder at 8 ½ <i>d.</i>	...	0 3 9
9	3	Hock at 5 <i>d.</i>	...	0 3 10 ½
6	0	Back at 11 <i>d.</i>	...	0 5 6
3	8	Chump at 10 <i>d.</i>	...	0 2 11
11	12	Loin at 11 <i>d.</i>	...	0 10 9 ½
7	10	Streaked at 11 <i>d.</i>	...	0 7 0
3	9	Flank at 6 ½ <i>d.</i>	...	0 1 11 ½
4	10	Corner gammon at 10 <i>d.</i>	...	0 3 10
10	0	Gammon at 7 ½ <i>d.</i>	...	0 6 3

		2	8	3
Cost, 65 lbs. 2 ozs. at 63 <i>s.</i>	...	1	16	7
Profit	...	0	11	8

lbs.		£	s.	d.
8	Fore hock at 4 ½ <i>d.</i>	...	0	3 0
6	Hind hock at 5 <i>d.</i>	...	0	2 6
8	Pole or collar at 6 <i>d.</i>	...	0	4 0
4	Two first ribs at 6 <i>d.</i>	...	0	2 0
3	Flank at 4 <i>d.</i>	...	0	1 0
16	Back at 10 <i>d.</i>	...	0	13 4
8	Streaked at 10 <i>d.</i>	...	0	6 8
6	Gammon at 10 <i>d.</i>	...	0	5 0
3	Corner of gammon at 10 <i>d.</i>	...	0	2 6

		2	0	0
Cost, 60 lbs. at 50 <i>s.</i> per cwt.,	...	1	6	10
Profit	...	0	13	2

In some of the foregoing examples of sides mention is made of the "oyster bone". This is one of those odd pieces which, because of the bone, are difficult to get rid of and are often kept lying about to go to waste, or are sold at such a sacrifice as makes a difference to the profit when one comes to reckon how "mony mickles make a muckle". Instead of being put aside to grow stale, lose weight, and become more and more unsaleable, such pieces should be put forward and sold off as quickly as possible. A good way of treating the oyster-bone piece, when rashers have been cut off as far as possible, is to turn the piece on its side, insert the point of your bacon-knife behind the bone, and cut out the bone as cleanly as possible, thus leaving a piece of bacon that may be cut into rashers and sold at the full rasher price. A very little practice will enable an assistant to cut out the bone so as to sacrifice as little as possible of the meat.

Hints on
Selling
Bacon.

The following is a useful practical letter on the subject of bacon-cutting, from a provision-merchant who cuts up on an average twenty-five sides a week:—"First of all, I should advise, buy the best brands only. Customers will go out of their way to get good bacon, for nothing is so much appreciated on the breakfast-table as a good rasher or ham. When asked for a piece of bacon, inquire as to what weight the customer wants, take down a piece near the weight required, and endeavour to sell the piece in order to avoid cutting again. All pieces in cut should be kept trimmed both sides; if not, you will lose the sale of a piece and have to cut again when the other side is noticed by your customer. The word pieces (I lay stress upon this) means loss or profit to the seller. Untrained or careless men, when asked for a piece of bacon, will take down the best bit and say to the customer, 'Would you like some off this?' The customer naturally says 'Yes'. She is a good judge, it is the primest—regardless of the fact that there are perhaps five or six pieces in cut about the same weight as required. There is absolutely no profit in selling the middle cuts while nursing the odds and ends, as though they were something to be looked at rather than sold. This reminds me of a friend of mine (a retired grocer) having occasion to go to Smithfield to buy bacon; and while chatting with the head of the firm, one of the juniors came in and said he had sold so many backs and middles. The reply was, 'I do not pay you to sell them—they sell them-

selves; put a ticket on that dog and he could go around and sell them'. Give special attention to the customers who buy your flanks, hocks, necks, &c., and charge a shilling per lb. for your prime cuts when bacon is 68s. to 70s. per cwt., or if a piece is taken which is cut off, say elevenpence as an inducement to save cutting. When overdone with streaks cut your backs out as wide as possible, or *vice versa*; this will make a considerable difference. By keeping clear of ends you are in a position to buy sides. If you have to buy three-quarter sides or middles you will have to pay through the nose, which will make a big hole in your profit. In cutting rashers the bones must be weighed in (I have seen them thrown on the floor), and in all cases insist upon the $\frac{1}{2}$ -oz. weight being put on the scales to see if it will go, or the $1\frac{1}{2}$ -oz. if it will not go 2 ozs. I have checked the weight of a pound of rashers and found it go 1 lb. $\frac{1}{2}$ oz., but only 1 lb. charged to customer through neglect of this important little friend. Whenever there is an alteration in the wholesale price, cut up a side and work the prices of different parts out, then compare with cost. If not sufficient profit, put your prices up, but commence on your prime parts first. The customer who wants the best part will pay the price providing the quality is right. It is better to sell five sides weekly at a profit than twenty showing a loss or no profit. Once get a name for good bacon and your customers will stick to you. It is a splendid advertisement. Great care and constant watching are required during the summer months, as the blue-bottle is very energetic, and always on the alert to fill your gammons, fore-ends, &c., with trouble. A little ground borax and close inspection will overcome this. I would advise all who are interested in cutting up bacon to give it more attention, for I am certain there is a good profit to be got; also a good bacon hand is able to demand, and get, far better wages than the average grocer's assistant." In a further letter the same correspondent writes: "I put on an average all my prime bacon parts at 11d. I get 1s. 1d. for middle-cut gammon, 1s. for corners, middle cuts of backs and streaky $10\frac{1}{2}$ d., and 11d. for top and oyster cuts, according to condition, and $5\frac{1}{2}$ d. for hocks at present. It would be folly to take this as an all-round figure; allowance has to be made for losses, such as a bad bruise in the middle of a gammon; it may be a little hammy or too salt;

Bacon in
Summer.

again, sometimes it will cut a bad colour and cook black; in that case I do not sell it as prime, but reduce it, and inform my customer it is not up to our usual standard. (This will appear in the best brands at times.) By adopting this course my best customers can always depend upon having good bacon, and are willing to pay a good price. When asked for a piece of bacon, always make a point of showing your oyster or top cuts. Sometimes a customer will say, 'I do not like that part; it is so difficult to cut with that bone in it'. Offer to cut it out or cut in rashers for her, not forgetting to say how much leaner it is, and a saving of perhaps $3\frac{1}{2}d.$ on the piece, according to size—in fact, bring all your business abilities into play to effect a sale. When you have once sold an oyster cut to a customer, keep the fact in your head, and never offer her any other part. I am confident that if the bacon hand will keep the oyster and top cuts to the front, and leave the middles to take care of themselves, it will not be a difficult matter to keep clear. By cutting the fore-end a little large (the object I have tried to explain) the worst part of top streak is disposed of, also the top back. Next we come to the flank. This part should not be cut too small; customers will not buy it if it is all end; 3 lbs. to $3\frac{1}{2}$ lbs. is the average I allow, and, as with the hock, I find they sell readily, always providing there is some slight advantage to offer on the inferior parts. I make $7\frac{1}{2}d.$ for my flanks, and at times am open to buy them; the price is generally about 30s. to 32s., which will show a good profit upon returns. I admit that what it is possible to do in one neighbourhood it is next to impossible to do in another, but with careful management and regulation of prices, constant attention, coupled with business abilities, it will show a living profit to the grocers. While some men I have come in contact with lose on this article, others have made a good living out of it, with something put by for a rainy day." Another practical correspondent points out the loss in weight incurred in stocking bacon during the week, and in cutting and exposing the article for sale. "This, I think, is quite 2 lbs. Then if a window and rasher trade is done there is scraping and facing to be done night and morning, and a slight loss in transferring left-over rashers to lower prices, and this occurs with the most careful windowman, which of course means a slight loss. Again, if customers insist on exact weight and no

A Profit—
With care!

half-ounces or ounces over the quantity asked for, it is impossible to give exact weight; often the scale goes down heavier than it would if one were weighing butter, and this tells against the seller, however slight. Our wholesale friends say: 'You must put your prices up'. This, perhaps, can be done on the prime parts, but the inferior remain very little different from when bacon is cheap, except it may be on some particular part, such as collar or fore-hock, according to the time of the year. If you hold out for increased prices for the inferior parts when they are not in demand, then you get them on hand, and have to buy three-quarters at increased prices; and the same remarks apply to gammons during the winter, which have to be boned and rashed or sold reasonably to prevent buying middles. It is good advice to assistants to sell top ribs of streaky and back and oyster parts, but my experience is that if customers have $1\frac{1}{2}$ lb. or 2 lbs. oyster part cut into rashers and see the big gap made by removal of the bone, which is often very large, they do not have it again, but prefer paying *2d.* or *3d.* a pound more for a better cut. I find the best way is to cut both sides right up to the bone, and even saw a piece away, and then sell the remainder at about *7d.* per pound, weighing about a pound. You cannot lay down a hard-and-fast rule as to the selling price, but often have to take $\frac{1}{2}d.$ per lb. less to keep a good customer."

However careful the shopkeeper may be, it will sometimes happen that special parts of bacon or hams do not move off as they should, so that he is in danger of finding himself over-
Boiling Gammons. stocked with perishable goods. In this case loss is often avoided by cooking the meat and disposing of it in that way. The following letters from experienced men contain hints worth noting: "We smoke our own bacon. When overdone with gammons, we cut them out ham shape. Weigh and ticket green weights. Use new flour liberally, and then smoke twice to ensure keeping. This has kept us fairly clear of gammons through the winter." "If bacon is dear, carry light stock and move up the price with the market. Don't accumulate flank, knuckles, and cut-down hocks; bone them out, and put them over a board at what price they will fetch. In the summer, when bacon is apt to be dear, be very careful with your gammons; cut them off and put them away for boiling. It is next to impossible to make money in gammons

when they are, say, 80s. You sell your corner and some of the middle at a good price, but the knuckle will spoil it. If you can do a good boiled trade, take my advice, and, when boiling-stuff is dear, cut off the fore-ends, with at least two ribs on; bone and roll them, and boil, and cut out at 1s. You can make 1s. 4d. of the boiled gammon well. If you have a copper holding 16 gallons, I would just clap two fore-ends and four gammons into it, in cold water; bring it to a boil; boil about 25 or 30 minutes; then bag them down and let them stop till morning. I would boil in the evening. One of the great secrets of a cooked trade is to boil it well, just sufficiently. Have a nice show on the counter—the hams on stands and the fore-ends on a board. You can cut them better than if they are on a stand; keep your knife going well. Gammons well cooked and well carved please the customer.” In handling bacon, “Don’t cut in the morning more than you can sell in the day” is a good motto, for bacon soon deteriorates if cut and in a warm shop. Note also that American or Canadian hams must not be sold as “English”, “Irish”, or “Scotch”. That way lies disgrace!

Our chapter on bacon would be incomplete without mention of that famous custom, instituted by a noble lady in Essex in A.D. 1111, and still kept up as a contribution to country humour and the gaiety of nations, the annual award of the “Dunmow flitch”, or flitches (*i.e.* boned sides).

The
Dunmow
Flitch.

The following is the doggerel adjuration used at the annual festival at Little Dunmow priory:—

You shall swear by the custom of our confession,
That you never made any nuptial transgression,
Since you were married man and wife,
By household brawls of contentious strife,
Or otherwise in bed or at board,
Offended each other in deed or in word,
Or since the parish clerk said Amen,
Wished yourselves unmarried again.
Or in a twelve-month and a day,
Repented not in thought any way,
But continued true and in desire,
As when you joined hands in holy quire.
If to these conditions without all fear,
Of your own accord you will freely swear,
A gammon of bacon you shall receive,
And bear it hence with love and good leave;
For this is our custom at Dunmow well-known—
Though the sport be ours, the bacon’s your own.

7. EGGS—HANDLING AND PRESERVING

The enormous extent of the trade in eggs, and the large proportion borne in that trade by the egg of foreign lands, have already been spoken of. In late years great and patriotic efforts have been made to encourage the farmers and cottagers of our own country to dispute more energetically this trade with the foreigner, and in Ireland, if not in England and Scotland, something has been done in this direction; but as long as eggs can be brought thousands of miles and landed in our ports at such

Cheap Eggs. a price as twenty a shilling we are pretty certain to go on importing them, and the grocer and provision-dealer will have to handle a considerable proportion of foreign eggs. The following table, showing the declared value of the eggs imported in 1903, suggests how cheaply this valuable article of food must be produced in the countries of supply:—

Source.	Number.	Declared Value.	No. per 1s.
Russia	816,332,760	£1,866,421	21.9
Denmark	462,186,840	1,648,367	14.0
Germany	370,529,760	994,797	18.6
Belgium	274,951,440	725,680	18.9
France	192,231,600	670,104	14.3
Canada	66,849,600	218,571	15.3
Other countries	198,785,280	493,659	20.1
Total	2,381,867,280	£6,617,599	17.9

In view of such statistics as the above, home fowl-keepers are urged to compete, not so much for the general trade in cooking and confectionery eggs, but for the absolutely new-laid trade, it being found that eggs at a shilling a dozen, and chickens properly reared for the crammers, pay the producer fairly. As a rule the new-laid egg, perfectly fresh, is an item of food which people are willing to pay for. The trader handling eggs should therefore exercise the greatest care in securing a new-laid egg supply that is thoroughly reliable. Regarding egg-preserving and storage, information is given further on in this chapter, but a prudent tradesman will in his own interest be very chary of relying upon stored eggs of any kind to eke out his new-laid supply.

The special feature of the new-laid egg is the creamy appearance of the white when cooked. Of that characteristic it is safest to assume that most customers are good judges. As regards external appearance, size and cleanliness are, of course, always taken into account, and to some extent colour, many purchasers fancying that the darker colour indicates a richer egg. An ordinary fowl's egg weighs from $1\frac{1}{2}$ to 2 ounces; that of the duck weighs from 2 to 3 ounces; that of the turkey 3 to 4 ounces; that of the goose 4 to 6 ounces. The eggs of all domestic poultry are edible, but we need not concern ourselves with any but those of the hen. It is said that oval eggs are better than round ones. Fowls which lay large eggs, averaging about seven to a pound, are Houdans, La Flèche, Crèveçœurs, and Black Spanish; medium eggs, weighing eight or nine to the pound, are laid by Leghorns, Cochins, Dorkings, Sultans, Brahmas, Polands, and Games; smaller eggs, eight or ten to the pound, are laid by Hamburgs. An authority recommends egg-producers to use cross-bred hens of the first cross—Leghorns or Minorcas with Orpingtons, Wyandottes, Plymouth Rocks, or Langshans. "Let them have some degree of liberty in summer, but much less in winter. Don't taint your land; collect at least once a day. An egg which has been sat on for twenty-four hours should never be marketed. Keep your nests and houses scrupulously clean, for an egg-shell is porous, and a clean egg will keep fresh much longer than one laid in dirty places. Above all, keep your egg rolling—I mean, so arrange for relays of pullets that they may be laying all the winter through, when, of course, your profits should be greatest." On this latter point it may be mentioned that the quotations of eggs on the market show that eggs are, as a rule, from 30 to 60 per cent cheaper in summer than in winter. In regard to new-laid eggs an even greater difference prevails, for while eggs may be retailed at ten for a shilling in the plentiful season, the winter price is often as much as twopence-halfpenny or threepence for a single egg!

If any country reader should be tempted—and we do not see why many should not be—to try eking out his new-laid supplies by producing eggs for himself, he may usefully note the fact that the food of a fowl has a considerable influence on the

The
New-laid
Egg.

taste and odour of its eggs. This has been proved by experiments on the American official agricultural stations. In a bulletin issued by the United States Department of Agriculture, Mr. C. F. Langworthy writes:—"There is a very general belief that the flavour is influenced by the feed which the hens receive, and that material possessing strong flavours, like onions, turnips, &c., impart an injurious flavour to the eggs. The truth of this belief was shown by recent experiments at the North Carolina station. Chopped wild-onion tops and bulbs were fed to hens, and the length of time before there was a change in the flavour of the eggs was noted, as well as the length of time which must elapse after onion-feeding was discontinued before the objectionable flavour would disappear. At the beginning of the trial a half-ounce of chopped onion-tops per head daily was fed to twelve hens of different breeds. Repeated tests did not show any onion flavour in the eggs until the fifteenth day, when it was distinctly noticeable. The amount of onion fed was doubled for four days and then discontinued. The eggs laid while the larger amount of onion was fed was so strongly flavoured that they could not be used. After discontinuing the feeding of onions the flavour became less noticeable, and in a week the eggs were of normal flavour. The main point brought out by the tests was that flavour can be fed into eggs. Therefore it appears that to ensure finely-flavoured eggs it is necessary to restrict runs so that no considerable amount of food which will produce badly-flavoured eggs can be obtained."

The New York Cornell station, in studying the effect of nitrogenous *versus* carbonaceous food for poultry, also reported observations on the effect of the different rations on the flavour of eggs. One lot of fowls was fed a mixture of wheat shorts, cotton-seed meal, and skim-milk; another lot, "cracked corn" and corn dough. The former ration contained much more nitrogen than the latter. The hens fed corn laid fewer eggs than those fed the nitrogenous ration, but the eggs were larger. The eggs produced by the nitrogenous ration were of a disagreeable flavour and smell, had a small yolk, and did not keep well. The flesh of the poultry fed this ration, however, was darker, more succulent and tender than that of the fowls fed the carbonaceous ration.

As an instance of the tendency of an egg to absorb a strong odour, it was noticed on one occasion that some eggs had a very asphalty smell; on inquiry it was found that they had been stored near a yard which had been newly asphalted.

The North Carolina station, in some of its poultry experiments, also recorded the weight of eggs per dozen, as well as the number of eggs produced by pullets and old hens of a number of well-known breeds and by Pekin ducks Egg-weights. during six months. Generally speaking, larger eggs were laid by hens than by pullets of the same breed. The eggs laid by the Pekin ducks (old and young) were heavier than those laid by any breed of hens, weighing 35.6 ounces per dozen. Of the different breeds of hens tested, the largest eggs were laid by the Light Brahmas, weighing 28 ounces per dozen. The Black Langshan and Barred Plymouth Rock hens' eggs weighed a little over 26 ounces per dozen, while those laid by Single-comb Brown Leghorns, late-hatched Plymouth Rock, White Wyandotte, and Buff Cochin hens ranged from 21.7 to 23.7 ounces per dozen. Of the pullets, the heaviest eggs were laid by the Black Minorcas, weighing 26.5 ounces, the lightest by the Single-Comb Brown Leghorn and Silver-laced Wyandottes, weighing 17.5 and 22.1 ounces per dozen respectively. The Barred Plymouth Rock, White Plymouth Rock, White Wyandotte, Black Langshan, and Buff Cochin pullets' eggs all weighed not far from 24 ounces per dozen.

Bearing upon this subject of the relative productivity of different breeds of hens, but with special reference to the winter—when productivity is so much more valuable, for Productivity of Hens. obvious reasons—an interesting competition took place in England in the winter of 1902-3 under the auspices of the Utility Poultry Club. The contest commenced in the middle of October, and lasted sixteen weeks. The competitors, twenty-four in number, each sent four young hens or pullets hatched during 1902. The birds were all managed upon a Berkshire farm by an expert hand, fed and housed alike, receiving milk, grain, clover, and cooked meat, the food being sometimes supplied warm. They were housed in such a way that they were practically exposed to the air, and in many cases only a canvas protected them during the night. In every case the "trap-nest"

was used, each hen having a nest of her own. This was found to succeed admirably, the hens taking to them with readiness, while they entirely prevented egg-eating. The hen enters to lay, and her passage through the opening closes it behind her, while she cannot be removed except by the attendant, who forthwith marks her egg. By the aid of these nests the number of eggs laid by each hen can be recorded, with the result that all bad layers can be discarded or eaten and be replaced by others, while the best layers can be retained and employed for reproductive purposes. In the competition hens representing eight breeds were entered, eleven being Wyandottes, four Orpingtons, four Leghorns, and one pen each were Langshans, Plymouth Rocks, Minorcas, and common Lincolnshire Buffs. The largest number of eggs laid in the sixteen weeks was 276 by a pen of White Wyandottes, one hen producing 78 eggs. Two other lots of birds, both Buff Orpingtons, produced 200 eggs each. The White Leghorns, long the most highly prized of all layers, produced in one instance 174 eggs and in another only 63. The *Yorkshire Post's* agricultural correspondent pointed out that almost all the old English varieties were absent. It is now known that laying powers are chiefly confined to the newly-produced or composite breeds, those in which the vigorous blood imparted by the crossing process is still dominant. Just as in the past, the Brahmas and Cochins, the Dorkings and the Spanish, were surpassed by the Plymouth Rocks and the Langshans, so have these birds been surpassed by the Wyandottes and the Orpingtons.

In 1902 the New York Mercantile Exchange adopted the following rules for egg classification:—

Fresh-gathered extras shall be free from small and dirty eggs, and shall contain fresh, reasonably full, strong, sweet eggs, as follows:—From February 1 to May 31, 90 per cent, and for the balance of the year 80 per cent. The balance
 Classification of Eggs. (other than the loss) may be slightly defective in strength or fulness, but must be sweet. There may be a total average loss of one dozen per case, but if the loss exceeds this by not more than 50 per cent, the eggs shall be a good delivery upon allowance of the excess. When sold "storage packed", extras must not contain an average of more than twelve cracked or checked eggs per case.

Fresh-gathered firsts shall be reasonably clean and of good average size, and shall contain fresh, reasonably full, strong, sweet eggs, as follows:—From February 1 to May 31, 85 per cent; June 1 to October 31, 65 per cent; November and December, 50 per cent; January, 65 per cent. The balance (other than the loss) may be

slightly defective in strength or fulness, but must be sweet. There may be a total average loss of one dozen per case from February 1 to May 31, and one and one-half dozen per case for the balance of the year. But if the loss exceeds these amounts by not more than 50 per cent, the eggs shall be a good delivery upon allowance of the excess. When sold "storage packed", fresh-gathered firsts must not contain an average of more than eighteen cracked or checked eggs per case.

Fresh-gathered seconds shall be reasonably clean and of fair average size, and shall contain fresh, reasonably full eggs, as follows:—From February 1 to May 31, 70 per cent; for the balance of the year, 45 per cent. The balance (other than the loss) may be defective in strength or fulness, but must be merchantable stock. From February 1 to May 31 there may be a total average loss of two dozen per case, but if the loss exceeds this amount by not more than 50 per cent, the eggs shall be a good delivery upon allowance of the excess. For the balance of the year there may be a total average loss of four dozen per case.

Held firsts shall be reasonably clean, of good average size, and sweet. At least 40 per cent shall be full and strong. The balance may be defective in strength or fulness, but not badly shrunken, excepting the loss. There may be a total average loss of two dozen per case, but if the loss exceeds that by not more than 50 per cent, the eggs shall be a good delivery upon allowance of the excess.

Held seconds shall be reasonably clean and of fair average size. May be defective in fulness, strength, and flavour, but must be merchantable stock, not musty. There may be a total average loss of four dozen per case.

Refrigerator extras shall be free from dirty or small eggs, reasonably full, strong, sweet, and free from mildew or foreign taste or odour. The loss must not exceed one dozen per case. Cases, fillers, and packing shall be as required for "storage packed".

Refrigerator firsts shall be reasonably clean and of fair average size. They must be reasonably full, strong, and sweet, and free from mildew or foreign taste or odour, excepting the loss, which must not exceed two dozen per case. Cases, fillers, and packing shall be as required for "storage packed".

Refrigerator thirds shall be of fair appearance and may be off-flavoured to some extent, and the loss must not exceed five dozen per case.

Limed extras shall be of uniformly good size, well cleaned, strong bodied, reasonably full and sweet, excepting the loss, which shall not exceed one dozen per case.

Limed firsts shall be of good average size, well cleaned, of good strength, reasonably full and sweet, excepting the loss, which shall not exceed two dozen per case.

On the London market eggs are sold according to the rules of the London Egg Market (Limited), which as printed in *The Grocer Diary* do not deal with classification, but specify ^{The London Market.} in full the terms, &c., on which egg transactions are conducted in the wholesale trade. The market is held every Monday, except when Monday falls on Christmas-day or Bank Holiday; and the market prices ruling on Monday remain in force until the following Thursday at noon. All goods (unless otherwise stipulated) are sold as at the railway-station, wharf, or docks in London, and are at the purchasers' risk two business days after

sale. The terms of payment of the London wholesale egg market are that on all accounts paid within seven days from date of invoice there shall be a discount of twopence on every pound sterling. In cases of dispute arbitration is provided for, the arbitrators to be members of the London Egg Market (Limited), and such other persons as the committee appoint, not being interested parties.

All foreign eggs are packed to the number of 1440 eggs, equal to twelve long or great hundreds (of 120), in a single case, with the exception of extra and best Italians, of which 1380, or eleven and a half "great hundreds", go to each case; or small eggs generally that take 1620 (or $13\frac{1}{2}$ hundreds) and 1680 (14 hundreds) to fill a case. There is an allowance from the importers to the egg merchants of 60 eggs (or half a hundred) to compensate for any broken or bad eggs there may be in each case, and 30 eggs (or $\frac{1}{4}$ hundred) on each half-case. This allowance, however, is not recognized as being due from egg merchants to retailers, as the egg merchants have often to repack the goods, on account of damage or other causes, and the half-hundred is then taken into account. All claims for extra waste have to be made within three clear days from date of delivery order.

In market quotations it will be seen that Danish and Russian eggs are quoted by weight, whilst the general rule with imported eggs is so much per "great hundred" (120). The following (May, 1903) is an example which illustrates this, and also the cosmopolitan nature of our latter-day egg supply:—

Eggs.—French, extra 9s. 6d. to 9s. 9d., selected 9s. 3d., best 8s. 3d., seconds 6s. to 6s. 9d.; Italian, extra selected 7s. 9d. to 8s. 3d., best 6s. 9d., selected 6s. 6d., seconds 5s. 9d. to 6s. 3d.; Hungarian, Vienna blues 6s. to 6s. 3d., reds 5s.; Stryian, blues 6s. to 6s. 3d., reds 5s.; Galician, blues 5s. 6d., reds 4s. 9d.; Danish, 18 lbs. 8s. 3d., 17 lbs. 7s. 9d., 16 lbs. 7s. 3d., 15 lbs. 6s. 9d., 14 lbs. 6s. 3d.; Moroccos 4s. 9d. to 4s. 10½d.; Bulgarian, blues 5s. 9d.; Dutch Duck Eggs, 7s. 9d.; Russian, 16 lbs. 6s. 3d., 15 lbs. 5s. 6d., 14 lbs. 5s., dirties 4s. 6d., and grubbies 4s. 9d. to 4s. 10d. Liquid Eggs 6d. per lb. Irish Eggs, selected Hens' 6s. 9d. to 7s. 9d., unselected 6s. to 6s. 3d., seconds 5s. 3d.; Ducks' 8s. to 8s. 9d.; all net, landed in London.

As lately as 1897 France was easily first as our chief source of foreign eggs, but she was beaten by Russia in 1898, by Germany in 1899, and by Denmark in 1900. Organization to secure quick collection and prompt transportation to the market

is the great secret of the progress made by these three countries, and also lately in Ireland. The Irish egg at its best is said by experts to be the finest to be bought in Europe, but its fortunes were at a low ebb towards the end of the Victorian century, owing to the practice of the peasants of keeping them until they became stale, whilst they were never washed before being packed, and were packed in dirty straw. When the Irish Organization Society stepped in and formed co-operation poultry societies, these societies commenced the plan of buying eggs from their members by weight instead of by the dozen or score: they refused to take any but perfectly fresh and clean eggs; they had them packed in accordance with instructions by an expert from Denmark; **Packing and Storage.** and the Irish egg once more began to re-assert itself in the British market. With regard to packing and storage, the official instructions issued in 1903 by the Irish Department of Agriculture are as follow:—

1. Fresh eggs should be kept in a dry, cool place, free from any odour which would be capable of impairing their flavour.
2. The eggs placed in each separate case should be fresh and clean, and, as far as practicable, uniform in size.
3. The layers of eggs in each case should be formed with great care, and no egg the shell of which is in any way broken should be allowed to remain in the case.
4. Eggs should not, in any circumstances, be packed under rain.
5. Packing should be so carried out as to afford sufficient protection to all the eggs put in the case.
6. New oaten straw or specially-prepared wood wool (fibre), if thoroughly clean and dry and free from any objectionable odour, are suitable substances for use in packing eggs for transit. If wood wool be used, a thin layer of clean dry straw might in addition be placed on the bottom and top of the case to assist in preventing injury from concussion.

It may be mentioned that large quantities of eggs brought from various countries in Europe are packed in wood wool, and that a considerable number of Canadian eggs arrive in cases which contain layers of compartments formed of strong paper, and in each separate compartment an egg is held in position.

7. The boards and other wooden parts forming the cases should be substantial in thickness, and securely and neatly put together.
8. The cases should be so constructed as not to leave any aperture which would admit of injury to, or extraction of, the eggs.
9. When the weight of the cases permits it is an advantage to have strong rope handles properly attached to each end, or some other suitable arrangement made in order to facilitate the lifting of the cases.
10. The use of unnecessarily large and cumbrous boxes should be discouraged as a means of conveying eggs to market.
11. Although cases of eggs varying in size may be necessary to suit different

customers, it would seem, as the result of inquiries made on the subject, that those cases which contain six hundreds (old) of eggs, arranged in six layers, or long cases made on the Continental plan, which hold twelve hundreds (old), and are capable of being divided in the centre so as to form two half-cases of six hundred eggs each, are on the whole the best adapted for general purposes.

12. When eggs are being conveyed to the railway-stations or to the steamships the cases should be most carefully handled, and should be adequately protected from adverse conditions of weather.

If such rules as the above were scrupulously observed, the Irish egg trade would undoubtedly be greatly improved thereby; but up to the time of writing there have been complaints that practice is not on a level with precept. In the countries which compete with Ireland in the egg market, very special care is taken to secure prompt collection of the eggs and their continuous supply to the market, and to ensure the freshness. In Denmark the great co-operation society (Dansk Andels-Ægeksport), which numbers 26,000 members, exporting eggs at the rate of twelve millions a year, has mapped out the country into districts. The members engage to deliver none but fresh eggs, under penalty of a fine of five crowns (about 5*s.* 10*d.*). Each peasant must supply only the eggs from his own establishment, and the eggs must not be more than six days old. The eggs are obtained from the peasants by collectors in the employ of the society, who convey them to the packing-stations, which number four hundred. From these they are transferred to warehouses, and thence again as promptly as possible to the central depôt at Copenhagen, where, after due examination, they are packed for export in cases of 500 or 1000. By means of an elaborate system of brands in the various districts the eggs can be identified and delinquents amongst the peasants readily discovered. A German plan, adapted by a co-operative association of the same kind in the Kehl district, carries the principle somewhat farther. The agents of the association go among the farmers each day and purchase eggs, the farmers guaranteeing that these have been laid within the past twenty-four hours. In consequence of this guarantee, the farmer is paid three pfennings (about a farthing) above the regular market price for each egg. At the time of purchase the farmer is given a registered number, each of the eggs being at the same time stamped with the same number. Should a consumer receive a stale egg,

he returns it to the dealer, who in turn charges it to the association, who report the matter at once to the farmer. The eggs are supplied to retailers by the association in cases of five dozen. This system has been found to be a great success, and a protection to all parties concerned.

Various modes of **testing eggs** for freshness are in common use. At one end of an egg is a small "air-space", which becomes larger as the egg becomes older. The weight of an absolutely fresh egg being a little greater than that of water, such an egg if placed in a vessel of water will sink to the bottom and remain horizontal. After a few days, however, the air-space at the end of the egg will have enlarged itself inside the egg, and that end becoming lighter will rise, so that the egg will become tilted a little. The angle of this tilt is the basis of a method of testing the age of eggs which was introduced in Saxony. As we have said, the new-laid egg will remain horizontal; an egg three to five days old will be at an angle of 20° ; at eight days this angle will have reached 45° ; at the end of fourteen days, 60° ; at three weeks, 75° ; at four weeks the egg is upright on the pointed end; and a bad egg, or one more than five weeks old, will float. If a glass vessel is obtained, and upon it graduated divisions are marked corresponding to the various inclinations of the ageing egg, a very good age-ometer is thus formed, by means of which the age of an egg can be ascertained, it is said, to within a day. The vessel, graduated so that these angles could be read off, was filled in the Saxony experiments with "some harmless liquid". It was satisfactorily tested by the National Society of Poultry Breeders at Halle, and was awarded their medal. A method practised in the markets of Paris is the following:—About 6 ozs. of common cooking salt is put into a large glass vessel, which is then filled with water in the proportion of a pint to 2 ozs. of salt. When the salt is in solution an egg is dropped into the glass. If the egg is only one day old it immediately sinks; if any older it does not reach the bottom of the glass. If three days old it sinks only just below the surface; from five days upwards it floats; the older it is the more it protrudes out of the water.

"**Candling**" eggs is the method of examining them by looking at each egg in the dark (or in a box) against the strong light

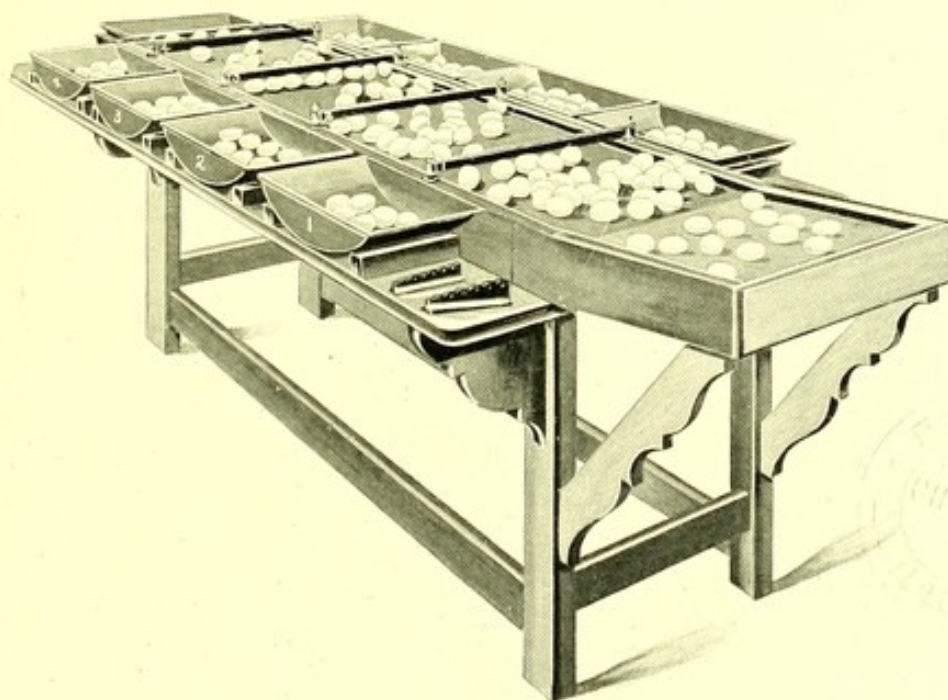
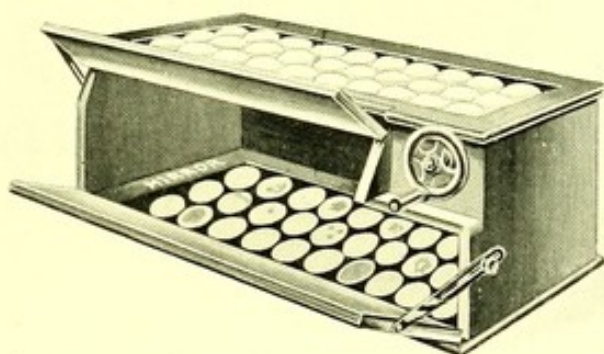
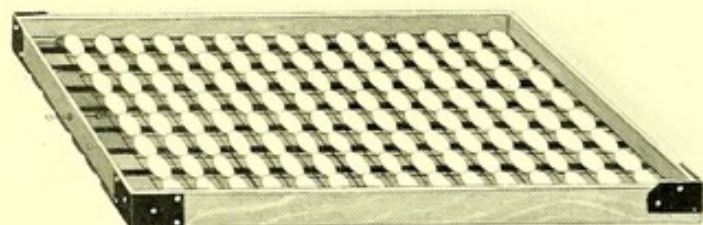
of a lamp or other illuminant, so placed as to throw the rays through the egg and increase its transparency. The fresh "Candling" egg appears unclouded and almost translucent, whereas a bad one is dark-coloured. If incubation has begun at all there is a dark spot, the size of which is in proportion to the age. In a Glasgow "cinematograph" egg-tester or candler, four 1200's of eggs can be passed through in an hour and effectually tested without a breakage. An ordinary sixteen-candle power electric lamp is inverted with the shade downward. Over this is laid a piece of glass to prevent any dust from getting on to the lamp. The apparatus, which is about eight feet long by two feet broad, is placed on two trestles, in front of which sits the operator on an office-stool, a black cloth enclosing him to shut out the daylight. Another man feeds the eggs into a gently-sloping hopper lined with felt, at the bottom of which a band driven by the operator's right hand carries the eggs in a continuous swift single stream across the electric lamp, the brilliant rays of which enable him to detect at once black, spotted, watery, or greenish eggs. Bad eggs he tips over into a felt-lined shoot, down which they roll into a box, while the good eggs pass on and spread themselves out on a felt-lined tray, from which two assistants pack them into boxes.

In the course of a letter on this subject of egg-testing, Mr. E. Brown, of The Chestnuts, Theale, Berks, writes:—"In some of the American markets an official tester is appointed, who candles the eggs and stamps the boxes in pretty much the same way as I have seen the butter expert do at Cork. So far as the producers and consumers are concerned there is no doubt that this would be a very excellent plan, but of course such a tester would not decide at all in favour of home produce, the business of this man being simply to take the eggs for what they are worth and mark them accordingly. I am not quite sure that this might not ultimately be a very beneficial thing, because if our producers rise to their opportunities there is no foreign egg that can possibly compete with our own, and therefore the expert would always, of course, put them in the first rank. The method of testing, however, is so simple that there is no reason why the producer himself, or at any rate the first person into whose hands they fall, should not rigidly

EGG TESTING AND GRADING

The accompanying illustration gives views of some of the egg-handling appliances in use in the grocery and provision trade. The Lyons "Egg-Grading Table" is an inclined plane of glass, across which are standard bars which can be set at any given weight per hundred eggs, the egg's size, of course, regulating the weight. The first bar is set to the largest weight required, the second bar represents the second size, and so on to the end of the table. The top end of the table is covered with felt to receive the eggs, and on each side are trays for the eggs as sorted. The largest eggs stop at the first standard bar, and are removed by the operators and placed in the receptacles in front of them, while the smaller eggs pass on along the smooth glass surface to the bar that is low enough to stop them. It is claimed that with these machines four girls can unpack and grade a case of 1440 eggs in ten minutes. The "Egg-Tester" is a contrivance for inspecting eggs by the aid of light thrown through them, and a mirror, on the principle explained in the text. The "Turning and Storage Tray" explains itself.

EGG TESTING AND GRADING



1. Lyon's Egg-Grading Table.

2. Grocer's Egg-Tester.

3. Egg Turning and Storage Tray.

test every egg, and forward them accordingly. This would save an enormous handling of the eggs, and consequently reduce the intermediate profits. What we have to strongly urge is that every egg shall be tested before being sent out, and then be sold for what it really is. The facts which we have to keep in view are as follows. In the first place, it must be borne in mind that very speedily after an egg is laid the contents of the shell begin to lose a certain amount of bulk. It is possible in this connection to stop to some extent the evaporation by closing the pores of the shell, but at the same time there is an undoubted shrinkage. In the earlier stages this is more generally seen in an enlargement of the air-space, and therefore one of the first points in testing we have to look for is to see the size of the air-space, at first very small, so that a sixpence would quite cover it, but gradually increasing in size until afterwards the air-space is easily distinguished, and covers a greater area than has already been indicated. Then that egg should not be classed as of first-rate quality. Later on, as evaporation increases, the entire contents of the egg shrink; and thus we have that rattling that is found in stale eggs. The size of the air-space can only be seen by light passing through the shell. Various methods are adopted for this purpose, sometimes simply a candle, but a lamp with a good reflector is the best thing for this purpose. Another point that a tester has to look for, in addition to the size of the air-space, is the brightness of the egg itself. When fresh and in a good condition it is clear, without any cloudiness or thickness or dark marks. This is a very important point, and the clearness and brightness of the egg very soon tell the tester what is the condition of its contents. Any egg which is at all dark or spotty should at once be rejected, and here is one of the most important things to be kept in view in connection with the testing of eggs. Many poultry-keepers make a great mistake, in that they do not gather their eggs often enough, and consequently as a result, and especially during certain seasons of the year when there are broody hens about, the eggs are sat upon, probably for eighteen or twenty-four hours, before being gathered. Thus the germ is started and the embryo developed to a certain extent, with the result that when the egg is broken open there is distinct evidence that it has commenced to hatch, and of course the change in the contents

throws it out of the grade of first-class quality. Such a condition can be seen from the outside, in that it is darker in the centre, and the skilful tester will be on the look-out in this way." The New York State Experiment Station studied the changes in the specific gravity of eggs on keeping, and found that on an average fresh eggs had a specific gravity of 1.090; after they were 10 days old, of 1.072; after 20 days, of 1.053; and after 30 days, of 1.035. The changes in specific gravity correspond to the changes in water content. When eggs are kept they continually lose water by evaporation through the pores in the shell. After 10 days the average loss was found to be 1.60 per cent of the total water present in the egg when perfectly fresh; after 20 days, 3.16 per cent; and after 30 days, 5 per cent. The average temperature of the room where the eggs were kept was 63.8° F. The evaporation was found to increase somewhat with increased temperature. None of the eggs used in the 30-day test spoiled.

Apropos of testing, it is also very necessary to warn the grocer of the necessity of occasionally, if not regularly, **counting** the eggs he receives, cases of foreign eggs being not infrequently found deficient.

HOW TO PRESERVE EGGS is a question to which of late years a great deal of attention has been given alike by egg producers, egg merchants, and official bodies acting in the agricultural or general public interest. The modes of preserving eggs are many, but they may be grouped in two main classes: (1) cold storage; (2) exclusion of air by coating, covering, or immersing the eggs with or without the use of a germicide. Sometimes the two methods are combined. The general object in view is, of course, to equalize supplies so as to put by eggs when they are plentiful and cheap, and sell them when new-laid ones are scarce and dear.

The **cold-storage** method owes its value to the fact that micro-organisms will not grow below a certain temperature, the degree of cold varying with the species of the micro-organism. Whilst they will not grow, however, experiments have shown that these germs cannot be killed by any degree of cold. Thus it appears that for preserving eggs there is no necessity of, or advantage in, a *very* low temperature, more especially as this means increased cost and possible injury by freezing. The cold-

storage method of preserving is practised to an enormous extent in America; and that the practice has its votaries on this side the Atlantic is shown by the statement which a cold-storage company advertised in May, 1903, that in the preceding season a few principal firms in Russia, Germany, and England cold-stored no fewer than 60,000 long cases. An official bulletin prepared by the United States Department of Agriculture states that the temperature which appears to be preferred in America for storing eggs is about 31° to 34° Fahrenheit, though in England writers have recommended 40° to 45° as being equally satisfactory. During the month of September, 1900, no fewer than 600,000 cases of eggs, each case containing 30 dozen, were taken into cold storage at the Chicago stock-yards; and it was reported at the time that two packing-houses had in their "chill-rooms" about 216,000,000 eggs. An official report on the Chicago storage stated that opinions varied regarding the temperature at which the eggs should be kept, two of the large houses storing them at $30\frac{1}{2}^{\circ}$, while another carried successfully at as low a temperature as 29° . The eggs, the report stated, could be held in cold storage for six or eight months, or even longer. Eggs which have been stored at a temperature of 30° should be used, it is suggested, soon after removal from storage, "while those stored at 35° to 40° will keep for a considerable time after removal". Much depends on various conditions apart from temperature, such as the amount of moisture in the air in the cold-storage chamber, and the time of year. Mr. Madison Cooper (*Eggs in Cold Storage*) gives the following table of correct relative humidity for a given temperature in egg-rooms:—

Temperature.		Relative humidity.	
28 degrees Fahrenheit.	.....	80 per cent.	
29 " "	.....	78 "	
30 " "	.....	76 "	
31 " "	.....	74 "	
32 " "	.....	71 "	
33 " "	.....	69 "	
34 " "	.....	67 "	
35 " "	.....	65 "	
36 " "	.....	62 "	
37 " "	.....	60 "	
38 " "	.....	58 "	
39 " "	.....	56 "	
40 " "	.....	53 "	

On this interesting subject a useful leaflet was published in 1903 by the Board of Agriculture. It is pointed out that cold storage, in order to be profitable, must be operated upon a large scale. In America large plants have been specially erected for the business. "Eggs require to be unpacked and laid upon shelves or in trays, and kept at an even temperature, not falling below 33° Fahrenheit, with a free circulation of air, which air should be absolutely sweet. No other products may be kept in the same room, otherwise the eggs will be effected. By this method, provided that the eggs are new laid when placed in storage, they can be kept for many months in good condition, but great care is necessary in removing them for use, as a too sudden change of temperature causes rapid deterioration. In all cases they require to be used very speedily on removal from the cool chamber, and the evidence obtained in this and other countries shows that cold-storage eggs will keep for a much shorter period after they are taken out of the chamber than if preserved either in solutions of lime or water-glass." These latter methods of preservation are explained farther on. In his special report to the Foreign Office on the Chicago storage, Mr. Getty, of H.M. Consulate, writes:—"Before being put into cold storage, the eggs should be selected with great care, each one being subjected to the 'candling' process in order to detect any defects. The candling of eggs is a very important factor in cold storage. Should one decayed egg be carelessly passed over in the candling process, the whole case would be spoilt. In the selection of eggs both size and cleanliness are the main features in determining the quality. The eggs are packed in whitewood boxes and stored away until the winter following. Eggs should be stored apart from any strong-smelling product, such as cheese, onions, &c., as they very readily absorb bad odours. It is of the utmost importance that the germ in the egg should be preserved, and the temperature of the room should not vary one-half a degree. The floor of the egg-room should be strewn well with chloride of calcium or slack lime, which not only draws the moisture from the air, but is also a disinfectant. The eggs should never be washed. To prevent the yolk adhering to the shell it is further recommended that stored eggs should be turned at least twice a week."

Some further advice is given by the New South Wales Government Board for Exports, which publishes the following:—In order that eggs may be kept fresh and good for ^{Colonial} Egg Wisdom. from four to six months it is necessary to see that only new-laid ones be selected; where possible also it is advisable to have them infertile, as, when fertile eggs get exposed to a temperature of 98° to 100° for even a short time, the germ will start into life, and no subsequent treatment will then avail to give them the quality of freshness. Eggs for storage should be gathered every morning before the sun has gained strength, and placed at once in the storage boxes in a cool place. To attain the highest success they should be graded as to colour and size, the boxes being marked accordingly. Care should also be taken to have them clean and free from unsightly stains. The boxes used should be of the usual trade size, holding thirty-six dozen, and packers should see that they are made of odourless timber, as eggs are peculiarly liable to absorb flavours from their surroundings. Another important point is to see that the boxes and fillers are thoroughly dry before using, otherwise mustiness is almost sure to ensue. Beyond the “fillers” of tasteless cardboard, no packing of any kind should be used, as the natural moisture exuding from the eggs should be allowed to escape, otherwise a musty flavour is likely to be perceptible when the cases are opened. Eggs for storage should be forwarded as soon as packed, by quick train or steamer, and handled on the way with the greatest care. The charges have been fixed (in New South Wales) at as low a rate as possible, in order that small producers may have the benefit of the higher winter markets:—Receiving and delivering, 3*d.* per case; storage, for week, 3*d.* per case. In other words, eggs can be stored for eleven weeks at a cost of 1*d.* per dozen. Carriage to or from the stores has to be paid by the owners. It is stated by the Board's experts that, given the proper temperature, the effect of cold storage upon eggs is that everything in the egg is held in suspense, undergoing no change during the storage.

The Canadian Commissioner of Agriculture and Dairying, in a report, says that when fresh-laid eggs are put into cold storage with a sweet, pure atmosphere at a temperature of 34° F., very little, if any, change takes place in their quality. The egg-cases

should be fairly close, to prevent circulation of air through them, which would cause evaporation of the egg contents. "Eggs should be carried on the cars and on the steamships at a temperature of from 42° to 38°. When cases containing eggs are removed from the cold-storage chamber, they should not be opened at once in an atmosphere where the temperature is warm. They should be left for two days unopened, so that the eggs may become gradually warmed to the temperature of the air in the room where they have been deposited, otherwise a condensation of moisture from the atmosphere will appear on the shell and give them the appearance of sweating. This so-called 'sweating' is not an exudation through the shell of the egg, and can be entirely prevented in the manner indicated."

Another method of storing eggs, or rather egg, is that of *canning in bulk*. In America this is practised on a commercial scale. The whites and yolks of cracked and broken eggs are separately preserved in air-tight tins. Eggs are also frozen in bulk, being emptied from their shells into 50-lb. tin cans, and stored at 30° F. "When taken out and thawed," says the Foreign Office report above quoted, "they should be used as soon as possible." In a similar manner decayed and clouded eggs are saved for tanning leather and glossing finely-prepared leather, South America and the West Indies being the principal markets for this product.

Before passing from the subject of the cold storage of eggs, it may be desirable to quote a warning offered by Mr. J. V. R. Swan, one of the chief authorities on Continental eggs and egg-preservation generally, who writes (1903):—"As the egg-laying season on the Continent and at home practically ceases in September, it naturally follows that imports of European eggs during the months of October to January, inclusive, must be drawn from reserve stocks—mostly spring produce, acquired when eggs are everywhere plentiful and cheap, and kept in pickle and cold stores to meet the demands of the winter trade, when eggs are everywhere scarce and dear. Hence it happened, at the very lowest computation, that 50 per cent of the total imports during 1902—2,710,000,000 eggs—were from three to seven months old before they reached the British retailer. Out of pickle, eggs deteriorate rapidly, and to counteract, if possible, this waste, the system of

cold storage has been extensively resorted to, but the results have been scarcely satisfactory. The putting of surplus eggs into cold stores, if only temporary, is decidedly an advantage, and some holders, of course, find it answer their purpose to do so, while to others, who may form a majority, the results have proved simply disastrous; for, besides serious monetary losses, there is invariably a woeful waste of eggs by their staleness and rapid deterioration of quality when taken out of cold storage, and, besides becoming difficult to sell, their condition and unfitness invariably have a demoralizing effect on the market as a whole. During the past year producers and importers have suffered heavy losses from overstocked goods, and millions of preserved and cold-store eggs have been almost thrown away, irrespective of what they cost, or the profits that had been forfeited, and these losses have been estimated at several hundreds of thousands of pounds in London alone. During the last year certain cold-storage eggs are alleged to have almost stopped the retail trade, as many shopkeepers have found that the exceptionally bad keeping-qualities of cold-stored eggs have much interfered with their ready sale to consumers, and they have on that account been scrupulously avoided."

The **air-exclusion method** of preserving eggs, which depends upon the coating of the shell with some impermeable substance, or the immersion of the egg in a so-called pickle, has been practised for hundreds of years. Mr. Swan, already quoted, states that there is evidence to prove that lime-water pickle for preserving eggs was known and extensively used in Holland in the sixteenth century. It was in the latter part of the nineteenth century that the advantages of "water-glass", or silicate of soda in solution, were discovered, Ransome being the originator of this method of egg-keeping. Scores of other methods have been tried, but according to the Board of Agriculture leaflet on the question, the lime-water and water-glass methods are those which up to the present have yielded the best results. We cannot therefore do better than quote the Board's instructions.

Lime-water
and
Water-glass.

Lime-water.—An egg-pickle, composed of lime, salt, cream of tartar, and water, was patented upwards of a hundred years ago; and this preparation, or a modification of it, is still used extensively both at home and abroad. The pickle now

generally employed is made by mixing four parts by measure of finely-slaked lime with twenty parts of water, and afterwards adding one part of salt. This solution should be prepared by mixing the lime and the water a week before it is used, and stirring well together daily, adding the salt on the fourth or fifth day. The eggs should be placed in vats, barrels, or crocks, and the cleared solution poured over them, taking care to avoid adding any of the lime sediment, otherwise there is danger of the solution becoming a solid mass. It is desirable not to fill the vessel with eggs, but to allow two or three inches of solution above the top layer. An excellent arrangement is to add a little fresh solution occasionally, in order to provide for evaporation. An egg preserved by this method can be easily told by the roughness of the shell. When boiled, the shell cracks, a result due to the effect of the lime upon the outer covering, causing it to be hard and brittle. This may generally be prevented by pricking the broad end with a needle when the egg is about to be boiled.

Water-glass.—Water-glass is the name given to a solution of silicate of soda, and is prepared by dissolving the chemical in water. It is now largely sold in the form of a concentrated solution, to which should be added five or ten times its bulk of pure water, according to the strength. Experiments in America have shown that a 3-per-cent solution (*i.e.* three parts of water-glass to ninety-seven parts of water) yields as good results as that generally recommended, namely, 10 per cent. When the water-glass is added to the water the two must be very carefully and thoroughly mixed. The eggs may be dipped in the water-glass and dried off, leaving a film on the shell, and then stored upon shelves, or they may be kept in the liquid until sold or used. The latter method is to be preferred. When taken out of the solution they are sticky, and before packing should be wiped or dried off.

Water-glass, it may be added, is the popular name for either potassium silicate or sodium silicate, or a mixture of the two, and is either syrup or powder, but as usually sold is an opaque, tasteless, colourless fluid of the consistency of treacle.

Water-glass Solutions. It dissolves readily in warm water (but the solution must not be used warm). An enterprising chemist who wrote to the *Chemist and Druggist* in 1903 explained his method of turning an honest penny by saving the housewife or other egg-preserved the trouble of mixing the solution. "I buy", he wrote, "2-cwt. casks of soda-silicate solution, 1.700 sp. gr., at 9s. per cwt., delivered. This is diluted with hot distilled water to weigh in the finished solution 13 lbs. to the gallon. A pint of this in a bottle (wine) sells for 7d. (lever-top tin 8d.), and is added to 9 pints cold water for use, which will cover about eighteen dozen hens' eggs, depending on the art of packing and the shape of the vessel. The poultry papers teem with advertisements of 'water-glass' in tins at 10d., 1s., &c., and even grocers now sell it at 4½d. per 1-lb. tin, put up by wholesale packers. The 'dissolve in hot water and allow to cool' principle tries the patience of the

housewife, and is unnecessary." It was suggested that the solution thus prepared should be sold with the following explanatory label:—

This **Prepared Solution** mixes at once with *cold water*, and saves the trouble of *melting*, which is necessary with ordinary water-glass. It is colourless and without smell, and can impart no unpleasant flavour to the eggs. A bottle costs 7d., and this quantity, when mixed with nine pints of cold water, will cover about eighteen dozen of eggs. An earthenware glazed crock is a suitable vessel for storage of small quantities of eggs, and thoroughly cleaned barrels or tubs of various sizes serve the purpose for larger quantities. Each egg should be packed to rest *on its pointed end*. The eggs should be completely immersed in the liquid, and, if any float, a plate or saucer should be laid upon them to keep them under the liquid. It is desirable to keep the vessel packed with eggs in a cool place. *Eggs thus stored will remain good for the better part of a year at least.* *Note.*—When the eggs are taken from the solution for the purpose of boiling, the large end, shell only, should be pricked several times with a sharp pin. This will prevent the shells cracking in the process of cooking.

One of the large firms making water-glass for this purpose directs that the preserving mixture should be placed in the vessel in which the eggs are to be preserved, and when it is cold the eggs may be placed in it, but that it is desirable to allow the mixture to stand at least twenty-four hours before using. The eggs must remain completely covered by it. Another correspondent advises:—"In order to use water-glass successfully, the following plan should be adopted: Take 1 lb. of water-glass and dissolve it in 1 gallon of water that has been well boiled and cooled. Pack the eggs in the vessel in which they are to be preserved, and having stirred the water and water-glass well together, pour this on until the topmost layer is completely covered. The reason for boiling the water is obvious, for the process kills any putrefactive germs which may happen to be in at the time; but great care must be taken that the water is not used hot, or even warm. It should be cooled to the temperature of the air before the water-glass is mixed with it, and the mixture poured over the eggs."

There is some little difference of opinion as to the kind of vessel best adapted for holding the eggs, wood, zinc, and stoneware being recommended. Wood is apt to leak, and zinc to be affected by the silicate; a stoneware crock is therefore the best article for a small number of eggs. Mr. Baghot de la Bere, of Burbage Hall, Leicestershire, who has given great attention to the subject, recommends for private use an ordinary 3-gallon galvanized

iron bucket, "which, when half-filled with diluted water-glass (3*d.* worth), makes a perfect egg-preserved that will last a lifetime, and should be in daily use to receive every egg that comes into the house". This gentleman has devised a wire cage, or inside bucket, which is packed with the eggs and then placed in the first bucket. A 3-gallon bucket will hold about 250 eggs, to cover which about five quarts of diluted glass-water will be required. A 36-gallon paraffin-cask, well burnt out, will hold some 3000 eggs in water-glass. Glazed earthenware pans are also recommended by Mr. Baghot de la Bere, who, it may be remarked, says it is not necessary to place the eggs upright in the vessel; "they may be packed close, in any position". A correspondent of the *Farmer and Stockbreeder* writes:—

The best receptacle in which to store eggs preserved by water-glass is a large jar, such as chemists and drysalters use, with a cork bung at the top almost as large as the circumference of the jar itself. Failing these, 7-lb. or 14-lb. jam jars, with earthenware lids, obtainable of most grocers, will answer well. The only thing that happens to water-glass solution is that it tends to dry up—that is to say, it loses moisture and becomes reduced in bulk, so that it cannot be left exposed to the air. If, however, it is kept in these jars, with either cork bungs or earthenware lids, no evaporation takes place, and it will remain good for any length of time. People who recommend the use of water-glass are very fond of laying down the law as to the weight per gallon which ought to be used. Now, the writer's own experience is that there is a great deal more trouble in using water-glass which weighs 17 lbs. or more to the gallon than there is in using the quality which weighs about 14 lbs., for the reason that the thicker quality is more difficult to handle, and there is more waste attending it, whereas that which is 14 lbs. to the gallon can be diluted with about nine times its own volume of water, is no trouble to pour out of the vessel in which it is received, and works out at a very moderate cost, 1 gallon purchased being practically equal to 10 gallons when it has been diluted, and 10 gallons of this diluted water-glass will cover some thousands of eggs. There can be no manner of doubt but that water-glass is the successful medium for egg-preservation, as it is free from the objections which can be raised against lime-water—*i.e.* that the latter does not keep well—and to the various substances which have been recommended for coating the eggs with a view to making them keep. Water-glass itself can be used for coating eggs if desired, and for that purpose the 14-lbs.-to-the-gallon solution makes a very good varnish, which will dry quickly, and eggs coated with that can be packed away in bran or some other unobjectionable material, and will then keep satisfactorily for a long period.

The United States Government Department of Agriculture, which has often tested the preservation of eggs in water-glass, points out that "the water-glass offered for sale is sometimes very alkaline; such material should not be used, as the eggs

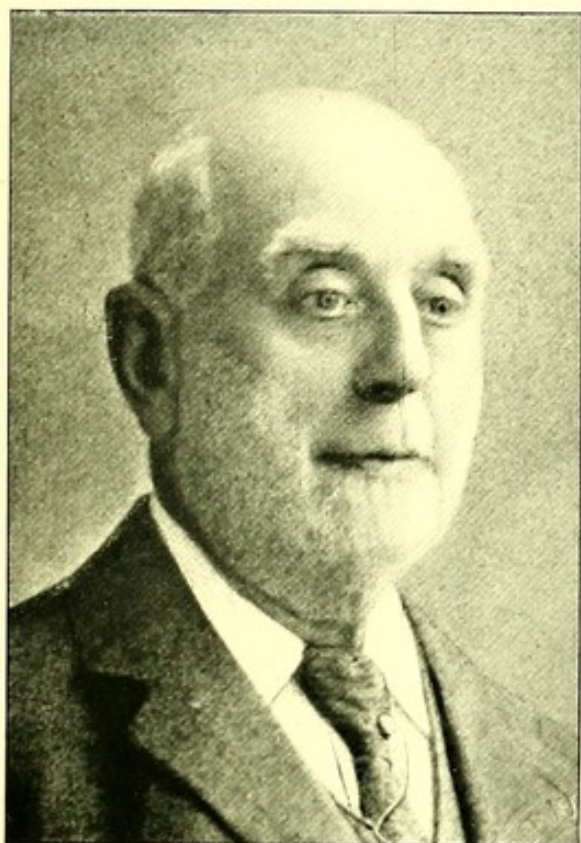
Mr. JOHN NICKSON is chairman of George and John Nickson & Co., Ltd., Liverpool, London, and Manchester. The business was established in 1837 by the late Mr. George Nickson, who held a prominent position in connection with municipal matters in the city of Liverpool. Mr. John Nickson joined the firm in 1849, and in 1896 it was formed into a limited liability company. George and John Nickson & Co., Ltd., are export merchants, large manufacturers of preserved provisions in glasses, are widely engaged in the dried fruit and canned goods trade, and for some years have represented in England several large American packing companies.

Mr. F. W. LEIGH, of Leigh & Pearce, Ltd., Bradford, Hull, and Birmingham, is well known in the butter and egg trade, in which he has large interests as an importer. In 1904 he was elected president of the Federation of Grocers' Associations of the United Kingdom.

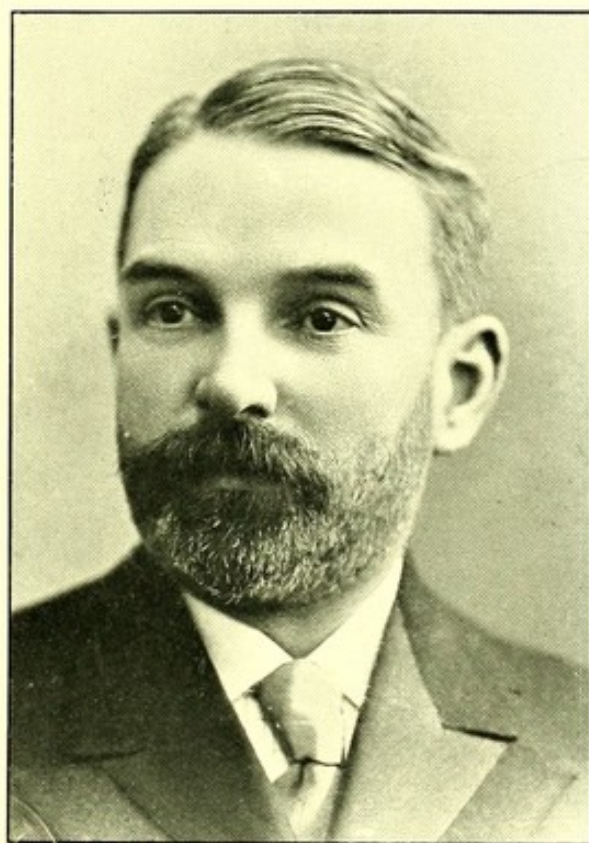
Mr. JAMES P. GIBSON, sole partner of the firm of R. & T. Gibson, Edinburgh, was born in 1849, and entered the business twenty years later. For a number of years he has been actively engaged in the municipal affairs of Edinburgh, for which city he is a Justice of the Peace. Mr. Gibson is chairman of the West Edinburgh Liberal Association, and vice-chairman of the Mid-Lothian Liberal Association.

Alderman CHARLES EDWARD LEY GARDNER, J.P., of Bristol, was born at Cheltenham in 1843, and educated at Bristol Grammar School, and Mr. David Vine's Academy, Kingsdown. In 1886 he became a partner in the firm of Gardner, Thomas & Co., one of the oldest and largest wholesale grocery and provision businesses in the west of England. Mr. Gardner was elected a Councillor for the District Ward of Bristol in 1881; in 1898 he was made an Alderman and Justice of the Peace. In 1901 he was elected Lord Mayor of Bristol in anticipation of the coronation of King Edward, and during the year he had the honour of entertaining the Prince and Princess of Wales at the cutting of the first sod of the Royal Edward Dock at Avonmouth.

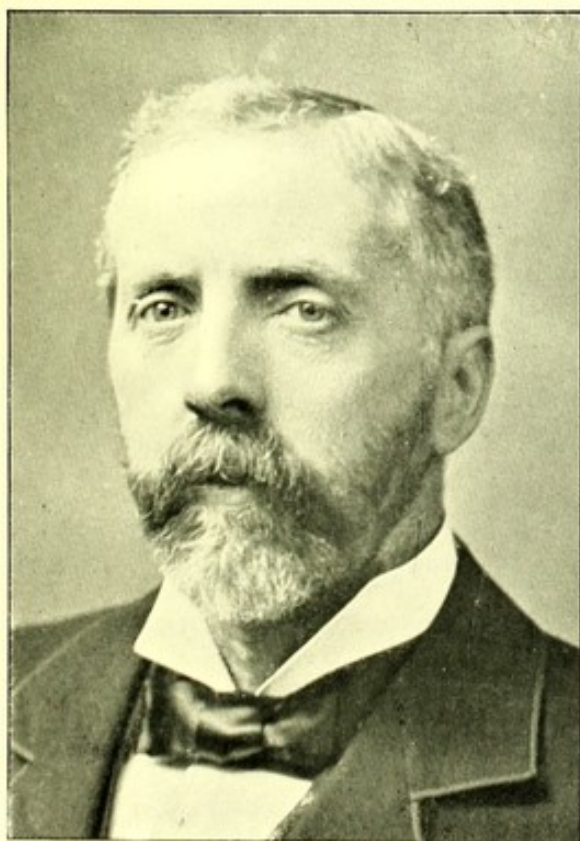
LEADING MEMBERS OF THE TRADE



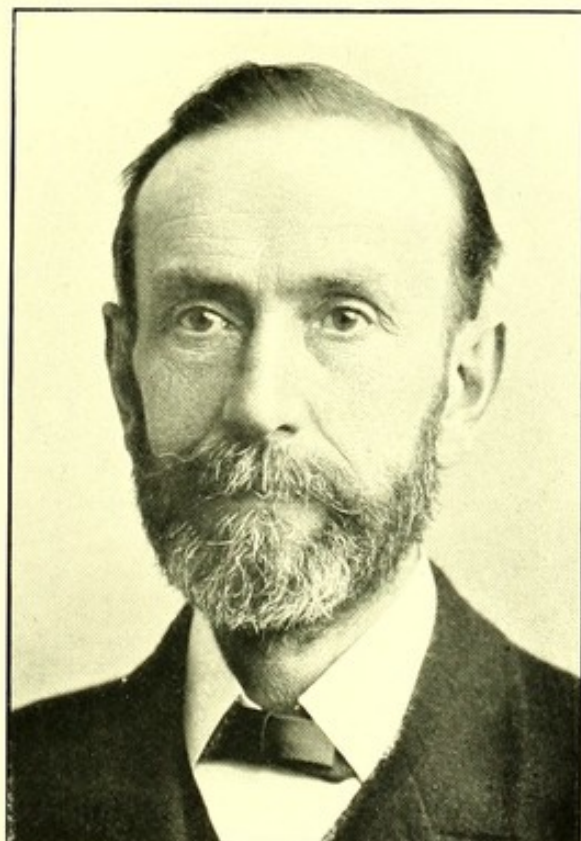
JOHN NICKSON



FREDERICK WILLIAM LEIGH



JAMES P. GIBSON



ALDERMAN CHARLES E. L. GARDNER, J.P.

will not keep well in it. Only pure water should be used in making the solution, and it is best to boil the water and cool it before mixing with the water-glass. The solution should be carefully poured over the eggs packed in a suitable vessel, which must be clean and sweet; and if wooden kegs or barrels are used, they should be thoroughly scalded before packing the eggs in them. The packed eggs should be stored in a cool place; if they are placed where it is too warm, silicate is deposited on the shell, and they do not keep well. It was found best not to wash the eggs before packing, as this removes the natural mucilaginous coating on the outside of the shell. One gallon of the solution was found to be sufficient for 50 dozen eggs if properly packed. It is stated that the shells of eggs preserved in water-glass are apt to crack in boiling, but that this may be prevented by puncturing the blunt end of the egg with a pin before putting it into the water."

Some General
Hints.

General suggestions on the subject are also offered as follows by our own Board of Agriculture:—Eggs for preservation should be treated as soon as possible after they are laid, but not until they have been cooled. It is recognized that an egg twenty-four hours old is superior to, and has greater food value than, one a week old. Consequently, if when placed in the preserving medium the egg has depreciated to this extent, the final result cannot be as satisfactory as under the former conditions. It is therefore desirable that preservation should be as near to the point of production as possible. Eggs should not be treated in a warm place, and where lime-water or water-glass is used the preparation should be quite cold before the eggs are placed in the solution. Eggs from hens fed chiefly upon grain, and with full liberty, are likely to keep better than those laid by fowls in confined runs. The general experience has been that infertile eggs keep in good condition longer than those which contain a living germ. Probably this is less apparent when eggs are preserved at a low temperature. When eggs are preserved in water-glass or lime-water the containing vessels should be stored in a cool place, at a temperature not less than 33° F. nor more than 45°. A cool, sweet cellar is excellent for this purpose. Exposure to a higher temperature even for a few hours will cause deterioration in spite of the preservative. Pre-

served eggs should be carefully tested by light before they are sold. For this purpose a well-constructed candling lamp is to be preferred; but a piece of black card-board, 8 inches square, with an oval hole in the centre rather smaller than an ordinary egg, can be used. Each egg is placed against the hole, and held between a strong light and the eye, so that the condition of the contents can be observed. All dark eggs, or those showing spots or black shadows, should be rejected. The best months for preserving are March, April, May, and June. It has been found in many cases that summer eggs do not keep nearly so well as those laid before the hot days. Preserved eggs should be sold under that name, and not as "new-laid", "breakfast", or "fresh" eggs.

Some useful hints regarding the **Retail Sale of Eggs** have been collated by a member of the **Liverpool Grocers' Association**, Mr. Joseph Trantom, Cheapside, Liverpool, who has kindly placed them at the disposal of the editor of this work as below:—

1. To the invoice price add the cost of bringing them to the shop door—carriage, cartage, and portage. Experienced men agree that reckoning shortage, cracked and empty shells when received, breakage when counting, selecting, displaying, delivering, and otherwise handling, there is an average waste of at least 6 eggs per 120, or 5 per cent. Add this also to the cost, and a further penny per 120 for cost of bags.

2. In the spring, when eggs are being laid in increasing quantities, and declining prices are causing all concerned to hurry them to market, the loss caused by stale or rotten is comparatively small, but it increases as laying diminishes and all concerned are holding for the rise. The retailer who can get full allowance for stale and bad needs to be particularly patient, persistent, and clever, and perhaps something more. How much he shall add to the cost to cover these losses depends upon how much he is allowed, and how he meets his customer's claims. These remarks apply with tenfold force to stored or preserved eggs. Whether dealing in fresh or stored, the dealer should not fail to make his estimate of the loss, and add it to the cost before fixing the selling price.

3. Likewise it is indispensable, if the seller would make sure of profit, or avoid loss, that he should, preferably when unpacking, divide his eggs into at least three grades: small, medium, large; and, having ascertained the quantity of each, fix the selling price of each.

4. To select eggs from the bulk, at varying prices, in the presence of the purchasers is unbusinesslike and unprofitable. The natural tendency, especially with the young and inexperienced, is to leave the smallest, no matter what the selling price may be.

5. When fixing prices it should be remembered that at 7*d.* per dozen one half-penny per dozen more or less increases or diminishes the profit or the loss by about 6 per cent, whilst at 16 for a shilling, one egg more or less affects the loss or the profit to the same extent.

6. For the securing of profit upon anything it is indispensable that a trader should know how much per cent his working expenses are. When he has deducted that percentage from the percentage of gross profit, he may see how large or small his net profit is.

7. To find the cost price, the seller must add to the invoice price the cost of bringing the eggs to the shop door; at least the five per cent suggested to cover shortage and breakages, also the cost of bags, and sufficient to cover the item mentioned in paragraph 2, which may be anything from 5 per cent to 25 per cent.

EXAMPLE.

			s.	d.
Invoice price ...	...	...	6	3
1st item, par. 1 ...	...	say	0	1
2nd item, par. 1 ...	...	5%	0	3¼
3rd item ...	...	...	0	1
Item in par. 2 ...	...	say	0	3
			<hr/>	
			6 11¾	

Sold at 9½*d.* per dozen, the nominal profit is 11 per cent.

„ 15 for 1*s.*, „ „ 12¼ „

Less working expenses, say 10 per cent.

Some firms are adopting the plan of selling eggs at so much per dozen; and there is much to be said in favour of it. In the first place, when buying by the 120 it is much easier to ascertain mentally the cost per dozen than how many are obtained for a shilling, as dividing the cost of 120 by 10 gives the cost of a dozen. It also renders it easier to fix a safe selling price; that is, a price where the profit or the loss may be clearly seen. The price per dozen also lends itself easily to the finding of the price for smaller quantities. The compiler of the table on p. 146 has therefore put the price per dozen to the front.

8. MILK, CONDENSED MILK, AND CREAM

The milk of animals has been used and valued as an article of food from the earliest ages. At a very early period in history, to speak of a “land flowing with milk and honey” was regarded as synonymous with plenty; and from the many allusions to the

EGG TABLE.

Cost per 120.		Cost per dozen.		Sold at per dozen.		Nominal Profit % is	Getting for 1s.	Selling for 1s.	Nominal Profit % is
s.	d.	s.	d.	s.	d.				
5	0	0	6	0	7	14 $\frac{1}{4}$	24	21	12 $\frac{1}{2}$
5	2 $\frac{1}{2}$	0	6 $\frac{1}{4}$	0	7	12	23	20	13
5	5	0	6 $\frac{1}{2}$	0	7 $\frac{1}{2}$	13	22	19	14 $\frac{1}{4}$
5	7 $\frac{1}{2}$	0	6 $\frac{3}{4}$	0	7 $\frac{1}{2}$	10	21	18	14
5	10	0	7	0	8	12 $\frac{1}{2}$	21	18	12 $\frac{1}{2}$
6	0 $\frac{1}{2}$	0	7 $\frac{1}{4}$	0	8 $\frac{1}{2}$	14 $\frac{1}{2}$	20	17	14 $\frac{1}{4}$
6	3	0	7 $\frac{1}{2}$	0	8 $\frac{1}{2}$	11 $\frac{1}{2}$	19	16	16 $\frac{1}{2}$
6	5 $\frac{1}{2}$	0	7 $\frac{3}{4}$	0	9	14	18	16	13 $\frac{1}{2}$
6	8	0	8	0	9	11	18	16	11
6	10 $\frac{1}{2}$	0	8 $\frac{1}{4}$	0	9 $\frac{1}{2}$	13	17	15	14 $\frac{1}{4}$
7	1	0	8 $\frac{1}{2}$	0	9 $\frac{1}{2}$	11	17	15	12 $\frac{1}{4}$
7	3 $\frac{1}{2}$	0	8 $\frac{3}{4}$	0	10	12 $\frac{1}{2}$	16	14	14 $\frac{1}{4}$
7	6	0	9	0	10	10	16	14	12 $\frac{1}{4}$
7	8 $\frac{1}{2}$	0	9 $\frac{1}{4}$	0	10 $\frac{1}{2}$	11	15	13	16
7	11	0	9 $\frac{1}{2}$	0	11	13	15	13	14 $\frac{1}{4}$
8	1 $\frac{1}{2}$	0	9 $\frac{3}{4}$	0	11	11	15	13	12
8	4	0	10	1	0	16 $\frac{1}{2}$	14	12	16 $\frac{1}{2}$
8	6 $\frac{1}{2}$	0	10 $\frac{1}{4}$	1	0	14 $\frac{1}{2}$	14	12	14
8	9	0	10 $\frac{1}{2}$	1	0	12 $\frac{1}{2}$	14	12	12 $\frac{1}{2}$
8	11 $\frac{1}{2}$	0	10 $\frac{3}{4}$	1	1	16	13	11	18
9	2	0	11	1	1	15	13	11	17
9	4 $\frac{1}{2}$	0	11 $\frac{1}{4}$	1	1	13	12 $\frac{3}{4}$	11	16
9	7	0	11 $\frac{1}{2}$	1	1 $\frac{1}{2}$	14	12 $\frac{1}{2}$	11	14
9	9 $\frac{1}{2}$	0	11 $\frac{3}{4}$	1	2	16	12 $\frac{1}{4}$	10	18
10	0	1	0	1	2	14	12	10	16 $\frac{1}{2}$
10	2 $\frac{1}{2}$	1	0 $\frac{1}{4}$	1	2	12 $\frac{1}{2}$	12	10	14 $\frac{1}{2}$
10	5	1	0 $\frac{1}{2}$	1	2	11	11 $\frac{1}{2}$	10	13 $\frac{1}{2}$
10	7 $\frac{1}{2}$	1	0 $\frac{3}{4}$	1	3	15	11 $\frac{1}{2}$	10	11 $\frac{1}{2}$
10	10	1	1	1	3	13	11	10	9 $\frac{1}{2}$
11	0 $\frac{1}{2}$	1	1 $\frac{1}{4}$	1	3	11	10 $\frac{3}{4}$	10	8
11	3	1	1 $\frac{1}{2}$	1	3 $\frac{1}{2}$	12 $\frac{3}{4}$	10 $\frac{3}{4}$	9	15
11	5 $\frac{1}{2}$	1	1 $\frac{3}{4}$	1	4	14	10 $\frac{1}{2}$	9	13
11	8	1	2	1	4	12 $\frac{1}{2}$	10 $\frac{1}{4}$	9	12
11	10 $\frac{1}{2}$	1	2 $\frac{1}{4}$	1	4	11	10	9	10
12	1	1	2 $\frac{1}{2}$	1	5	14	10	9	8 $\frac{3}{4}$
12	3 $\frac{1}{2}$	1	2 $\frac{3}{4}$	1	5	13 $\frac{1}{4}$	9 $\frac{3}{4}$	8	17 $\frac{1}{2}$
12	6	1	3	1	6	16 $\frac{1}{2}$	9 $\frac{1}{2}$	8	16 $\frac{1}{2}$
12	8 $\frac{1}{2}$	1	3 $\frac{1}{4}$	1	6	15	9 $\frac{1}{4}$	8	15 $\frac{1}{4}$
12	11	1	3 $\frac{1}{2}$	1	6	14	9	8	14
13	1 $\frac{1}{2}$	1	3 $\frac{3}{4}$	1	6	12 $\frac{1}{2}$	9	8	12 $\frac{1}{2}$
13	4	1	4	1	6 $\frac{1}{2}$	13	9	8	11
13	6 $\frac{1}{2}$	1	4 $\frac{1}{4}$	1	7	14	9	8	9 $\frac{1}{2}$
13	7	1	4 $\frac{1}{2}$	1	7	13 $\frac{1}{2}$	8 $\frac{3}{4}$	7	19
13	11 $\frac{1}{2}$	1	4 $\frac{3}{4}$	1	7 $\frac{1}{2}$	14	8 $\frac{1}{2}$	7	18
14	2	1	5	1	8	15	8 $\frac{1}{2}$	7	16 $\frac{1}{2}$
14	4 $\frac{1}{2}$	1	5 $\frac{1}{4}$	1	8	13 $\frac{1}{2}$	8 $\frac{1}{4}$	7	15 $\frac{1}{2}$
14	7	1	5 $\frac{1}{2}$	1	8	12 $\frac{1}{2}$	8 $\frac{1}{4}$	7	14
14	9 $\frac{1}{2}$	1	5 $\frac{3}{4}$	1	8	11	8	7	12 $\frac{3}{4}$
15	0	1	6	1	8	10	8	7	11 $\frac{3}{4}$

milk of the cow, the ewe, and the goat, which occur in ancient writings, it is evident that this food must have played an important part in the dietary of the earlier nations.

For present purposes we need not trouble about any milk other than that of the cow—except, perhaps, by way of passing reference. Nor need we, in the case of so well-known an article, devote more than a few words to a description of its more obvious characters. Everyone knows that milk is an opaque fluid, generally of a white or yellowish-white colour, with a sweetish taste, and slight but characteristic odour. Everyone knows, too, that milk is the fluid secreted by female mammals for the nourishment of their young, and that, consequently, it has come to be regarded as the model food, especially where children are concerned. In fact, milk as a food occupies an intermediate position between cereals on the one hand and flesh foods on the other, and has its composition so admirably adjusted that it may justly be looked upon as something approaching a perfect food. A “love-food” is the rather fanciful name sometimes applied in treatises on food-stuffs.

By a sort of natural analysis milk separates itself into three portions—*Cream*, *Curd*, and *Whey*. If fresh milk be allowed to stand for some time, the cream rises to the surface. If this be skimmed off, the remaining liquid will, after a further period, spontaneously separate into a solid portion (*curd*) and a liquid called *whey*. The same separation into curd and whey can be made in a few minutes by means of rennet or acids, as is done in cheese-making (see CHEESE).⁶ Of these three portions, the **cream** consists essentially of milk-fat and water, with small quantities of curd and other substances. The **curd** is a nitrogenous body, substantially consisting of what is called “*casein*”. The **whey** is a watery solution of milk-sugar, with a little salt and other mineral matter. Ultimately, therefore, we find that milk is made up of the following:—Fat, casein, milk-sugar, mineral matter, and water. By far the largest of these constituents of milk is the water, which forms nearly nine-tenths of the whole. This may be seen from the following analysis, which represents a fair average milk:—Fat, 3.3 per cent; casein, 3.2 per cent; milk-sugar, 4.8 per cent; mineral matter, 0.7 per cent; water, 88.0 per cent. For ordinary purposes it is only the

Constituents
of Milk.

first and last of these that are usually required to be known. The richer the milk is in fat, the more butter it will make; and the more water it contains, the less is its food-value to the consumer. Hence the other three constituents are usually grouped together as "*non-fatty solids*", and the composition of the milk is shown thus:—

Fat	...	...	...	...	3.3 %	} 12.0
Non-fatty solids	...	...	...	...	8.7 „	
Water	...	...	...	...	88.0 „	
					<hr/>	
					100.0 „	

By the term "total solids" is understood the non-fatty-solids *plus* the fat; *i.e.* all the constituents of the milk except water. In the above example the "total solids", it will be seen, amount to 12 per cent. The milk-fat exists in the milk in the form of very minute globules, which are suspended in the liquid, and slowly rise to the surface as cream when the milk remains undisturbed for a time. These globules are individually quite invisible to the naked eye, the largest being only about $\frac{1}{3000}$ th of an inch in diameter. It is a curious fact that certain breeds of cows yield milk in which the fat-globules are always larger than those in the milk from other breeds; this results in the butter having a different texture in the two cases. The white colour of milk, and its opacity, are due to these innumerable little fat globules disseminated through the liquid. The quality of a milk is chiefly judged by the amount of fat which it contains. A cow, however, does not always yield milk of the same quality. Even in the same milking, the milk which comes last is always richer in fat than that drawn in the first stages—provided that four hours or more have elapsed since the previous milking. There is also, generally speaking, an appreciable difference between the morning's milk and the evening's milk, in respect of both quality and quantity. This depends, however, upon the fact that the intervals between the milkings are usually unequal. When the times are arranged so as to have equal intervals between the milkings there is little or no difference in the milk. When arranged otherwise, the milk given after the shorter interval is almost always smaller in quantity but of richer quality than that obtained after the longer period. Hence the evening's milk is generally rather richer than

the morning's milk. The quality of the milk yielded by the same cow depends also upon the period of lactation, upon the age, breed, and idiosyncrasy of the cow; and, of course, upon proper feeding and tending. As a rule a cow will give milk for about 43 weeks after calving, and in the later part of this period the milk becomes richer in fat. On the other hand, for a short time during "bulling", cows often yield very poor milk indeed—the proportion of fat in some instances having been as low as 1 per cent, instead of the normal 3 to 4.

A knowledge of these variations in the quality of milk is of some importance to the seller, in view of the fact that the Board of Agriculture have fixed certain standards by which the genuineness of milk is to be, provisionally, judged. This matter will be dealt with immediately, but it will first be well to mention another point which bears upon the question of variation. What has been stated above with regard to the milk of an individual cow loses much of its force when applied to the mixed milk of a herd of cows. Still less does it apply when, as in the case of a large dairy, the supply may be the mixed milk of several herds. The poor milk of one cow is then balanced by the rich milk of another; the cows in the herd will be at different stages of lactation; they will be, or always may be, of different ages; they may be of different breeds, rich-milkers and poor-milkers; so that the milk always in such cases tends to be of average composition and uniform quality. Hence, since by far the greater proportion of milk sold, especially in our large towns, is the mixed milk of several cows, the regulations governing the sale of milk have had regard to this tendency to uniformity, rather than to the fluctuations shown by the individual cow.

The chief forms of adulteration to which milk is subject are: (1) the abstraction of fat (cream); (2) the addition of water, or of skim-milk; (3) the use of injurious preservatives. Other methods of sophistication, such as mixing the milk with powdered chalk, are now getting out-of-date, and occur only occasionally. The detection of such clumsy frauds is absolutely certain if the milk is analysed; consequently recourse is generally had to the first two malpractices mentioned above, the detection of which is less easy.

Adulteration.

As regards fat, the Regulations made by the Board of Agriculture enact—

“That any milk (other than skimmed, separated, or condensed milk) in which the amount of milk-fat is less than 3 per cent, shall be deemed to be so deficient in milk-fat as to raise a presumption, until the contrary is proved, that the milk is not genuine by reason of some portion of its normal content of milk-fat having been removed”.

It is quite recognized that genuine milk, especially of individual cows, may have less than 3 per cent of fat in exceptional cases. For this reason a smaller percentage is looked upon, not as final proof of abstraction of fat, but only as raising a presumption “until the contrary is proved”, leaving it to the defendant to adduce any evidence he can bring as proof of the genuineness of the milk. Such evidence might, for example, be a further “appeal” to the cow in order to show that she did, in fact, sometimes yield milk poor in fat. But such testimony would probably have to be very strong if it was not a question of an individual cow; because the average milk of *herds* of cows has appreciably more than 3 per cent of fat. It was deposed before the Committee on Milk and Cream Regulations, 1900, that “the average of 120,540 samples of milk analysed by Dr. Vieth, for the Aylesbury Dairy Company, was 4.1 per cent of fat, 8.8 per cent of solids not fat, and 12.9 per cent of total solids”. Further, the results of 76,058 samples analysed during the years 1894–99 showed that less than one in a hundred fell below 3 per cent of fat, and only three and a half in a hundred fell below 3.2 per cent of fat.

As regards the adulteration of milk by the addition of water, it may be said that the detection of this fraud depends upon the fact that the watered milk contains a smaller proportion of milk-solids than genuine milk does. This is easily seen by a simple example. Suppose 100 parts of genuine milk, containing 12 of milk-solids, to be mixed with 100 parts of water. Then the 200 parts of the mixture will contain the 12 of solids; and 100 of the mixture, therefore, contain only 6 of solids, or one-half of those in the genuine milk. If, therefore, this mixture were analysed, the chemist, finding that it contained only one-half of the normal solids, would at once say that the sample was made up of one-half water and one-half genuine

Watered milk.

milk. In practice the *non-fatty* solids are the criterion employed, and the Regulation of the Board of Agriculture is to the effect that whenever these non-fatty solids fall below 8.5 per cent a presumption shall be raised that the milk is not genuine, "until the contrary be proved". The amount of added water can be calculated from the deficiency in non-fatty solids, on the principle explained above. Thus, if these solids are found to be only three-quarters of the proper amount (8.5 per cent), the sample consists of 3 parts of genuine milk and 1 part, or 25 per cent, of added water. The figure 8.5 is lower than the average for non-fatty solids. Various breeds of cows give various qualities of milk, but the difference is much greater in the amount of fat than in the non-fatty solids, which is why the latter are chosen as the criterion instead of the total solids. Mr. H. D. Richmond laid before the Milk Regulations Committee in 1900 the results of the analyses of the milk of over 6000 individual cows of different breeds, as follows:—

Breed.			Fat.			Solids not fat.	
Montgomery	...	...	3.6	per cent.	...	9.0	per cent.
Pedigree Shorthorn	...	...	4.0	"	...	8.8	"
Dairy Shorthorn	...	...	4.0	"	...	8.9	"
Red Poll	...	...	4.3	"	...	8.9	"
Kerry	...	...	4.7	"	...	9.0	"
Sussex	...	...	4.9	"	...	9.3	"
Welsh	...	...	4.9	"	...	9.2	"
Jersey	...	...	5.7	"	...	9.2	"

Thus, the Jersey cows give over 2 per cent more fat in their milk than the Montgomery cows do; but there is very little variation in the solids not fat. In butter-factories the milk is commonly bought from the producer on the basis of its richness in fat, because, of course, the more fat there is in the milk, the more butter will it produce. This basis is also very generally adopted by large milk-dealers, who as a rule buy by contracts which name a minimum limit of fat, varying, according to the evidence tendered the Milk Committee, from 3.25 to 3.8 per cent, while in some cases both factories and milk-dealers pay a higher price for milk of more than average quality.

The adulteration of milk by adding separated milk to whole milk is not so easy to detect as is the addition of water, especially if skilfully done. But unless the composition of the whole milk

is known pretty accurately, it is very easy to overstep the mark, and then the presence of skim-milk can be proved. To make the detection easier the Milk Committee have suggested "ear-marking" all separated milk by adding to it some innocuous tell-tale substance as it comes from the separator. This "tell-tale" ingredient would be readily recognized by chemical means. Any milk in which it was detected would be at once known to have been mixed with separated milk.

What is called "centrifugalizing" is largely used for commercial purposes in determining the percentage of fat in milk.

Milk-testing. Not only milk-dealers, but creameries and butter-factories conduct their business and settle accounts with their suppliers on the basis of quality as shown by one of these centrifugal machines. One of the witnesses before the Milk Committee observed that thousands of gallons of milk a day were bought and sold on the indications of the tester. It works as follows:—A small bottle is provided, having a long neck, graduated in divisions. In this a measured quantity of milk is placed, mixed with a proportion of fusel-oil and sulphuric acid. The bottle is then placed in the centrifugal machine and whirled for a few minutes, whereby the fat is separated from the liquid and collects in the graduated neck. Here its volume can be easily read off as a percentage on the milk. The method requires a few minutes' time, and gives very nearly as accurate results as other analytical processes which take hours. For legal purposes, however, the fat is always determined by extracting it from the milk with ether and then weighing it, no centrifugal machine being used in this case. For rough and not very ready work in farm or dairy, "cremometers" are sold, in which the milk is allowed to stand until the cream has risen, when its volume is read off. "Lactometers" are also sold for testing milk, which they do by means of its specific gravity, since milk with plenty of cream is lighter than poor milk; but such instruments are not conclusive in their indications, because mixtures of milk and water may be made up which have the same specific gravity as rich milk. Consequently a lactometer does not distinguish between these, though it will show the difference between genuine milk and milk that has been more or less deprived of its cream.

1. Prior to the introduction, some twenty years ago, of the centri-

fugal cream separator, the sale of skimmed milk to the public was comparatively small, because the length of time which, under the old system of "setting", necessarily elapsed before the milk was available for use, naturally impaired its freshness. The centrifugal separator, however, enables separated milk to be supplied in as fresh a condition as new milk, and thus opens up possibilities of its utilization which did not formerly exist. The output of separated—as distinct from hand-skimmed—milk has been greatly increased by the establishment of butter-factories and by the development of the "jar-cream" trade. The proprietor of one factory stated before the Milk Committee that he separated nearly a million gallons of milk per annum, and another factory referred to in the evidence separates about 390,000 gallons. Some of the milk so produced is taken back by the farmers, or utilized for pig-feeding, but a very large proportion of it is sent away. It is said to be purchased for various purposes, as, for instance, the manufacture of biscuits, margarine, and ice-cream; but a considerable portion goes directly into consumption.

Compared with whole milk, the composition of skim or separated milk is more watery, and its colour appears at average temperatures slightly bluish. Both kinds contain a small quantity of fat or cream, chiefly in the form of the smallest fat-globules of the milk. There is, however, a larger amount of fat in hand-skimmed milk than in separated, since the separation of the cream is much more complete when the centrifugal separator is used. By means of this machine it is possible to extract all but about 0.1 or 0.2 per cent of the fat, whereas milk which is "set" to throw up the cream would turn sour long before the process was as complete as with the centrifugalizer, and so in practice about 1 per cent of the fat is left in. The chief value of skimmed or separated milk as a food, however, lies not in the fat, but in the casein (curd), mineral matter, and milk-sugar; practically the fat is almost negligible. For this last reason such milk, though a valuable food, is a more one-sided kind of nutriment than whole milk, and is consequently much less suitable for the nourishment of infants.

There is no legal difference between hand-skimmed and separated milk. In theory the fat is presumed in both cases

to be removed. But as such milk is liable to be watered, the Milk Committee, in their report of 1901, recommended to the Board of Agriculture:—

That any skimmed or separated milk in which the total milk-solids are less than 9 per cent shall be deemed to be so deficient in normal constituents as to raise a presumption, until the contrary is proved, that it has been mixed with water.

This recommendation was given statutory force by a regulation of the Board of Agriculture, 1902. Moreover, in order to prevent the mixing of separated milk with whole milk, the suggestion (though not a formal recommendation) was made that it would be desirable to “ear-mark” separated milk by the addition of some suitable innocuous substance, and that the churns containing it should be marked, or painted a distinctive colour.

The average composition of skim-milk may be taken as follows:—

				Hand-skimmed.	Separator.
Total solids	Fat ... ..	...	...	0.8 per cent.	0.2 per cent.
	Casein, &c. ...	...	...	4.0 „	4.0 „
	Milk-sugar ...	...	...	4.6 „	4.7 „
	Mineral matter	...	...	0.8 „	0.8 „
	Water ... ..	...	...	89.8 „	90.3 „
				100.0 „	100.0 „
Specific gravity at 60° F.				1.034 „	1.035 „

Milk is very frequently coloured; in fact such treatment is rather the rule than the exception in large towns. Annatto is the colour almost always used, but aniline yellows are occasionally employed. The substances are sold under various fancy names, such as “primrose colouring”, “cowslip” and “buttercup” colour; and the quantity added is generally very small—about 1 part of the commercial annatto-colour to 30,000 parts of milk may be taken as the average, which means something like 1 part of the pure annatto itself in 300,000 parts of milk. The general testimony as regards these colourings is to the effect that the nature and amounts of the substances in common use at the present time are such that but little danger is likely to accrue to the public health therefrom. But they are not necessary, except in so far as the public taste has been taught to regard a yellowish colour as a sign of richness

Colouring
Matters
in Milk.

in milk. Moreover, under certain circumstances, as of illness, for example, a large quantity of the milk may be consumed by a single individual, and the amount of colouring-matter consumed might then be very prejudicial, although when in normal health and drinking the usual quantity the person might never feel any ill effects. Such considerations as these, together with the further fact that milk is sold as an absolutely raw, unmanufactured article, of which the purchaser is entitled to know the natural colour and to draw his own conclusions therefrom as to quality, have induced the Milk Committee to recommend that the use of any colouring-matter whatever in milk offered for sale in the United Kingdom should be constituted an offence under the Sale of Food and Drugs Acts. It is quite likely that this recommendation will be legally adopted, but at the time of writing it has not been actually made law.

Boric acid in one form or another is the preservative usually added to milk. It is met with under various titles—boron preservative (a mixture of boric acid and borax), *glacialine*, *sal preservare*, *arcticanus*, *preservitas*, &c. &c., Preservatives. and it is undoubtedly effective in keeping the milk sweet for a much longer time than it otherwise would be. "Formaline" (formaldehyde), an even stronger antiseptic than boric acid, is also used to some extent in milk. In favour of using preservatives for milk, it has been alleged that it is not possible to supply large towns, especially London, with new milk without the aid of preservatives, and in fact it has been estimated that fully half of the London dairymen are in the habit of using them. But one of the largest companies, the Aylesbury Dairy Company, use no preservative whatever; moreover, milk has been consigned to London during several years from mid-Staffordshire, a distance of 126 miles, under a contract prohibiting the use of preservatives; and a large quantity comes daily from Berkshire and Oxfordshire under similar conditions. In Denmark the use of all preservatives in milk is strictly prohibited, and the prohibition is stringently enforced. Milk stands on a somewhat different footing from butter, bacon, &c., in regard to preservatives. The nutrition of infants and young children depends greatly upon the purity of the milk supply; and, seeing how frequently milk is prescribed for invalids and convalescents, it is of the utmost importance that it

should not be the vehicle of any unsuspected drug or chemical agent. Now, while it is possible that milk which contains boric acid in sufficient quantity to act as a preservative (say 30 grains to the gallon) might be consumed to the amount of four or five pints a day, without harmful results, by most healthy children or adults, yet with weakly infants and grown-up invalids it is quite another matter. Moreover, there is no guarantee against the random use of the drug: quantities of boric acid ranging up to 640 grains per gallon have been met with. This very large proportion is probably due to the fact that the milk may be subjected to several treatments before it reaches the actual consumer. The farmer sometimes applies the preservative; so does the wholesale purveyor, and so does the retail dealer; lastly, the domestic use of preservatives is by no means infrequent, so that the milk may even receive a fourth dose before it reaches the person who actually consumes it. Such arguments as the foregoing induced the committee which considered the use of Preservatives in Food (1901) to recommend that the use of any preservative whatsoever in milk should be constituted an offence under the Sale of Food and Drugs Acts. So far, this has not been given legal effect to; but, even without this, the recommendation no doubt carries great weight with magistrates.

Frozen milk is to some extent an article of commerce; and "**milk-powder**" or "**desiccated milk**" has from time to time been put upon the market; it consists of evaporated milk finely powdered. "**Extract of milk**" has been found to be simply ordinary milk partially skimmed, and evaporated to a thick consistency.

A small quantity of fresh milk is imported into this country; it comes chiefly from Holland and France.

A good many experiments were made about the middle of last century to discover some means of making milk more portable and to improve its keeping properties. Thus, a **Condensed Milk** factory was started about 1850 near New York, in which "cakes of milk" were made; these consisted of evaporated milk, mixed with a little bicarbonate of soda, and pressed into cakes. They did not, however, keep well; the fat was liable to turn rancid; and, moreover, the cakes did not properly dissolve in water. Attention was therefore more turned to the question of

A CONDENSED-MILK FACTORY

Switzerland has become so prominently associated with the condensed-milk trade that no apology is needed for taking our illustration of the industry from that country. At Cham the industry is organized on large lines, and the assemblage of milk-wagons shown in the receiving-yard of the Anglo-Swiss Condensed-Milk Company's factory—one that is but typical of its kind—gives a striking notion of the vast quantities of milk that such factories handle from day to day in order to supply the grocers of the world with their condensed-milk stocks. An important adjunct of this industry which has sprung up quite recently is the manufacture of milk-chocolate.



A CONDENSED-MILK FACTORY—A Consignment of Fresh Milk

evaporating the milk without carrying the operation far enough to dry the residue, and in 1856 Gail Borden took out a patent in America for the preparation of condensed milk by essentially the same method as at present practised. Borden is, therefore, generally looked upon as the chief discoverer; but earlier inventors had paved the way to some extent for him, notably the Frenchman De Leigrac (1846), and our own countryman Dr. Moore, who in the early fifties made "concentrated milk" and "milk and cocoa" in two English factories. The use of the vacuum-pan in condensing, and the addition of sugar to the milk, together with the soldering-up of the product in air-tight cans, were the chief improvements which Gail Borden introduced into the manufacture. The well-known Anglo-Swiss Condensed Milk Company was formed in 1866, and founded a large factory at Cham, on the Lake of Zug, for the preparation of condensed milk. In addition to the chief works at Cham, the company has branches in other parts of Switzerland, in South Germany, and in England; and one of its offshoots in this country was the Aylesbury Company, established in 1870. The process employed for the manufacture is briefly as follows:—For sweetened condensed whole milk, the fresh milk is first warmed with about one-eighth of its weight of powdered cane-sugar, and the mixture is then evaporated in large vacuum-pans until reduced to about one-third or one-fourth of its original volume. It is then ready to be filled into the cans and soldered up.

There are four distinct classes of condensed milk, viz.: (1) condensed whole milk, sweetened; (2) condensed whole milk, unsweetened; (3) condensed machine-skimmed milk, Unsweetened Milk. sweetened; (4) condensed machine-skimmed milk, unsweetened. The sweetened milk is disagreeable to some people on account of its taste, and others object to it for medical reasons—*e.g.* in cases of diabetes, &c. Consequently, soon after the sterilizing of milk by heat became known, some thirty years ago or more, the idea was applied to condensed milk as a means of making it keep good without the addition of sugar. The process is perfectly successful if carried out properly; the product keeps excellently, and when diluted with water to the right degree is almost as good as fresh milk—indeed, in some respects it may be superior. In this country, however, the unsweetened milk

has made comparatively little headway as against the sweetened article. It is used in the navy, and in the army to some extent; whilst the troops in India are exclusively supplied with it by the India Office. The general public, however, as a rule prefer the sweetened milk. Mr. C. T. Lehmann, whose firm imports two-thirds of the machine-skimmed condensed milk sent to this country, stated before the Milk Committee that the unsweetened brands are not largely sold except for ships' stores or for export, and his explanation of this was as follows:—"We deal with a pretty big quantity of condensed milk, and our experience is that we cannot get the public in England—and our public is the lower-class public, not the higher-class public—to take unsweetened condensed milk. In countries where the condensed milk has been introduced more recently—in Rhodesia, for instance, where condensed milk was introduced after the rinderpest—it is the unsweetened milk that has gone ahead, and which sells very much more than the sweetened milk, because there the public have had practically both kinds of milk, the sweetened and the unsweetened, offered to them at the same time, and they have, as I should do myself, naturally taken to the unsweetened first. But in this country, where the public taste has been educated to sweet milk, we cannot get them to take unsweetened milk." The method of manufacture of the unsweetened milk is similar in main outline to that described for the sweetened milk, but with one or two additions. In some cases the fresh milk is first purified by whirling it in a centrifugal machine, in other cases by simple straining. It is then boiled, in order to coagulate the albumen, which would otherwise coagulate during the subsequent sterilization and make the milk lumpy. After this it is concentrated in the vacuum-pans down to about one-third of its original volume, filled into the cans, soldered up, and then sterilized by heating the closed cans for a few minutes to a high temperature—about 280° F. Properly prepared, such milk will keep an indefinite length of time if the cans are not opened.

Whatever the reason may be which leads to the preference for sweetened milk in this country, there is no doubt that sometimes such milk contains a very large amount of added sugar—
 Sugar and Water. as much as 40 per cent in some cases. At first sight this might appear advantageous to the purchaser, because this

sugar replaces so much water in the milk—the more sugar it contains, the less room is there for water. But the practical effect is this, that in order to dilute these highly-sweetened milks sufficiently for use a large quantity of water must be added, and this makes the mixture very poor in the chief nutritive substances—fat or cream, proteids, and mineral matters. Mr. A. H. Allen, the Public Analyst for Sheffield, mentioned to the Milk Committee (Report, 1901) one of the best-known condensed milks, the makers of which say on the label that for the purpose of feeding children it should be diluted with from twelve to fourteen parts of water, and he added: “Seeing that it never was concentrated more than three down to one—not twelve or fourteen down to one—it means that the children who are served with that milk diluted to that extent, in accordance with the directions of the manufacturers, are starved”. From such considerations as this the Committee concluded that “the state of affairs thus disclosed is prejudicial to the health of the community”, and they therefore consider that official limits of quality for condensed milk are desirable. These limits, they recommend, should be a minimum of 10 per cent of milk-fat, or 25 per cent of milk-solids other than fat, “which would practically imply that the milk, before condensation, contained not less than 3.25 per cent of fat”. The Committee were further of opinion that “the addition of sugar to condensed milk is not required for its production or preparation as an article of commerce, or to render it fit for carriage or consumption, while the evidence laid before them tends to show that it is sometimes used to conceal the inferior quality of the article”.

The first points—those with regard to the minimum limits for fat and non-fatty solids—were embodied in a formal recommendation to the Board of Agriculture to make the following regulation under Section 4 of the Food and Drugs Act:—

“That any condensed milk (other than that labelled ‘machine-skimmed milk’ or ‘skimmed milk’ in conformity with Section 11 of the Food and Drugs Act, 1899) in which either the amount of milk-fat is less than 10 per cent, or the amount of non-fatty milk-solids is less than 25 per cent, shall be deemed to be so deficient in some of the normal constituents of milk as to raise a presumption, until the contrary is proved, that it is not genuine”.

The other points—those dealing with the addition of sugar and the dilution of the milk—were not made the subject of a recom

The next analyses are those of well-known brands of unsweetened condensed milks, such as the Cow's Head Brand, Milkmaid, First Swiss, Viking, Sledge, Edelweiss, Mountain, &c.:—

(II.) UNSWEETENED CONDENSED MILK

				From.	To.		A good Average Milk.
Fat	...	...	...	9	11½	.....	11.0 per cent.
Casein	...	...	...	9	11½	.....	10.7 „
Milk-sugar	...	...	...	12	14½	.....	13.8 „
Mineral matter	...	...	...	1.8	2.3	.....	2.0 „
Water	...	...	...	61	68	.....	62.5 „
							100.0

The foregoing analyses are, of course, those of unskimmed milks. In such condensed milks it may be taken that the milk-fat usually ranges between 9 and 12 per cent, the best brands containing 11 to 12. Government contracts for condensed milk for the navy, the army, and the India Office stipulate for 10 per cent of milk-fat, and this figure may be looked upon as indicating a fair quality, but by no means the best.

Where the condensed milk is sold as "machine-skimmed", or as "skimmed", the proportion of fat is, of course, very small—less than 1 per cent as a rule—and no importance is attached to its variation. The chief value of this milk as a food-stuff lies in the casein, though the milk-sugar and the cane-sugar, where such is added, have, of course, a certain importance also.

ANALYSIS OF MACHINE-SKIMMED SWEETENED CONDENSED MILK

				1st Brand.	2nd Brand.	
Fat	...	...	...	0.7	1.0	per cent.
Casein	}	...	...	69.4	71.0	„
Milk-sugar						
Cane-sugar						
Mineral matter	...	...	...	2.0	2.3	„
Water	...	...	...	27.9	25.7	„
				100.0	100.0	

Although the separate figures for casein, milk-sugar, and cane-sugar are not given in these last analyses, yet the amount of mineral matter shows, very approximately, how much the milk has been concentrated—namely, to about one-third of its

original bulk. From this it follows that the samples contain 10 to 12 per cent of casein, 14 to 16 of milk-sugar, and 43 to 45 of added cane-sugar.

Powdered Milk. — The following analyses of milk - powders brought out a short time ago may be of interest:—

			Skim-milk powder.	Whole-milk powder.		
Fat	...	...	4.1 per cent.	.....	11.3 per cent.	
Casein	...	...	33.7	.....	33.8	„
Milk-sugar	...	...	49.5	.....	42.6	„
Mineral matter	...	...	6.8	.....	6.4	„
Water	...	...	5.9	.....	5.9	„
			100.0	100.0		

Practically the only difference between the two is that the whole-milk powder contains 7 per cent more fat and 7 per cent less sugar than the skim-milk powder.

Condensed milk possesses a number of advantages over the ordinary article in respect of convenience in use. It can be always kept on hand, and is not liable to be tampered with between producer and purchaser; the better brands are of very uniform quality, and can be pretty confidently relied upon as pure; the milk is portable, and hence convenient for travellers, yachtsmen, picnics, and so forth. Moreover, ordinary milk is very liable under some circumstances to be a vehicle for the conveyance of disease-germs, whereas the condensed milk which has been properly sterilized must be quite free from such germs.

Condensed milk is best stored in a cool place. The tins should not show any bulging, nor should they, when emptied, show any considerable discoloration of the metal inside. The weight of the tin when empty is generally about $2\frac{1}{2}$ ozs. for the size having 12 ozs. net contents, and a little more for the 16-oz. size.

In recent years the sale of **Cream** in jars, jugs, and pots by grocers has developed considerably, and this is probably entirely due to the use of preservatives, whereby the potted cream can be kept good sufficiently long for the needs of the trade. Some dairies, having a quick sale for their cream, and knowing pretty accurately what their customers are likely to require, can, and do, supply cream without preservatives; but such cream will only keep about three days or so, whereas for

the ordinary grocer's trade the potted cream must keep a week or a fortnight, which is not possible without the use of a preservative. Not only has the ordinary use of cream increased, but the article is now often prescribed by medical men in the place of cod-liver oil, and also for mixing with milk to enrich it for the feeding of children. As a consequence of this increased demand, farmers are giving much more attention to the production of cream than they formerly did.

Cream consists essentially of the fat of milk with more or less water, but it contains also variable proportions of milk-sugar and casein. The term, in fact, covers an exceedingly wide range of quality. The article may contain as much as 50 or 60 per cent of fat, or as little as 8, and still be sold under the name of cream. In some places at least three different grades are recognized commercially. Thus, in Glasgow there is: (1) "Cream" containing from 9 to 12 per cent of fat; (2) "Cream" with 15 to 25 per cent of fat; and (3) "Double" or "Switching Cream", containing fat to the extent of 30 to 50 per cent. In other parts of the country two grades, "single" and "double", are generally recognized in the trade, the average percentage of fat being about 25 and 56 for the two classes respectively.

These great variations contrast sharply with those shown by milk, yet the latter, it will be remembered, has been legislated for and rendered even more uniform in quality than it previously was, by the fixing of legal limits for the amount of fat, &c., which shall be deemed to represent genuine milk. Cream, however, stands on a somewhat different footing from milk. It is, of course, more limited in consumption, and, except as regards its medical use mentioned above, is essentially a luxury. Moreover, the purchaser can by simple inspection tell whether the cream is thick or thin, and thus form a roughly-accurate opinion as to its quality; while in the case of milk a person could not do this without subjecting the sample to some process of analysis. In the opinion of the Milk Committee (1900) the weight of evidence brought before them on this point was not favourable to the establishment of official limits of fat for cream. Nor did it appear to them that any substantial difficulty arises in selling cream of different qualities—at corresponding prices—to meet

the requirements of the public. No regulations, therefore, were considered to be necessary with regard to the amount of fat in cream.

In modern dairies cream is separated from the milk by means of centrifugal machines, but there is still a good deal obtained by one modification or another of the old "setting and rising" method—*e.g.* either by letting the milk stand in shallow pans for the cream to rise, or in deep cans cooled by ice-water. For more detailed information on these points see the chapter on BUTTER. By the use of the centrifugal separators the milk can be "creamed" almost immediately after coming from the cow, so that the cream can always be obtained sweet.

In making **Clotted Cream**, which is also known as "**Devonshire Cream**", the milk is set aside overnight in pans about 9 inches deep to cream in the ordinary way. The following morning the pans are set upon hot plates, and the milk raised in the course of about an hour to near the boiling point, care being taken not to disturb the layer of cream. The milk is then set aside to cool, after which the cream is skimmed off. By this means a more complete separation of the cream is effected than by the setting of milk which has not been heated, whilst at the same time a much smaller proportion of the underlying milk is removed when the cream is skimmed off. Consequently Devonshire or clotted cream generally contains a high percentage of milk-fat.

Borax or boric acid is the preservative almost always used in the potted cream sold by grocers. It is mixed up well with a little milk, and then incorporated with the cream; or, sometimes, powdered borax is simply sprinkled over the top of the cream after the latter has been placed in the jars. This second method is objectionable, partly because it is not so certain in its action as the first mode, and partly because the first spoonful of cream taken out of the jar is liable to contain a very excessive proportion of borax. Clotted cream is less in need of preservative than the ordinary article, because the scalding of the milk during its preparation destroys the micro-organisms of putrefaction. Indeed the cream thus sterilized could without much trouble be kept from further exposure to bacterial contamination, and packed in sterilized jars, when it would remain sweet without the addition of borax; and as a matter of fact the Aylesbury Dairy Co. do

not use any preservatives at all in their clotted cream. But, as ordinarily handled, clotted cream, though it may keep better than the ordinary cream without preservative, could not be relied upon for more than two or three days in the summer unless borax or some such antiseptic is used. Occasionally other substances than boric preservative are employed: thus, salicylic acid and formalin have been found in cream. Such compounds, however, are exceptional.

The Departmental Committee on the use of Preservatives in Food, after hearing a good deal of evidence, came to the following conclusion upon this question:—"We are of opinion that, under present conditions, it would be difficult to maintain or increase the present supply of cream without the use of some preserving agent. The presence of a preservative is less objectionable in cream than in milk, because cream is usually consumed in much smaller quantities than milk; but, inasmuch as cream is now often prescribed for invalids and children instead of cod-liver oil, we consider that the obligation should be laid on the vendor of cream of notifying the presence, nature, and quantity of the preservative." The Committee therefore make the formal recommendation, "that the only preservative which it shall be lawful to use in cream be boric acid or mixtures of boric acid and borax, and in amount not exceeding 0.25 per cent expressed as boric acid; the amount of such preservative to be notified by a label upon the vessel". At present no regulation based upon this recommendation has been made a legal enactment.

It is a common practice to add gelatine to cream for the purpose of thickening the latter. Some people justify this; others condemn it. Those who do not hold with the practice "Thickening"
point out that the richness of cream is roughly indi- Cream.
cated by its thickness, and consequently the addition of a foreign substance for the purpose of giving it a fictitious appearance of thickness is obviously a deception of the consumer, and a means of obtaining a higher price than the article, on its merits, would command. Acting on this view, the Milk Committee (1900) recommended the Board of Agriculture to frame a regulation to the effect that "the artificial thickening of cream by any addition of gelatine or other substance shall raise a presumption that the cream is not genuine".

9. TINNED MEATS, POTTED GOODS, &c.

The preservation of meat and fish by one form or another of the "canning" process is now a very considerable industry. Australia, Canada, and the United States, especially this last, are pre-eminent in this method of putting-up such food-stuffs, which has undoubtedly had great influence in keeping down the price of fresh meat, and which gives us in a convenient form many table-delicacies that would otherwise often be dispensed with or obtained only at considerable trouble. No doubt tinned meat is never quite equal to the best fresh article in the matter of flavour, but it may be excellent for all that; and in regard to nutrition it is questionable whether there is any practical difference between the two when the tinned product is properly prepared. So greatly has the world appreciated such food supplies that the canning industry has assumed vast proportions. The chief canning centres in the United States are New York (as a general market), Chicago (for meat more specially), Baltimore (for oysters, fruit, and vegetables), San Francisco (the emporium of the salmon output and of the canned fruit from California), Boston (fish canning), and Philadelphia (as a general market). The Alaska region is extensively engaged in the salmon industry, whilst the eastern districts are noted for lobster canning. We have already spoken of the great Canadian industry of salmon packing on the Fraser River and elsewhere. Australian beef and mutton are largely shipped from Melbourne and Sydney, Victoria being renowned for its meat-preserving factories.

The general principles of meat-preserving are essentially the same as those which underlie the preservation of fruit. All ordinary cases of meat "turning bad"—*i.e.* all putrefactive changes—are due to the action of micro-organisms contained in the air, and which fall upon the meat when the latter is exposed. They develop upon it, and produce the ill effects in question through the action of their vital processes upon the flesh-tissues. Among other products of the activity of the bacteria are especially to be noted the *ptomaines*, chemical substances arising from the decomposition of the nitrogenous flesh-tissues, and of which some are harmless, others virulent poisons—as shown, for

instance, in cases of pork-pie poisoning. Antiseptics such as borax, formaline, and, to a more limited extent, salt and sugar, either destroy the micro-organisms (bacteria, moulds, and ferments), or at all events prevent their further development. But these preservatives are not always desirable or even possible to use in the case of such goods as we are now considering; and there is, in fact, a better method of dealing with the troublesome little agents of putrefaction. Heat, especially moist heat, also kills them. Consequently the aim of the meat-canner is to destroy all these organisms on or in his goods by means of steam, and then to seal the goods up air-tight, so that no further contamination can take place by exposure to the air. If the destruction of the bacteria has not been completely effected, those which remain may eventually develop, producing ptomaines and other products of putrefactive change. One of the commonest results is the formation of gases—usually carbonic acid gas and hydrogen—which accumulate inside the sealed tins; and when the pressure of these gases becomes sufficiently great, the flat parts of the tins become forced outward, and give the tins a bulged or “blown” appearance. “Blown” tins, therefore, are always an indication that decomposition has proceeded to a greater or less extent in the contents of the tin. On no account whatever should the contents of such tins be sold for human food. They may be harmless, but they may also be deadly; and there is nothing at all to show whether it is the innocent or the objectionable change that has taken place.

Coming now to the goods in detail, we may conveniently divide the present section into the following groups of articles:—(1) **Tinned Meats**; (2) **Sausages, &c.**; (3) **Essences and Extracts of Meat**; (4) **Tinned Fish**; and (5) **Potted Goods**.

Under the heading **Tinned Meats** we may include Beef and Mutton, Tongues, Dressed Provisions, Game, and Poultry. Beef is put up both in the simpler forms of Roast and Boiled Beef, and in various more or less “fancy” preparations, such as Corned Beef, Braised Beef, Minced Steak, and so on.

Boiled Beef.—In preparing the commoner kinds, the meat is boiled in water containing a little salt until thoroughly done, to admit of its easy removal from the bone; it is then boned and packed as solid as possible in the tins. The latter are either

sealed air-tight, or are left with a small vent-hole—the practice differs—and are then “processed” or “sterilized” to destroy ferments and bacteria. This is effected by heating the tins and their contents for a time in a hot-water bath (“process kettle”) or with steam under pressure, the length of time depending on the size of the tin. When a vent-hole is left it is finally soldered up at the end of this processing stage. For the better kinds of boiled beef, the meat is first salted twice, using each time about one-twentieth of its weight of salt, or a mixture of salt and sugar. Then it is put in weak brine and maintained at just below the boiling-point for about two hours. It is kept well skimmed, and is sometimes flavoured by suspending in the copper a bag of spices such as mace, nutmeg, pepper, and bay-leaves. After this it is cut up into the proper size and packed into the tins, filled up with jelly or broth, sealed, and “processed” as before described. 2-lb. tins are the commonest size.

Roast Beef.—For the commoner kinds the meat is well roasted in large pieces, then boned, seasoned, and packed in the tins, with final sterilizing as mentioned for boiled beef. For the best grades choice cuts are selected, seasoned, and either roasted thoroughly, or, as some packers prefer, about half-cooked; then, in the former case, the cuts are packed whole in flat tins, and in the latter, divided and packed with the better-cooked outside portions on the top. The tins are then filled up with spiced gravy and processed.

Corned Beef.—To prepare this, one method is to bone the meat, and cure it during several days with a mixture of salt, sugar, and saltpetre, after which it is washed and put for a week or more into a brine of the same ingredients, but containing also some mixed spice. The beef is then boiled slowly for about an hour, packed into the tins solidly, and sometimes with pressure; the tins are next filled up where necessary with hot broth, sealed, and sterilized in the usual way. Pepper, coriander, nutmeg, mace, cloves, sage, thyme, and bay-leaves are favourite ingredients of the mixed spices used. In other methods of preparation the so-called “corned” beef differs scarcely at all from the commoner kinds of boiled beef, except in name. One important process, however, is as follows:—The meat is freed from bone and fat, and cut into slices. These are then packed closely, with a little salt between, in the well-known slant-sided tins. The cooking, which is done by high-pressure steam,

causes the slices to adhere together in a nearly solid mass: the tins are finished off as before.

"Corned Beef" and "Compressed Corned Beef" are put up in several sizes, 1 lb., 2 lbs., 4 lbs., 6 lbs., and 14 lbs. being those most frequently met with.

Braised Beef (Beef Braisé).—According to one process the meat is cut up and rubbed with salt and pepper on two consecutive days. The pieces are then rapidly browned on the outside over a sharp fire, and boiled slowly in spiced-beef broth till sufficiently cooked, after which they are cut up, packed into tins or jars, covered with hot jelly, and processed.

The various other beef preparations, such as **Minced Steak**, **Rump Steak**, **Beef Loaf** and **Veal Loaf** for sandwiches, **Spiced and Pressed Beef**, are all prepared by substantially the same process as already described. In the Chicago packing-houses smoked beef is put up in jars ready sliced. For slicing the meat an automatic slicer is used, and girls pack the meat, which falls from the slicer on to a revolving table. "Have you seen a cutter slice swedes in a farm-yard?" asks a visitor. "Here you can see hunks of dried beef subjected to a similar process by an electric-driven machine and shaving slices of meat as thin as wafers. The meat is put on a travelling band, and slowly goes past a regiment of girls, who have stacks of glass jars by them. They seize one or two nice leaves of meat, and with deft fingers pack it neatly against the inside of the glass. That is for appearance sake—to make the jar look nice. But, that layer arranged, a handful of meat is seized and jammed in with fingers and thumbs till the pot is filled. It travels on. Other girls affix a cover, others put on labels, others wipe the jars, others wrap them up."

Mutton.—Australia is, of course, the great mutton-producing country, but a considerable quantity is now packed in the United States. The American Southdown brand is a favourite with some English importers. Both roast and boiled mutton are packed, but the boiled article is the **Australian Tinned Mutton**, one more frequently met with. Practically the same methods of preparation are used as those described for beef. Thus, in one process the raw mutton is freed from bone and filled into the tins, an excess of about 4 ozs. being allowed for a 2-lb tin, 8 ozs for a 4-lb. tin, and 10 for a 6-lb. size; this is to compensate for loss of

moisture, &c., during cooking. The tin is then closed, with the exception of a vent-hole, and is afterwards heated in a bath of water in which a quantity of calcium chloride is dissolved; this allows the temperature of the bath to be raised much above the boiling-point of pure water, and so facilitates the cooking and sterilizing. When the meat is sufficiently cooked, the vent-hole is soldered up, and the tins are ready for labelling. About 3 hours' heating is required for the larger sized tins, but the time depends upon the temperature employed, as well as upon the size of the package.

Tongues are cured by packing them for a few days in a mixture of salt, sugar, and saltpetre in the relative proportions of 10 : 2 : 1, alternate layers of tongues and of the mixture being used. They are then dried, and, in some cases, smoked. When required for canning, the dried tongues are soaked in water and skinned; after this they are boiled in spiced water till cooked, then rolled up in the tins, sealed, and sterilized. There are, of course, other methods of preparation, but they differ only in detail from the one described. **Ox tongues, Lunch tongues, Breakfast, Russian, Sheep's, Reindeer, and Strasburg** tongues are the chief varieties. They are mainly put up in tins of 1 to 3 lbs. or more, the sizes running approximately as 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{4}$, $2\frac{1}{2}$, and so on, with the various brands. Strasburgs are usually sold in bundles of three, Reindeers singly or by the dozen. **English Rolled Tongues** are often put up in boxes.

The packing-house method of treating lambs' tongues is thus described by the Chicago *National Provisioner*:—The lambs' tongues, after removal from the heads, are well washed to remove the slime and other extraneous matter from them. By the term "lambs' tongues" is meant the tongues of all lambs and sheep, this being a trade name. The tongues, after the above washing, are packed in tierces and covered with a brine made 75° strong; to each tierce of tongues is added 8 **Canning** ozs. of saltpetre, which has been dissolved previously in **Tongues.** a small quantity of hot water. The tierces are headed up and placed in the chill-room until thoroughly cured, which usually is the case in about 18 days. The tongues are then ready for canning. The tongues are shrunk or blanched for 30 minutes, and then placed in 1-lb. cans and processed either in (a) the

retort or in (b) the calcium bath. (a) If the processing takes place in the retort, the cans are put in with the centre vent left open, as usual. The cover of the retort is screwed down tight, the exhaust kept closed, and the cans processed for 1 hour 15 minutes at 3 lbs. pressure. When this period has elapsed, the pressure is allowed to exhaust slowly, the cans withdrawn, and the vents closed up as quickly as possible. The cans are then returned to the retort, the corner closed tight, and the cans boiled off for 1 hour 45 minutes at 4 lbs. pressure; in the latter procedure the exhaust of the retort is kept open. When the required time for boiling off has expired, the cans are taken from the retort and run on the trucks to the shower-room, and there showered until cool. (b) The processing in the calcium bath is carried out as follows:—The cans, with the centre vents open, are placed in the crates and lowered into the calcium bath, so that the tops of the cans will be nearly level with the liquid of the bath. The time of processing is taken from the time the steam issues from the vents of the cans. The latter are processed for 40 minutes at a temperature of 230°. Before the cans are taken out of the bath the vents are stopped up. The cans are now removed from the calcium bath and put into the retort, where they are boiled off for 1 hour 45 minutes at a pressure of 4 lbs. The cans are then removed from the retort, sent to the shower-room, and there showered as usual.

Dressed Provisions include articles sometimes referred to as *Cuisine Française*, comprising such products as *Beef Braisé*, *Boar's Head à la Pistache*, *Cutlets with Truffles*, *Galantine of Turkey with Truffles*, and so on. With the exception of the Beef Braisé, which has already been described, they are special articles which appertain to the cook rather than to the grocer.

Such game as **Pheasants, Grouse, Woodcock, &c.**, is canned to some extent in America. The bird is roasted sufficiently to brown it on the outside, but not enough to more than half-cook it through; it is then canned with its gravy, some spice, and melted butter. The subsequent sterilizing, which takes about two hours, and is done with steam under pressure or in a calcium chloride bath, completes the cooking. Sometimes game is put up with Madeira or other sauce, in which case the

Tinned Game
and Poultry.

bird is cut up, rubbed with flour, and lightly roasted or baked, then canned with its gravy and the sauce in question.

Of **Poultry**, Spring Chicken in Jelly will illustrate this branch. The birds are put up either roasted whole or boiled whole, or they may be halved, quartered, &c.; or special parts may be canned—*e.g.* **Chicken Breasts in Jelly**. One good process is to boil the dressed chickens in meat jelly till about half done, salt and flavouring being added as desired, with a calf's foot to improve the jelly, and, in the superior kinds, a pretty liberal proportion of white wine. The birds are then canned, covered with the clarified jelly, sealed up, and "processed" for about an hour.

Sausages may be conveniently mentioned here, although no very long disquisition upon them is needed. As everybody knows, they are composed of different varieties of chopped meat, bread, and other ingredients, seasoned with salt, pepper, onions, or what not, and enclosed in the skin of the cow's or sheep's intestines. In this country the kinds most commonly made are

Sausages— *Pork sausages* and *Beef sausages*, both of which are
Beef and Pork. enclosed in skins of the sheep's long intestines, scraped and cleaned to the thinnest membrane and salted. The contents of the sausage consist of the fresh meat, bread, &c., finely minced in a sausage-machine and duly seasoned. A specimen recipe is as follows:—24 lbs. lean pork; 8 lbs. fat pork; 5 lbs. bread; a little rice meal; seasoning composed of 10 ozs. salt, 4 ozs. white pepper, and $\frac{1}{4}$ oz. of rubbed sage. Sausage meal made from biscuits is an article sold a good deal for use in sausage-making, and may be added to the above to the extent of a pound or so in place of the rice meal. The pork, preferably from the large-sized or bacon pigs, is cut into small pieces and mixed with the bread, &c.; and the mincing is done by a machine, the size of which may vary from a small contrivance worked easily by one hand to a large affair driven by a powerful steam-engine. When the whole mixture has been reduced to an even fineness it is filled into the casings, which thus form long pipes of the sausage. By twisting the pipe at intervals of five inches or so "links" are formed, and these again may be bunched in the manner familiar to the buyer of sausages. Besides these, the most common form of sausages, there are many other kinds, perhaps the best known here being the *Polony*

or Bologna sausage, and the *Saveloy*. The Bologna, named after its Italian birthplace, where sausages of this kind are still largely made, is a thick sausage made of pork, veal, ^{Polonies} bacon, and cooked tongue, minced together and spiced ^{and Saveloys.} with pepper, ground caper, salt, &c.; the whole stuffed into beef lung casings. An American recipe employs beef, fat pork, and bacon, with a little potato flour and salt, white pepper, and ground coriander for seasoning. An English recipe gives equal quantities of lean and fat pork, with scalded rice and sausage meal added, and a seasoning of salt, white pepper, cayenne, nutmeg, and mace. Bread is sometimes substituted for the rice. But there are many such recipes in the cookery books and others, and the best is a matter for experiment and individual taste. It may be mentioned that "polony dye" is often used for colouring the skins in which the polonies appear. The *Saveloy*—so called from the French *cervelet*, having been in its original form composed largely of pigs' brains—is a short, thick sausage, the ingredients of which have been cooked or partly cooked, so that its keeping properties are increased. Salt pork, pigs' cheeks, &c., are parboiled, minced fine with bread or powdered biscuit, seasoned with salt, pepper, cloves, and sage, or otherwise, as the sausage-maker's fancy dictates. The "*Mortadella*" is a special Italian sausage made chiefly of ^{Mortadella and other Sausages.} lean pork seasoned with wine, garlic, and various spices, and often enclosed in ball-shaped skins covered with tinfoil; also imported in slices enclosed in tins. In Germany, where many varieties of sausages are popular, the long intestine of the cow is used for the Bolognas, the middle gut for chicken and ham sausages, liver sausages, &c., and the lung gut for sausages larger still; pigs' stomachs being also used for the same purpose. The *Frankfort* sausage, 4 inches or so in length, answers to our ordinary pork sausage, as does the French *saucisse*. The Brunswick brain-sausage and *Knackwurst* answer like the French *Cervelas* to the English saveloy. The Germans have also blood-sausages (*Blutwurst* and *Rothwurst*) in which blood is one of the ingredients. They are thus in some degree analogous to the British *black pudding* or *pigs' pudding*, which is a kind of sausage made of boiled groats seasoned with thyme, mint, salt, and pepper, mixed with small

pieces of pork, leaf fat, and pigs' blood, filled into pigs' casings and boiled. *Erbswurst* is a German speciality, the *Erbswurst* and Spanish *Vich*. basis of which is a well-cooked pulp of peas mixed with pork or bacon and seasoning, the whole being dried. It was a food largely used by the German soldiers in the war of 1870, the recipe being bought by the government from the inventor, Herr Grüneberg. A consul states that the genuine *Vich* sausages, which are famed throughout Spanish-speaking countries, are prepared exclusively from lean pork and a small quantity of bacon, without admixture of any other kind of meat. The meat for the sausages is first minced, usually by machinery, though in the farmhouses it is still done by hand, the peasants claiming that when cut in this way the meat retains more of its moisture and flavour. After the pork is minced and the desired quantity of bacon has been added, the necessary proportion of pepper and salt is thrown in—generally 4 per cent of salt. The whole is then well mixed and pressed into a compact mass, which is incased in intestines which have been previously washed clean, all fatty matter having been removed and a small quantity of salt introduced. This operation requires some care. As the sausages are made, they are placed on tables and wrapped in clean cloths, in order to extract any excess of moisture. After a few hours they are hung in the drying-room, care being taken that each sausage hangs separately, to get the benefit of the circulation of air.

In the Chicago packing-houses all kinds of sausages are made both from beef and pork. The meat is carefully cut from the bones, and is augmented by the trimmings from the *Packing-house Sausages.* pork used for hams, bacon, or cooking. Many different kinds of choppers, driven by power, are used, and the meat is cut up very fine; the meat is then mixed in a mixer with about 8 lbs. of bread meal or 2 to 5 lbs. of potato flour to every 100 lbs. of meat, and enough water to make the mixture flow through the stuffer easily. This mixture is flavoured with different herbs, according to the kind of sausage to be made, such as pepper, mace, garlic, allspice, cinnamon, nutmeg, thyme, sage, &c. The meat is put into the sausage stuffer, and the casing, which has been thoroughly cleaned by machinery, is drawn over the nozzle and the meat forced in. The sausages are then tied,

and hung on trucks, which are pushed into the smoke-houses for the sausages to be treated that way. Some sausage meat is put up in cans. All kinds of casings are used, according to the kind of sausage being made; the bladder and throat casings being used for the large sausages.

Pork Pies, in which the pork, cut up into small squares, peppered and salted, is baked in paste, are another popular mode of using pork; large quantities are sold by grocers.

Jerked Beef or *Tasajo* is the principal meat product of Uruguay, and is exported to Brazil, Cuba, and some of the other West India Islands. It constitutes the principal article of food—so far as meat is concerned—in the former and is important in the latter countries. The process of curing is as follows:—After the animal is slaughtered, the entire beef is cut into four pieces, the bones taken out in an expert manner, and each quarter cut in such a way that it forms a large slab. This slab of meat is hung on a rack exposed to the open air to cool. After about half an hour, the meat is put into a brine of strong salt, and kept there for another half-hour, more or less, the blood being fairly drawn out of the same by this time. These slabs are then piled one upon another, and between each layer a considerable quantity of salt is put. It remains in this pile sufficiently long to give the salt a good opportunity of penetrating all parts of the meat. After this, the slabs are put on racks again and exposed to the sun and air, and from time to time turned, so as to expose all parts thereof equally, until it is in this manner sufficiently cured. The meat is then piled up in large stacks, and there kept for days, and piled over again from time to time until it is ready to be shipped. It is then put into burlap coverings in bundles of about 100 kilograms (220 pounds), more or less, and placed upon the foreign markets in this shape. The nourishing properties of this class of meat, according to chemical investigations, are said to be 50 per cent of its original state when fresh: 50 per cent of its nourishing qualities being lost by the process it has undergone—the extraction of albumen by salt, &c.

*Jerked Beef,
Biltong, &c.*

Biltong is the South African name for sun-dried meat, which is largely used there by all classes, more especially the Boers. Ox flesh, or the venison of the many kinds of South African

bucks, is dried in the sun until it can be shredded with a knife. It is very nutritious and palatable when well made. *Dendang* is the name for similar sun-dried meat in the Eastern Archipelago, hog-pork being also used there. *Charqui* is the sun-dried beef of Chili and Brazil, and *Chalona* mutton similarly treated. *Pemmican*, which originated with the North American Indians, is now largely made in Queensland and elsewhere; it is lean venison or beef dried hard, pounded into a powder, and pressed into cakes—sugar, fruit, flavouring berries, or melted fat being sometimes added.

Coming to (3) **Essences and Extracts of Meat**, the principal difference between these two classes of preparations is that the **Essences and Extracts.** essences contain much more water than the extracts. Whilst ordinary well-known brands of essence of mutton, for instance, are made up so that water forms about nine-tenths of the article, the beef-extracts usually contain from one-fifth to one-sixth. This is illustrated by the following analyses, each of which represents one of the standard brands now sold in this country:—

	Essence of Mutton.	Essence of Beef.	Australian Extract of Beef.	American Extract of Beef.
	per cent.	per cent.	per cent.	per cent.
Water	88.7	88.8	17.7	18.5
Ash	1.4	1.2	23.0	24.0
Total nitrogen	1.7	1.8	8.0	7.9
Phosphoric acid	0.4	0.3	4.5	5.3
Common salt	0.3	0.2	8.9	8.0
Solids not dissolved by alcohol ...	7.3	7.8	21.4	24.0

Here the beef and mutton essences are of very similar character, as are also the Australian and American extracts; but the essences contain about 70 per cent more water than the extracts. The latter, it will be noticed, are much more highly salted than the former.

It is to the famous German chemist, Liebig, that we owe the introduction of meat extract, and also the erection of the first factory for the production of the article. This factory was situated at Fray Bentos in Uruguay; and it is still from Fray Bentos that some of the favourite meat preparations come to-day, although

there are, of course, now several competitors. Thus, in Australia, there is quite a number of meat-extract factories, and others exist, for example, at Monte Video and in Texas. Naturally the industry is chiefly carried on where cattle are plentiful, and where they would otherwise be killed for the sake of the hides and tallow. The herds which roam over the grass plains of the South American pampas afford excellent material for extract-manufacture.

In one method of preparing the beef-extracts, the meat is first divested of fat and bone, and is then finely minced. The product is next mixed into a paste with water, and subjected to great pressure in a hydraulic press, which forces out the meat-juices, the latter forming with the water a concentrated solution of the soluble constituents of the meat. This liquid is then boiled in order to coagulate the albuminous bodies which it contains. After these have settled out, the clear solution is run off into a vacuum-pan and evaporated down to the required consistency, when it is filled into bottles or tins as desired, or shipped in bulk to be afterwards bottled in the country where retailed. About 8 or 9 per cent of salt is added to the extract before bottling. When prepared in this way the extract is practically free from gelatine and fat. It then gives a clear solution when mixed with water. With other varieties, however, a certain amount of some of the dry, finely-powdered, solid constituents of the meat are purposely added to or left in the extract, and these kinds show more or less sedimentary matter and opacity when diluted with water for use. The salt which is added, together with the removal of the gelatine, both aid in the proper preservation of the extracts. One part by weight of beef-extract is said to be obtained from about 32 parts of the original meat.

"Essences" of meat are prepared in substantially the same way, but are not evaporated—*i.e.* not concentrated—to the same extent as the extracts.

A rather exaggerated idea of the food-value of these meat-preparations is prevalent. Nevertheless, they are valuable products in this respect, that much of the nutritive substance which they contain is in an easily-assimilable form, and puts a minimum of strain upon the digestive organs. The extracts, more especially, are rich in nitrogenous constituents and in phosphates, which are

the two principal flesh-formers and bone-producers; and these preparations are useful enough provided they are not overrated. To a smaller extent this is true also of the essences; but these already contain so much water that they will not stand much diluting without becoming merely a weak and meagre food. The relative nutritive values of the two products are practically in the ratios of the nitrogen which they contain. The true function of meat-extracts is that of food-adjuncts, like tea and coffee, rather than foods. Although the extracts may be rich in nitrogenous constituents, yet it must be borne in mind that to furnish as much food as an ordinary meal a very large quantity of the extract would have to be taken—not a mere teaspoonful or two. Indeed Liebig himself protested against meat-extract being judged from this point of view: in a letter to *The Times* (October 1, 1872) he remarked that “neither tea nor extract of meat is nutriment in the ordinary sense”. But, though not strictly of alimentary value, it possesses marked stimulant and restorative properties, which render it useful in exhausted states of the system; and it is in this sense that the preparations should be regarded.

It may be mentioned that extract of meat was first described more than a century ago—viz. in 1801—by the chemist, Proust. But the manufacture on a commercial scale was, as already stated, due to Liebig, who described it in 1847. The Liebig's Extract of Meat Company was established in 1865, but the article itself has been made and sold under the designation of Liebig's Extract since 1856. This latter term, it has been decided by the High Court of Justice, is public property, and does not necessarily imply an article made by the Liebig's Extract of Meat Company.

In October, 1903, considerable sensation was caused in trade circles by the discovery that yeast-extract, made from brewer's yeast, was being largely sold as Liebig's extract of meat, and that so close was the resemblance that the methods of analysis in use up to that time failed to detect the difference! The amount of yeast grown in England daily runs into many tons, and this was practically waste until a few years ago, when Dr. W. H. Squire successfully demonstrated that dried yeast could be manufactured from it, and thus an important industry has arisen. It is discovered that on evaporation the juice of yeast yields a brown extract, which in smell and

**Yeast-Extract
masquerades as
Meat-Extract.**

taste resembles extract of beef. An example of this which is marketed in a *bona-fide* manner is the preparation called "MARMITE", but in 1903 large quantities were being sold as extract of meat "manufactured by Liebig's process in South America from finest beef only". The deception was aided in some cases by mixing with the yeast-extract a small percentage of genuine beef-extract. On an exposure by *The Chemist and Druggist*, *The Grocer*, and other technical journals, the fraudulent substitutes were speedily withdrawn, for not only had the substitution been discovered but the means of detecting it in analysis. Mr. A. Searl, F.C.S., devised after long research the following test (*Chemist and Druggist*):—

Make a modified Fehling's solution by dissolving 200 grs. of sulphate of copper and 250 grs. of neutral tartrate of soda in 4 ozs. of water. Add to this 250 grs. of caustic soda, dissolved in 4 ozs. of water. Dissolve 10 grs. of the sample to be examined in 1½ oz. of water, and add to it half a volume of the above solution, and boil for a minute or two. With genuine meat-extract no precipitation occurs, but with yeast-extract a bulky curdled precipitate of a bluish-white colour is thrown out, which is almost insoluble in water. When collected, washed, dried, and weighed, several samples of yeast-extract have been found to give approximately 1 gr. of this precipitate (it looks to the eye more like 20 grs.) from 10 grs. of extract. It naturally varies a little, according to the amount of moisture and ash contained in the sample. Only one sample of yeast-extract has yet been found which did not respond to this test, and in that case it readily reduced the copper.

Subsequently Mr. Searl wrote that he had worked out a method whereby the analyst is enabled to detect an admixture of as little as 1 per cent of the yeast-extract. If the sample gives doubtful or negative results by the method above described, but is still open to suspicion—

Take from 50 grs. to 100 grs. and dissolve in 1 dram or 2 drams of water (according to the quantity taken); add to this sufficient spirit (methylated will answer the purpose) to throw down *all* that is insoluble in alcohol. After vigorous shaking, separate the insoluble residue by decanting or filtering, dissolve this residue in 1½ oz. of water, filter, if necessary, and proceed as before. If yeast-extract is present the characteristic bluish-white precipitate will be thrown down on boiling with the modified Fehling's solution, and may be collected and weighed.

In our fourth category, **Tinned Fish**, the staple articles are **Lobsters**, **Salmon**, and **Sardines**, which together constitute the bulk of the canned fish put on the English market. In addition to these, however, the following are tinned Tinned Fish.
in larger or smaller quantities, and in the aggregate make up,

no doubt, a respectable proportion of the whole amount of preserved fish consumed in this country:—*Anchovies, Bloaters, Haddocks, Herrings, Mackerel, Pilchards, Prawns, Soles, Sprats, and Tunny-Fish.* As already mentioned in our summary of the sources of provision supplies, Tinned Lobsters and Salmon reach us almost entirely from Canada and the United States, though a small quantity of Norwegian salmon is also imported in the tinned form. (Fresh lobsters come mainly from Norway, but a good number are taken off the Cornish coast and round the Scilly Islands.) The Alaskan region, California, and British Columbia are the great fishing-grounds of the North-west and West; and the principal ports for the shipment of the goods to this country are Astoria, Seattle, Tacoma, San Francisco, Victoria, Vancouver, Puget Sound, and New Westminster.

Canned Lobster is largely supplied by Canada. The eastern coast is the chief seat of the industry, especially Nova Scotia, New Brunswick, and Newfoundland, which are renowned
Lobster.

for their supplies of the crustacean. Artificial propagation has had to be introduced, and a close season enforced, as it was found that the extensive scale on which the fishery was carried out had led to serious depletion of the stocks, and threatened the industry with extinction. In the neighbouring American State of Maine there is also a considerable quantity of lobster taken. About 20 per cent of the fish consumed in the United States is calculated to come from Maine, the rest being supplied by Canada. A good deal of attention is required in the preparation and packing of lobster, in order to avoid the peculiar and disagreeable taste which this article is liable to acquire if not well manipulated. The animals are put alive into hot brine and boiled till sufficiently cooked. They are then cooled, taken out of the shell, and canned, the tins being generally filled up with salt water. After filling, the cans are, of course, sterilized by "processing" with hot water or steam in the manner already described. As the phosphorus in the lobster is liable to attack the tin and to affect the flavour of the contents, the tins should be lined inside with parchment-paper in order to prevent contact of the fish with the metal.

Curried Lobster is tinned to a certain extent, and finds some sale in this country.

Of **Salmon**, millions of tins are turned out daily during the season in Alaska, Oregon, on the Fraser River, &c., where salmon "canneries" exist in great numbers. At the smaller centres natives largely do the fishing, special nets being supplied to them for the purpose. About 10 cents each are paid for the fish. In the more important districts, however, the chief method employed for the capture of the fish is the "fish-wheel" method. These wheels are similar to large water-wheels, but with traps or baskets of wire-netting arranged round their periphery. They are placed where the current is rapid, and prove very effective in the capture of the salmon. The wheels revolve by the action of the water, and catch the salmon in the baskets as they swim up-stream. The fish are carried up to the top of the wheel as the latter rotates, and then shot out into a trough as the wheel goes farther round. In the season—which extends from April to July—one of these wheels will, it is said, catch as much as five tons of salmon daily. The best fish as regards quality is reputed to be the "**Chinook**" salmon of the Columbia River, but the variety most extensively packed is probably the "**Red Alaska**". After the Chinook in quality comes the silver or "**King**" salmon, one of the favourite kinds for canning, and next to this is the "**Sockeye**". Both these varieties are considered by experts to be superior in texture and in flavour to the "Red", though the latter sells well, on account, probably, of its generally lower price. Fraser River fish are chiefly the blue-backed salmon, a smaller variety than the "King", but a good fish for food purposes. When the fish reaches the factory the scales and entrails are removed, the heads cut off, and the fish well washed in warm water. Thus cleaned, they are placed in nets and boiled until they are, usually, about three-quarters cooked. The fish is then cut into slices to fit the tins, or into "salmon cutlets", packed into the tins, and filled up either with salt and water, or with sweet oil; or, sometimes, with water containing a little alum to make the salmon firmer. Finally the tins are sealed up and sterilized. "Alaska Red" and "Fraser River" are probably the two most popular kinds of tinned salmon imported into this country. The fish is put up in tins of the shapes known commercially as "talls", "flats", and "halves". Salmon "cutlets" are often

packed in oval tins. Glass boxes are sometimes used for salmon in the United States, and except for the liability to breakage in transit they would be preferable to the usual tins. Norwegian salmon is canned much in the same way as that described above. This variety of fish is also known and sold as "Lax".

Sardines are largely canned in France, where, as also along the coast of Sardinia, the fish is very abundant. Brittany (Cape Finisterre) is one of the principal sardine-fishing regions, **Sardines.** but the fish is also taken in quantity along the Italian, Spanish, and Portuguese coasts, and great shoals frequent some of the Indian shores. Quite recently, however, the Brittany sardines have largely deserted their usual haunts, though whether permanently or only temporarily remains to be seen. Great anxiety and serious loss have already been caused to the Breton folk engaged in the industry; though, on the other hand, the failure of the Brittany supply has given rise to an unusual demand for sardines from other sources, notably the Portuguese. Sardines are closely allied to pilchards—in fact it is thought that the latter are only full-grown sardines. In any case the differences between the two are generally not more than might be attributed to the development of the sardine with age. Nantes is the chief seat of the sardine trade. The fishing season begins in early summer, and ends about October for the ordinary sardines, but a larger size is caught during the winter months.

The process of preparation is substantially as follows:—The factories are usually situated on the sea-shore for convenience in dealing with the fish. As soon as they are landed, the sardines are salted either by being sprinkled over with salt after the removal of the heads and entrails, or by being placed at once in brine for half an hour or so, after which they are trimmed and allowed to drain. In some processes, they are next dried in a current of warm air until the skin is perfectly dry. The next operation is the cooking, which is done either in oil or with dry steam. This latter is the quicker process, but the fish are not of so good a quality as those done in the oil. Olive oil is used for the frying, and by means of steam-pipes it is kept, not boiling, but at a temperature high enough to cook the fish, without being so high as to burn or discolour it. The sardines are placed on wire frames and lowered into the oil-bath. When

sufficiently cooked, which is generally in a few minutes, the sardines begin to rise to the surface of the oil. The frames are then withdrawn, and the excess of oil drained off on an inclined slab. When drained, the fish are packed by women in the usual tins (or sometimes in glass boxes), and covered with fresh olive-oil. Of this latter a good quality is always used for the best products, although cotton-seed oil is said to be often employed by American packers of small fish. A little spicing of pepper, cloves, and thyme or bay leaf is frequently added to the superior kinds of sardines. When the dry steam process is used for the cooking, the trays of fish are run from the drying apparatus into a steam chamber, where they are closely fastened up, and subjected to the action of dry steam for about a minute and a half. This is sufficient to cook the medium-sized fish; larger ones require a little longer treatment. The chamber is then opened for a minute or two to allow the moisture to evaporate, and the fish is ready to be canned, covered with oil, sealed up, and sterilized.

The following description of the mode of canning sardines in one of the many factories on the coast of Maine is given by the British Consul at Portland in that state:—

“When fish are received at the factory the steam-whistle is blown for the work-people to assemble. Every factory has its own peculiar whistle by which to call its help. The fish are hoisted from the boats in great tubs, the hoisting being generally done by steam power. They are immediately carried to the cutting room and spread out on long tables or benches. The cutters are mostly young boys and girls, but there is a sprinkling of older people among them. All are armed with sharp knives, which they learn to wield with skill and swiftness. With one blow the fish is decapitated, and with another dexterous movement the entrails are removed. All this is piece-work, but these busy little people will make from 8s. to 12s. a day each when fish are plenty. The next step in the preparation of the fish is to thoroughly wash them; this is done in tanks filled with sea water. The fish are then thrown into a large tub filled with strong brine, where they are kept from fifteen to thirty minutes. They are taken out of this pickle and laid on iron flakes and carried to

Canning
American
Sardines.

the huge ovens, where they are placed on the projecting arms of a slowly revolving shaft. The oven is heated to such a degree that the fish are cooked sufficiently in one revolution of the shaft, occupying about five minutes. They are then carried to the packing - room, where young women pack the larger fish in mustard, and the smaller in oil. The mustard is a mixture of ground mustard-seed and vinegar; the oil is cotton-seed oil. The cans have been partly filled beforehand, so that the work is quickly done, the cover of the can is put in and the cans are passed along to the sealers. The sealers sit on either side of long tables, on which, at short intervals, are the stoves for heating the soldering copper. These stoves are connected with a blower, by means of which air is forced through a small tube, meeting as it emerges a small jet of kerosene oil which is atomized by the air, and being ignited it produces a very hot flame. The sardine can is placed on an iron disc, which is revolved by foot power, the sealer takes a ribbon of solder in one hand and his soldering copper in the other, and, giving the can a whirl by means of his foot, he seals the cover with neatness and despatch. From the sealers the cans go into a bath of boiling water where they are kept two hours. They are then taken out and tested for leaks, each can being carefully examined. The leaky cans are sent back to be resealed, and this must be done by those responsible for their faulty condition. In order to trace cans they have to be marked by those whose hands they pass in the successive stages of canning. The above description applies to the usual methods of preparing the fish, but another method prevails to some extent. In this method, after the fish are cut, washed, pickled, and partially cooked by passing through the oven they are placed on iron frames and cooked in boiling cotton - seed oil, much like frying dough-nuts. The subsequent processes are the same as described above. After the cans are taken out of the bath, sawdust is thrown on them to absorb the oil which has collected on the outside of the can, and this being wiped off, the cans are ready for packing into cases. The cases are wooden boxes, and many of these cases are made in East-port. 100 cans of the quarter or half sizes are packed in a case, while only 50 cans of the three-quarters size go into a case."

A French authority warns sardine-buyers against all foreign

packings on the ground that they are either sprats or inferior fish, and almost always *cuites à la vapeur* instead of *frites à l'huile*, the method of frying the sardine in fine oil being, he asserts, the only one which gives a really superior product.

On the Continent and in America sardines are put up in several forms; thus besides the ordinary article there are *Boneless Sardines*, *Sardines with Tomatoes*, *Smoked Norwegian*, *Pickled Russian* (in bottles), and *Royaus à la Bordelaise*. The new season's French fish usually reach here towards the end of June or early in July; the Portuguese sardines are packed almost all the year round. In Maine the canning season is fixed by law as from May 10 to December 1, but many of the factories do not open until July or August.

Anchovies are a small delicate fish four to six inches long, caught on the French Atlantic coast and in the Mediterranean, the finest being caught near Leghorn in May, June, ^{Anchovies,} and July. Small sardines and sprats are very often ^{Mackerel.} put up as anchovies. The genuine has a thin round-backed body of bluish-brown colour, ventral fin nearer the head than the dorsal one; sharp-pointed head, silvery scales, and flesh of pink salmon colour. A common method of treating them is, after gutting and removing the head, to wash them and place them in barrels with layers of salt and a little ochrous red earth to give colour. They reach this country in kegs, and are bottled here in brine. They are also packed in oil. American anchovies or "moss bunkers" are preserved in oil. Of the other fish mentioned as being tinned two or three examples will suffice. The general principles of packing and preserving are the same for them all. **Mackerel in Oil** are small mackerel slowly fried in oil or in lard, very much as sardines are prepared. They are then filled into the tins with oil, and finished as usual. Large mackerel are put up in vinegar, being first slit in several places to allow of the liquid reaching the deeper parts of the flesh. They are next soaked in brine, dried, and fried slowly in oil; then canned in weak vinegar, with the addition of slices of lemon and onion. **Herrings** are chosen small for packing in oil, and are treated like sardines. As with mackerel, the larger sizes are preferably put up in vinegar. This fish is also tinned with tomatoes, or in tomato sauce, as well as in the kipper and

bloater form. "Digby Chicks" are smoked herrings from Digby, Nova Scotia. **Russian Herrings** are soaked in brine after removal of the heads and entrails, then dried, and fried for a few minutes in sweet oil. They are canned in vinegar seasoned with mustard, onion, sage, and lemon. **Tunny Fish** Herrings and Tunnies. are allied to the mackerels, but are much larger. They abound in the Mediterranean, and at Trapani in Sicily the fishing is a very important industry. Some of the fish weigh as much as 1000 lbs., and the average is 400 lbs. to 500 lbs. On the African coast they average only about 130 lbs. The nets are fixed, the two main ones running out from the shore for over 3000 yards, and enclosing a large area of water in which the tunny are moving. These nets are from 100 to 150 feet broad, according to the depth of the water, and act merely as guides to the fish to an enclosed space forming the tunnery proper, which consists of various chambers that can be closed or opened by lowering or raising nets at certain apertures. Boatmen outside and watchmen within give notice of the movements of the fish, and thus the apertures are opened or closed at the proper time, until finally the fish have been guided or driven into the last chamber of all, which is surrounded, below as well as at the sides, by specially strong and close netting. When the fish are all in, this area is surrounded by boats or pontoons. The net is hauled in on one side, and as the water grows more and more shallow the struggles of the enormous fish cover and hide the spectator with spray and foam, which rapidly changes from white to red as the fish are hooked by the men on the other pontoon. Usually six men, armed with hooked poles, are employed in hauling each tunny on board, and sometimes it is far from easy even for this number to do it. When the haul is over, the barges or boats move in-shore to the factory, the fish being drawn up an inclined plane to the sheds by hooks. At the top they are ranged side by side, the heads cut off, the insides taken out and placed in brine, and the bodies hung up for about eight hours, when they are cut up, boiled in copper vats, and placed in tins in olive-oil.

Tinned fish when opened is best turned out at once on to a clean dish, and kept covered if put aside. With Sardines, however, and other fish put up in oil, this removal is not so

necessary, as the oil does not, in any reasonable length of time, appreciably attack the tin. Certainly no fish that has been taken out and mixed with vinegar should ever be put back in the tin, as the acid of the vinegar will attack the metal, and especially will it dissolve the lead from the solder. Cases of metallic poisoning may arise from neglect of this precaution.

Under our fifth heading, **Potted goods**, we include the various "pastes"—Anchovy, BLOATER, Crab, Shrimp, &c.—and the **potted meats**, of which a large number are now prepared and put up in tins and pots. The chief of these are Potted Meats, Pastes, &c. Beef, Devilled Chicken, Chicken and Ham, Game, Grouse, Ham, Lobster, Mixed Viands, Pheasant, Ptarmigan, Salmon, Shrimp, Tongue, and Turkey, with mixtures of some of these, as, for instance, Ham and Tongue. The various items in each class of goods are all made in much the same manner. It will suffice, therefore, to describe one or two typical articles in each group, the other members differing only in the meat taken as basis and in details of seasoning.

Anchovy Paste is largely made from herrings, with enough anchovies added to impart the desired flavour to the paste. Fresh herrings are cleaned and steamed until sufficiently cooked, mixed with a proportion of salted anchovies, then mixed and pounded into a paste with lard or bacon fat. Salt and seasoning such as mace and cayenne are added as desired, and the paste is passed through a fine sieve to separate pieces of skin and fibrous material. The paste is then ready for filling into the pots. Of course, anchovies without herrings can be used for the paste.

Shrimp Paste is made by pounding boiled and shelled shrimps into a paste with lard or margarine, and seasoning to taste with mace, cayenne, &c., together with a little essence of anchovies. The paste is packed into pots and covered with a layer of melted margarine or other suitable fat.

Meat Pastes, such as Ham and Tongue, are prepared by mixing the particular meat-basis with about one-third of its weight of bacon or fat pork, the mixture being minced and rubbed or ground to a pasty consistency and then pressed through a sieve. Salt and various seasonings are added as required, and the paste is then potted. It may be either preservatized with borax, or covered with a layer of fat to exclude the air and keep the

article in good condition; or it may be sealed air-tight and "processed".

For **Potted Tongue, Ham, Beef, Turkey, &c.**, the meat in question is cut up to the required degree of fineness, and then stewed slowly with a little water and lard in a copper. The water serves to soften the meat, and thus enables it to absorb the lard better than it otherwise would. Seasoning is added to suit the palate, and the mixture is then filled hot into the tins or pots, sealed air-tight, and sterilized by the Appert method—that is, by heating in a hot bath or with steam under pressure.

For **Potted Shrimps**, boiled and shelled shrimps are seasoned with well-ground pepper, cloves, mace, and salt, then filled into pots and heated in an oven to destroy micro-organisms. As soon as cool they should be covered with a layer of melted butter-fat or other fat to preserve them from the air; or they may be sealed in tins before heating, and then "processed" in the steam-bath just as canned meats are.

Pâtés, in which a large trade is done in France and elsewhere, are preparations of meat so named because they were originally enclosed in paste, but they are now packed mostly in Pâtés, and
Foie Gras. earthenware jars with lids, called *terrines*; also in tins and boxes. Various districts have their specialities in pâtés. Thus Strasburg is renowned for its *Pâté de Foie Gras*, or goose-liver with truffles "du Perigord"; so likewise is Toulouse. Other well-known pâtés are those of Chartres, Pithiviers, and Nogent-le-Rotrou, made with game; those of Rouen, made with fowl and ham; those of Amiens, made with ducks; those of Montreuil-sur-Mer, of woodcocks; those of Abbeville, in which various fish are used, such as the eel and the sturgeon; and those of Périgueux, Angoulême, Ruffec and Nérac, containing game or fowl with truffles. The fattening of geese for their livers has long been an important industry in Alsace, Strasburg, Languedoc, Toulouse, and elsewhere. Various stories used to be current of the cruel methods adopted for enlarging the livers—such as placing the goose alive in an oven and gradually increasing the temperature—but although the practice of "cramming" undeniably exists it is nowadays in a less atrocious form, if still objectionable enough to the humane mind. When the birds are considered ripe they are killed and the livers conveyed

to the truffling-house. Livers weighed after cleaning will often scale $2\frac{1}{2}$ to 3 lbs. each. In truffling the livers about half a pound of truffles is allowed to each pound of liver, and each liver is allowed to remain for a week on a marble slab in an ice-house, that the truffle perfume may thoroughly permeate it. The liver is then cut to the size of the pot or "terrine", and placed in the pot between two thin layers of mince-meat made of veal and bacon fat, an inch depth of lard being placed on the top. Five hours' careful baking completes the preparation. The **pâté de foie gras** is sometimes a mixture of goose liver and fresh minced pork, with truffles, sausage meat, and lard added. The American Consul at Bordeaux writes (1902) that Foie gras d'oie—the fat goose liver—is prepared for use and export there in several forms: (a) Foie gras naturel, (b) pâtés de foie gras, and (c) purée de foie gras. The foie gras naturel is simply the cooked liver served without any form of sauce or seasoning except the fat or oil of the liver itself. The pâté de foie gras of commerce consists of the cooked liver packed in tin boxes of a standard size, which the liver is roughly cut to fit. The space not occupied by the liver is filled with the trimmings of the liver or pork, finely hashed and pressed in. Over this is poured the melted fat, sometimes of the liver and sometimes beef suet. The pieces of liver clipped off in this process of fitting the cooked liver to the box are used with other hashed meats and flavouring matters like truffles in preparing what is known in commerce as "purée de foie gras". There is a practice of using suet instead of the natural fat of the goose liver, as a support or matrix by which the interstices between the liver and the box are filled. It is found that the suet and the somewhat firmer meat packed about the liver prevents the latter from being broken up by sliding about in the box, as it is likely to do on long journeys when only the thin oil of the liver is used. Another fact which shippers have learned by costly experience is that the pure fat of the goose is much more likely than beef suet to become rancid when used as the sole pack of the foie.

Another important food delicacy which may be mentioned is **Caviare** (pronounced Cav'yar) or preserved fishes' roe, nowadays made largely not only in Russia but in Ger- Caviare. many, Norway, Italy, and America. But Russia is *par excellence*

the land of caviare, and the preparation of that article in its different forms, "red", fresh or granular, pressed in bags or in linen cloths, &c., gives employment to large numbers of people. During the year 1900 Russia exported of Red Caviare 50,300 cwts., value £48,700; and of other kinds 11,000 cwts., value £221,100. An official Russian report says the Red Caviare goes principally to Turkey, Roumania, Greece, and Bulgaria, and the other kinds to Germany, Turkey, Roumania, and Austro-Hungary. Russia excels in her caviare because for the finer kinds of that delicacy the sturgeon roe is required, and her broad waters are particularly rich in sturgeons and members of the sturgeon family. Thus in the brackish waters at the mouths of rivers in European Russia the sturgeons are of foremost importance, first coming the so-called "red" fish, the "belooga", (*Acipenser huso*, L.), and then the sturgeon (*Ac. guldenstädtii*, Br.), the stellated sturgeon (*Ac. stellatus*, Pall.), the smaller sturgeon (*Ac. schyba*, Lov.), and the sterlet (*Ac. ruthenus*, L.). In Asiatic Russia there are also the common sturgeon, the lesser sturgeon, the shovel-nosed sturgeon, the caluga, and several other curious forms of the sturgeon and sterlet family. There are many centres of the caviare industry; the principal is the Astrakhan country, where large fishery companies have sprung up. From the roe of the sterlet the finest quality of caviare is made; but the most in quantity is made from the roe of the "belooga" or red fish. As indicated above, there are various kinds of Russian caviare; the two chief divisions, however, are the granulated and the pressed. Liquid caviare, or "ikra", also known by the French name of demi-sel, which is regarded as the finest in flavour, requires such a low temperature and carries so badly that it is not much seen out of Russia. The roes are pressed and rubbed through a fine-meshed sieve, which allows the small eggs to pass through but retains the membranous sheath. To the eggs pure salt is added and intimately mixed with them by means of a kind of wooden spoon, and after the brine has been drained off the granulated caviare is the product. The pressed caviare is prepared somewhat differently, with an eye to its keeping qualities. The fresh roe is treated with a solution of salt after being washed in vinegar, an operation requiring skill and experience, as the eggs must remain in the brine long enough to keep well but not so long as to become too salty.

When the superfluous brine has been drained off on a bench or trough the caviare is put into small sacks and these are squeezed under a screw press. The sacks, which measure some 8 inches by 20 inches, are packed in barrels containing up to 1000 lbs. Another method of preparation is to pickle the eggs taken from the fish for a considerable time in brine and afterwards dry the mass in the sun. The ordinary article of export is the pressed caviare or "pajusnaya". It is recommended that caviare in the pot or earthenware jar should be kept in a cool place, the jar head downwards in damp salt. The ordinary mode of consuming it is spread on hot toast with a squeeze of lemon and a pinch of Nepaul pepper.

Boron preservative is not infrequently added to potted goods, and is the chief substance used for antiseptic purposes in these preparations. Formalin and salicylic acid are not likely to be much used for this class of goods, but Preservatives. it may be well to mention that the Committee on Preservatives in Food (1901) recommended the absolute prohibition of formalin in foods and drinks, and the limitation of salicylic acid to the proportion of 1 grain per pound of solid or per pint of liquid food, its presence to be declared in all cases. This recommendation has not, up to the end of 1903, been given legal effect to, but no doubt it carries weight with magistrates when questions arise about excessive quantity of the preservative. No specific limit has been laid down or recommended for boric acid in potted goods.

All kinds of Australian and New Zealand tinned meats are packed in wooden cases, the number of tins varying with their respective sizes. A case of 6-lb. tins contains 12; Packages and
Weights. a case of 4-lb. tins contains 18 or 24; and a case of 2-lb. tins contains 24, 36, or 48 tins. The contents of the tins also vary according to the process of preserving adopted by the different companies. The meats are generally sold at actual weights, less an average tare on the separate sizes, viz.: 2-lb. tins give a tare of 8 ozs., 4-lb. tins give a tare of 14 ozs., and 6-lb. tins give a tare of 18 to 20 ozs. In the wholesale trade Blown, Washy, Doubtful, Collapsed, and Cracked Solder Tins are all thrown out of a parcel when being examined, and are allowed for in full. Soups, Entrées, &c., are sold at nominal

weights. American meats are also sent over in wooden cases, each containing the following number of tins:—Of 1-lb., 48 tins; of 2-lb., 24 tins; of 4-lb. and 6-lb., 12 tins; and of 14-lb., 6 tins. Both Roast and Boiled Beef contain tins of 2 lbs. and 6 lbs., according to size; but 14-lb. tins are never packed unless as Compressed Corned Beef. Ox Tongues from North and South America are sold at per dozen, as weights can never be guaranteed for each tin. The United States firms pack their goods two dozen in a case, irrespective of size, of $1\frac{1}{2}$ lbs., 2 lbs., $2\frac{1}{2}$ lbs., $2\frac{3}{4}$ lbs., and 3 lbs.; whilst the South American packers put theirs up in two, three, or four dozen in a case, depending on size. Soups come to this country in 1-lb. and 2-lb. tins of two dozen each per case. Extract of Meat from Australia and South America is packed in tins varying from 4 + 28-lb. to $1\frac{1}{4}$ -cwt. tins. The size most preferred is either that of 4 + 28-lb. or 2 + 56-lb. tins. Boiled Rabbits are imported from Australasia in cases of forty-eight 2-lb. flat and tall tins. Sometimes there are only thirty-six flat tins in one case. Frozen rabbits in the "fur" are packed in crates of about $\frac{3}{4}$ (or 72 lbs.) of a cwt. each. A single rabbit weighs about 3 lbs., and there are often twenty-four rabbits in one crate. Sardines are packed in tins of a great variety of sizes, but what may be called the staple sizes of the trade are large halves, known as 18-oz. tins, which weigh gross from about $17\frac{1}{2}$ to 18 ozs.; halves, known as 14-oz. tins; and "small halves" or "American quarters", weighing actually 11 ozs. to 12 ozs.; also quarters, sometimes called 8-oz. tins, and which vary, as a rule, from $7\frac{1}{4}$ to $7\frac{3}{4}$ ozs., very few brands reaching the full eight ounces. With rare exceptions, 100 tins of sardines (of whatever size) are packed in a case. Besides the standard sizes other tins may be met with, owing to the exigencies of particular foreign markets or tariffs; such tins are "16 ozs.", principally produced by a few of the highest class French packers; "large quarters", weighing about 10 ozs., and "small quarters" from $5\frac{1}{2}$ to 7 ozs. What are considered medium-sized fish run from 18 to 24 to the 18-oz. tin; 12 to 16 to the 14-oz. tin; and 8 to 12 to the quarter. The ideal sizes may probably be considered 20 to 24 to the 18-oz., 14 to 16 to the 14-oz., and 10 to 12 to the quarter tin. Many of the larger fish, though, as a rule, less highly esteemed,

are of excellent quality, but require some nine to twelve months to become nicely matured. The weight of a single case of sardines is about 66 lbs. gross, or $\frac{1}{2}$ cwt. net, and forty cases together weigh as much as one ton.

10. FROZEN MEAT, POULTRY, &c.

Although the distribution of frozen and "chilled" meat is mainly in this country undertaken by the butcher—whose "butchering" in very many cases nowadays involves no bloodshed whatever—the comparative ease and safety with which the trade can be conducted has caused many members of the grocery and provision trade to give it their attention. Obviously there is still, and always must be, some amount of risk in cutting up and selling meat, but the danger from its perishable nature has been much reduced by the latter-day facilities of cold storage and refrigeration. Cold storage and refrigeration, indeed, have had everything to do with this branch of food distribution. Such developments in that trade as, let us say, the great growth of the Navy pork-pickling industry in Aber- Aberdeenshire
Pork-pickling. deenshire at the end of the eighteenth century have arisen in the past from the individual enterprise of merchants. Or we may see a Chicago arise among the great cities of the world from the fortuitous circumstance of its site where commercial routes naturally demand a dépôt. But there is something dramatic in the spectacle of a world-wide industry springing from a single invention; and certainly few developments in economic history are more remarkable than those which followed, in the United States, the invention of the refrigerator car, and the despatch of the first load of fresh beef from Chicago to Boston in 1869; or, in the case of our own over-sea trade, the Clyde invention of the Bell-Colman refrigerating process for sea-going vessels, whereby it was rendered possible for cargoes of frozen meat to be brought hither from Australia none the worse even for crossing the Equator in the course of their long voyage. The packing of salt pork and barrelled beef has been an industry from time immemorial, but even in this industry, as well as in the fresh meat trade, the systems of artificial refrigeration intro-

duced in the last thirty years or so have had profound effect. For instance, in the great meat-packing districts of the States artificial refrigeration has practically lengthened the packing year from four months to twelve by rendering summer slaughtering possible. As for the developments in the transportation of fresh meat, "chilled" meat, and "frozen" meat, they are incalculable. From the Antipodes and the Argentine come great quantities of frozen mutton, lamb, beef, rabbits, &c., from America come quantities of "chilled" beef and pork; frozen hares are imported from Argentina, frozen salmon from Canada, frozen poultry and feathered game—such are the chief supplies, but there are many others. Australian beef and rabbits, New Zealand mutton and lamb, are nowadays found on every table, and very excellent eating they are as a rule. There is now no season for lamb, as there used to be. Lamb is always in season, and always obtainable. Nowadays there is not a single working day of the year in which some frozen lambs are not sold at Smithfield market.

Mention has been made of (a) **Frozen** meat and (b) **Chilled** meat. The difference is suggested by the terms. Whilst some

Frozen Meat. meat is actually frozen, other is but chilled. The object in both cases is to preserve the meat so that when thawed or defrosted it shall be fresh and sweet, with its nutritive qualities unimpaired; it must not be chilled suddenly or the effect is to drive the animal heat inward and cause decay of the marrow and bone and internal parts of the meat. In freezing the meat the carcass, side, or whatnot is first kept at a temperature of 36° F. for fifteen to eighteen hours, then chilled or refrigerated for twenty-four to thirty hours. In Australia, at Sydney and elsewhere, immense insulated stores are used for keeping the meat while awaiting shipment. The trucks of freshly - killed meat run alongside the refrigerating chambers, where they are unloaded by an overhead tramway across the weighing beam into one of the chilling rooms. Here the chilling or first stage of the freezing process takes place. The carcasses are then transferred to the "sharp freezing" rooms, where they gradually freeze down to 15° below zero; then they go forward again into the store-rooms, where the thermometer usually registers 5°. Beef, it may be mentioned, is dealt with in the same way

as mutton, but the carcasses take much longer to freeze. In the store-rooms the carcasses are bagged and stacked crosswise to the roof to await shipment. "Defrosted" meat is that which has been thawed scientifically in dry air, gradually rising in temperature—a method of treating frozen meat on its arrival in this country which has had an important influence for good upon the trade. Of late defrosted meat has been increasingly in demand, and has found its way into many quarters once supplied entirely with "Chilled" American. There are now various shops which make a speciality of this meat, some dealing in nothing else.

American and Canadian meat is not as a rule frozen hard, but chilled and carried at a temperature a little above freezing-point. In North America the meat-packing business has of late years grown to vast proportions. A Chilled Meat. special report on this trade, which the Foreign Office received from Chicago in 1902, stated that this mode of dealing with meat has practically driven the butchers, as slaughterers, out of all towns in the United States, where the butcher is now simply a retailer of the goods sent to him in refrigerator-cars owned by the packers or wholesale butchers. No butcher can compete with a modern packing-house where everything is utilized, and where the profit is made and expenses paid out of the by-products, which are practically an expense to the small butcher. These packing-houses deal in all sorts of by-products, as well as in meat, poultry, apples, vegetables, butterine, and eggs, as they have cold storage of their own, and men in the country who can buy other things besides cattle for them.

The big slaughtering centres in the States are Chicago, Illinois; Kansas City, Kansas; Omaha, Nebraska; St. Louis, Missouri; and St. Joseph, Missouri. At these and other places are stock-yards to which animals are brought by trains or "on the hoof" to be sold, most of them being consigned to commission agents, who sell to the packers, butchers, exporters, speculators, or feeders. Speculators buy at one market, and if they cannot sell later in the day at a profit they send to another market. On arriving at the yards the cattle are inspected, and all animals marked with a tag that show signs of tuberculosis by coughing, advanced pregnancy, recent calving, lumpy jaw, or extreme

emaciation are killed under special examination by the United States veterinary inspectors, and if found healthy they are passed, and if unsound are skinned and the carcass placed in a tank. Account is kept of the value of the hide and other product. Sheep are examined and rejected for scab and the same reasons as cattle, but few are diseased. Hogs we have dealt with in our chapter on bacon.

It is hardly necessary to say that meat-packing has been reduced to an exact science at such centres as Chicago. One of the largest packing companies makes the following detailed statement of what a 1200-lb. steer will produce:—

Hide	...	...	...	weight	75 lbs.
Head, feet, and knuckles	...	...	...	"	45 "
Butter fat	...	...	...	"	80 "
Liver, heart, and lungs	...	...	...	"	35 "
Cheek meat and tongue	...	...	...	"	10 "
Raw tallow and entrails	...	...	...	"	84 "
Liquid blood	...	...	...	"	46 "
Paunch and contents	...	...	...	"	106 "
Lip and weasand meat	...	...	...	"	4 "
Tail, trimmings, and casings	...	...	...	"	15 "
Carcass	...	...	...	"	700 "
Total					1200 "

When the cattle are bought by the packers (says the official report) they are driven to the slaughter-houses along overhead passages, landing the cattle at the killing floor, sometimes two or more stories high. They are driven along a narrow passageway leading to the killing floor, which is divided into boxes, just large enough to hold two cattle, by sliding doors. As soon as the first two cattle have reached the end, a door is let down behind them, and the same is done until the four pens are full. In a house killing about 2000 cattle a day there are four boxes, and four men stand on a platform above the boxes, the floors of which are about 4 feet from the floor of the killing-house, and urge the cattle on by prodding with smooth poles. When the gates are shut these men take steel hammers, weighing 4 or 5 lbs., with a shaft 30 inches long, and watching for an opportunity, strike the animals between the eyes. They then pull a rope which starts a hoist, lifting the outside of the pen, and raising the floor outwards, throwing the

stunned animals to the killing floor. Here four men are waiting with chains, which they fix round a hind-leg, the animal is hoisted, and the wheel to which the chain is fixed runs to the bleeder by gravitation. One butcher cuts the veins in the neck, and eight men with buckets follow the animals on their way, one to each animal, catching the blood. This blood is poured into shallow pans about 4 inches deep, placed on a shelved barrow, and is used for making albumen; the blood that escapes flows through the gutters to the tanks for fertilizer. The cattle, as they are bled, pass to their places, the first going to the end of the building, until the benches are filled up, each animal being pushed back a few feet on its arrival at its place, and so leaving the gangway clear for the next lot killed.

All the men working on the cattle start at the far end, and take the cattle in turn as they pass on, returning idle to the beginning after each row is finished. Five men, "head droppers", skin the head, commencing at the nose, and separate the head from the spinal column and place it on the floor. The carcasses are then moved back a few feet, and are lowered to the floor and laid square on their backs. Six men skin and cut off the fore-legs at the knees, and eight men skin and cut off the hind-legs at the hocks. These men are called "fore- or hind-leg-breakers". Two rippers slit the carcass from neck to tail; a boy raises the gullet, and another one removes the sweetbread. Meanwhile two men are collecting the chains and returning them to the slingers. Four "caul pullers" remove the fat from the caul covering the intestines; fifteen floormen then skin the animals to the backs, except the legs, and three "breast sawers" saw through the breast bone. The carcass is then partly raised from the floor, resting on its shoulder, and is moved farther along the floor, a spreader being fastened between its hocks by a hook from each hock attaching the carcass to rails about 30 inches apart. Two men are employed in putting in the spreaders, and two in hoisting. One "notch chopper" cuts to the pelvis bone, and seven men are employed in "catching fells", *i.e.* skinning hind-legs as far as stifle; two "rippers" clear the rump, five "rumpers" clear hide from the rump and round the base of tail; two men skin the tail by fastening hair at the end to the chain with pliers, and pull the tail from its covering, and

a boy cuts off the tail and deposits it in a box. The cattle are then hoisted clear of the ground, and six "fell beaters" skin the flanks, using cleavers; six "backers" skin the backs, and seven "rump sawers" saw about 1 foot through the bone. Six "gutters" clean out all the intestines, which are carefully examined by a United States veterinary inspector under the Department of Agriculture for any signs of disease, and if any is found the carcass is marked with a yellow tag and removed to a tank, where it is sealed up and steam turned on for twenty-four hours until the meat is destroyed, when it is placed in the tank for fertilizer. This is all done under the supervision of an inspector. Eight "splitters" then split the backbone to the chuck with cleavers, two more "hoisters" raise the carcass, and two men remove the spreaders.

Inspection of
the Meat.

The animal is now joined at the neck, but each hind-leg is chained to a wheel running on the rails, and two men push the carcasses back with the skin hanging from the fore-quarters. Four "hip trimmers" on short step-ladders trim any bruises off the flanks, throwing the trimmings of fat into boxes; these trimmings are carefully picked off, and the best is used for making oleo oil, while the badly bruised goes to the tank. Five men clear the hide from the front legs, and five "hide droppers" from the shoulders and neck, leaving the hide lying on the ground. Four "shoulder trimmers" clear bruises from the shoulders, and four "neck splitters" split the animal with cleavers, leaving the animal hanging in two halves. The halves are then moved again, and four "hide spreaders" spread the hides on the floor for inspection for cuts. An inspector goes over the hides, and if a cut is found, the man skinning that part is reprimanded, not more than two cuts in a day's work is allowed for any workman. Four "clear outs" then trim the inside, and remove the spinal cord. Four men wheel away the hides in barrows, the hides of each lot of cattle bought being kept separate and weighed. Two men with their hands and funnels expel the blood from the shoulders, and six men, on high step-ladders, fixed between the half carcasses, trim the bruises again. Eight men then mount the ladders, and with a scrubbing-brush and warm water, supplied through a hose hanging at the top of each ladder, wash the outside of the carcass. The carcasses are again moved back, and brought over washing-troughs by two

men; the water is warm, and kept running from a tank above. Five men with scrubbing-brushes and cloths wash the inside; five with long-handled brushes go once more over the outside; and five wash the necks and shoulders with scrubbing-brushes. The carcasses are then pushed back by two men, and two bruise-trimmers go over the sides and shoulders. Two men with chine saws saw the backbone and beat it back to give it a round appearance. Three scrapers with long-handled scrapers scrape the water off the outside of the carcasses, and four men wipe them with a cloth. Four men then push back the half-carcasses, and one man washes the blood from inside the neck, while two wipe the kidneys and insides with a dry cloth. Two men then fasten a cloth into the throat with a steel skewer to collect the blood, and a boy hooks the loose flesh of the neck over the cloth. This cloth is removed as soon as the meat is placed in the chilling room. The government inspector's tagger next labels each half beast with a linen tag to show that it has been inspected and passed. The meat is then pushed on to the conveyer (an endless chain running into the chill-rooms), and carried to the scales, and after it is weighed, on to the chill-room, where it is kept at a temperature of about 40° for forty-eight hours, after which it can be sent out or placed in cold storage. The weigher records the weights, and each lot or beast can be traced at any time and picked out of the cold store. The hide and meat, and the cost and product, of every animal are carefully recorded.

The by-products of meat-packing, which the small butcher often wastes, are just what the large packer gets his profit from. Albumen is made from the blood, and is used for calico printing, tanning, and sugar refining. The blood is congealed into buttons, used in making extract of beef, and for making fertilizer. The bones from the hind- and fore-legs of the cattle are used for making tooth-brushes and knife handles, chessmen, screws for joining the mouthpiece to the stems of pipes, mouthpieces, and buttons. Some bone refuse is ground to flour and made into billiard balls and buttons. Bones from the cooked meat are boiled and the fat and gelatine extracted, and all other bones are ground into fertilizer. Horns are made into buttons, combs, brushes, and pipe mouthpieces, and the refuse used for fertilizer. Hoofs are made into buttons, cyanide of potassium,

By-Products
of Modern
Meat-packing.

and fertilizer. Gelatine and glue are extracted from the soft bones of the head, shoulders, ribs, breast, and cores of the horns by boiling, but the scraps from hides, especially those of calves, are great gelatine producers. Glycerine is obtained from the "tank water", which is left after the removal of the grease obtained by boiling, under pressure, scraps of meat, bones, and intestines. Neat's-foot oil is extracted from the feet. Oleo oil is made from the fat of cattle, and is practically refined tallow. The beef fat is gone over very carefully, and selected into two grades for oleo oil making. It is then chopped up very fine by a hasher, working at the rate of 600 revolutions per minute. There are many different kinds of machines, but all are designed to cut the fat up very small without bruising it. The chopped fat is then put into large kettles, set level with the floor, and the contents are boiled, being kept continually stirred by an agitator. When the liquid has been thoroughly cooked, it is drawn from the top and placed in another kettle, to settle and clarify. It is then placed in shallow pans with a cloth in each, and put in a press, and the whole is subjected to a pressure of 250 lbs. to the square inch. The oleo oil is generally subjected to two pressures, and the stearine, which is left in the pans, is made into cakes. The stearine is usually white, and is used for making candles, chewing-gum, &c. The oleo oil is barrelled for shipment, or used for making butterine. When used for this purpose it is mixed with cotton-seed oil and milk—in the best grades 40 per cent of fresh cream is used—and in some cases with leaf lard. The refuse from the first boiling is pressed into cakes and sold as chicken food.

The main parts of the animal, as they are sent to the market, are all carefully trimmed, but there is no piece of good meat but has its market. Tongues and tails are regular articles of commerce, of course, and even the meat from the cheeks is added to the supply for sausages. Sixty lbs. of dressed beef for each 100 lbs. of live weight is considered a good average, and indicates that the animal was good stock in first-rate marketable condition. Of this the choice cuts, consisting of the ribs, sirloin, and rump steaks, constitute only about half. In an animal which weighs 1000 lbs. live weight the choice cuts will amount to about 310 lbs., and the coarse meat to 290 lbs. When the product is ready for shipping, it is packed in a box, and the box is labelled

Average
Weights.

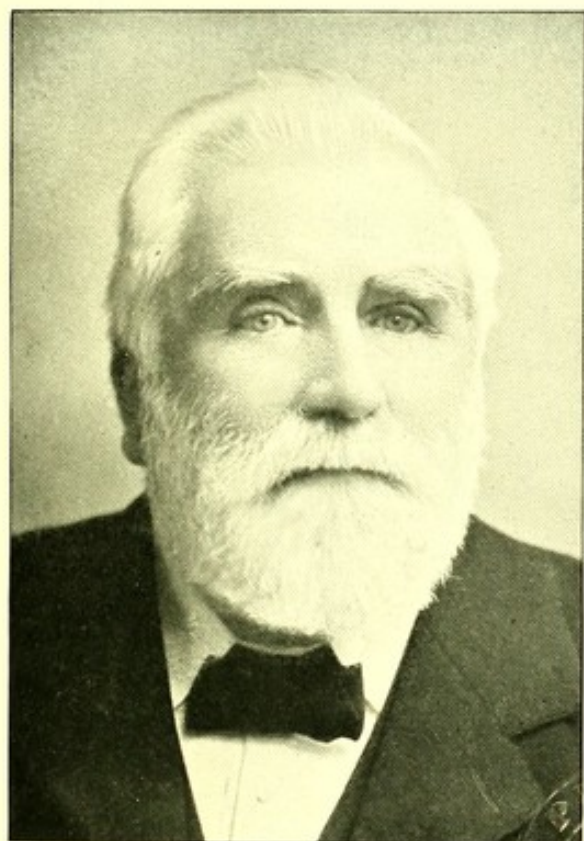
Mr. THOMAS AITKEN, of Aitken & Wight, wholesale flour and provision merchants, Leith, was born in 1832. He commenced business in 1855, and in course of years succeeded in forming an extensive connection. Mr. Aitken has devoted much of his time to public affairs. In 1887 he was unanimously appointed Provost of Leith—a post he held for six years. He has also been chairman of the Leith Chamber of Commerce. Mr. Aitken is a Justice of the Peace for the County of Midlothian, and a Deputy-Lieutenant and Justice of the Peace for the County of the City of Edinburgh.

Mr. GEORGE T. HILL, Ashton-under-Lyne, was born in 1862 in the town in which the Tudno Factories are now situated. Pioneer of the slab-cake trade, Mr. Hill is managing director of John Hill & Son, Ltd., the well-known cake manufacturers. Mr. Hill is, for the second time, president of the Manchester, Salford, and District Grocers' Association. He is also president of the National Association of Cake Manufacturers, a member of the executive of the Biscuit Association, vice-president of the National Association of Grocers' Assistants, and a member of the Manchester Chamber of Commerce. He takes a deep interest in all matters relative to the grocery trade.

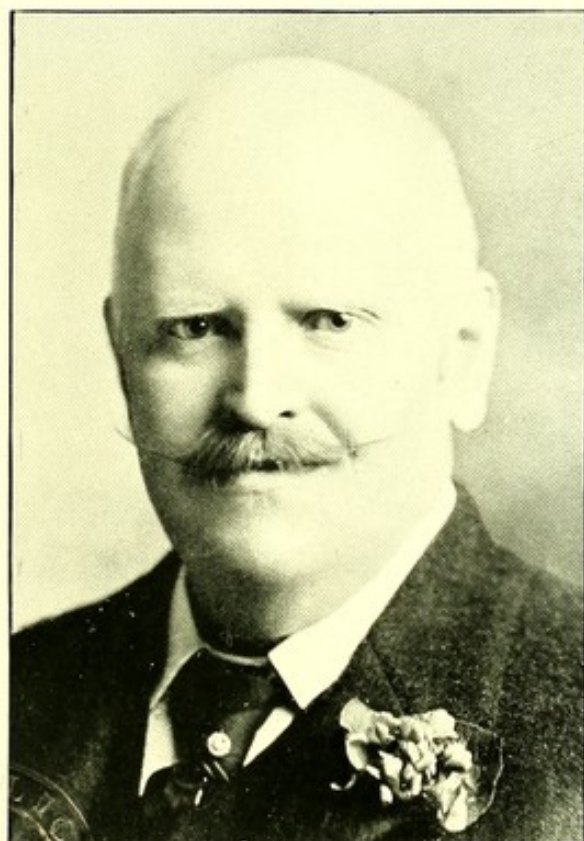
Mr. JAMES BOYD is chairman of James Keiller & Son, Limited, Dundee and London. He entered the service of the firm as office-boy, and gradually worked his way up until he was made a partner. On the formation of the firm into a limited liability company Mr. Boyd was appointed managing director, and became chairman on the decease of Mr. John M. Keiller. As president of the Manufacturing Confectioners' Alliance, Mr. Boyd has done a great deal on behalf of the trade with which he is associated.

Alderman J. T. GEE, of Wigan, is a well-known trader who has distinguished himself by his bold and uncompromising defence of private trading against the inroads of "co-operatism", the trading of the industrial co-operative societies. He has played a leading part in the organization of the Traders' Defence movement in England, and is at the head of the "Central Board".

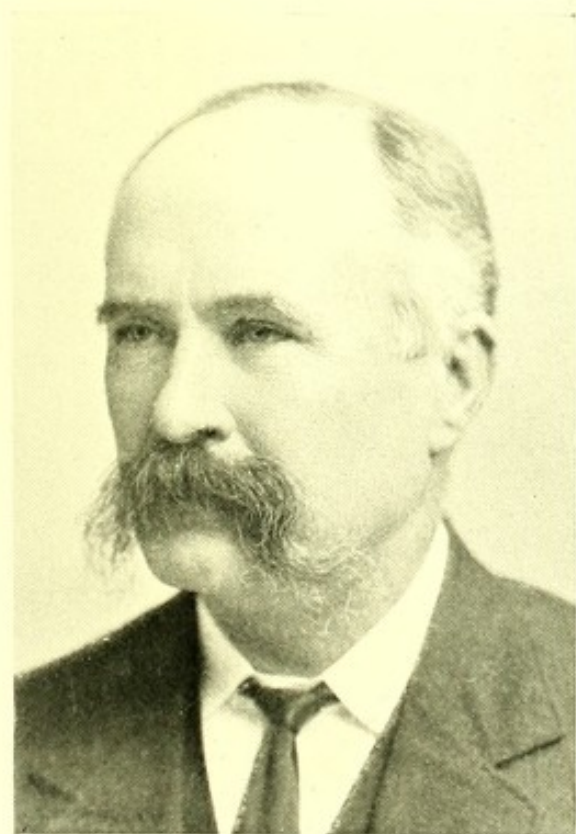
LEADING MEMBERS OF THE TRADE



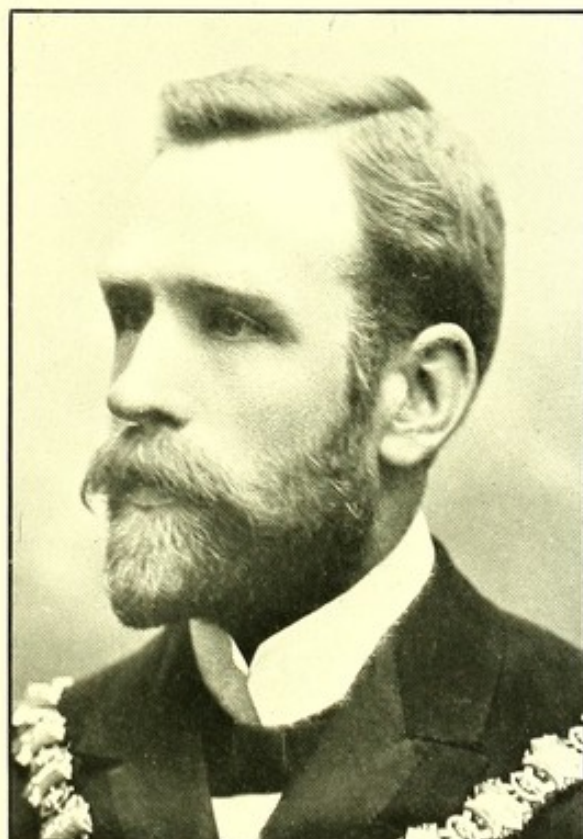
THOMAS AITKEN, D.L., J.P.



GEORGE T. HILL



JAMES BOYD



ALDERMAN J. T. GEE

with the official number of the packing-house, the number of pieces or pounds weight, the shipping marks, &c.; and is marked in large letters "For Export". An official certificate with a serial number is pasted on the box and covered with tin. A duplicate certificate is sent to the consignee, who, when he receives the package, removes the tin and compares the number on the certificate with that of his duplicate. This duplicate must be presented at the port of export before the package can be shipped.

The following are the particulars of the various cuts of Canadian and American pork:—*Clear Pork* is pork put up of ribs with the sides out. *Mess Pork* is made of the sides of the thickest and fattest hogs, cut into strips 6 to 7 inches wide running from back to belly. *Ordinary Mess Pork* is cut as above, but made from lighter hogs, ranging from 170 to 200 lbs. *Prime Mess* is cut from a still lighter class ranging from 100 to 150 lbs., the shoulder being included. It is generally cut into 4-lb. pieces so that fifty should make a barrel of 200 lbs. *Cumberlands*, the shoulder and side together, with backbone out; the shank cut short. *Short Ribbed Middles*, the side of the medium-weight hog (shoulder and ham off), the bone removed, and the ribs cracked through the middle. *Short Clear* is the same part cut from the best hogs with backbone and all the ribs taken out. *Long Clear* is the side including the shoulder with all bones removed. *Long Rib* is the same as above with the shoulder and backbone out; ribs left in. *Stretfords*, sides and shoulders together; the shoulder and bone taken out, shank left in; backbone and upper half of rib removed.

Cleanliness and low temperature in the retail shops are of the highest importance. An American writer says: "The **future butcher shop** will be a glass-walled and glass-cased meat and provision parlour insulated and cooled, so that everything can be seen and nothing suffer damage". It is hardly necessary to say that currents of hot air in the shop are bad for the colour and weight of the meat shown therein. The hardening of the meat—legs of mutton for instance—in such circumstances means dead loss; for the moisture thus dried out was bought at the same price as the meat which remains! In some shops ornamental tiles are used with excellent effect for floors, walls, ceilings, and counters. In some of the German meat shops the wall tiles are glazed in light shades arranged in patterns of artistic

Pork
Cuts.Meat
Shops.

design. The floors are also laid with tiles of different colours, but unglazed, heavier, and of cheaper quality. In one of the most attractive of these stores the walls are of ivory-coloured tiles, with panels of flowers and other designs. The counter, which runs along two sides of the room, is of the same ivory-coloured material, ornamented in gold. It presents a rich, handsome appearance. Even the book-holders, scales, and gas fixtures are tiled. The general effect of the room is suggestive, above all, of cleanliness—which is the *sine quâ non* in meat handling.

In buying meat the points to be looked for in beef are bright-red flesh with yellowish fat; in veal, pale flesh with firm white fat; in mutton, bright-red flesh and firm white fat; in lamb, firm flesh with white fat; in pork, firm flesh with smooth thin rind, cool to the touch. It may be interesting to quote from the price-list of a large association, retailing guaranteed British produce only, the following retail prices, current in May, 1903:—

Beef (Finest English or Scotch).—Aitch Bones (under 12 lbs.), 6½d. per lb.; Briskets, whole, 6½d. per lb.; Briskets, cut, 7½d. per lb.; Fillet, 1s. 3½d. per lb.; Flank, thick, whole, 9d. per lb.; Flank, thin, 5d. and 5½d. per lb.; Gravy Beef, 8d. per lb.; Ribs, back, 8½d. per lb.; Ribs, fore, whole, 11d. per lb.; Ribs, for rolling, 11d. per lb.; Ribs, top, 9d. per lb.; Ribs, wing, 1s. per lb.; Rump, whole, 10d. per lb.; Silverside, whole, 8½d. per lb.; Silverside, prime cuts, 9½d. per lb.; Sirloin, whole, 10½d. per lb.; Sirloin, prime cuts, 11½d. per lb.; Sirloin, wing end, 11d. per lb.; Steaks, beef, 11d. per lb.; Steaks, buttock, 1s. per lb.; Steaks, rump, 1s. 3d. per lb.; Stock meat, with bone, 6½d. per lb.; Topside, whole, 10d. per lb.; Topside, prime cuts, 11½d. per lb.; Suet, beef, 8d. per lb.; Ox Tails, each, from 2s.; Ox Kidney, 11d. per lb.

Veal (Finest English).—Breasts, whole, 7d. per lb.; Breasts, best end, 8d. per lb.; Cutlets, 1s. 3d. per lb.; Fillets, 1s. 3d. per lb.; Knuckles (up to 4 lbs.), from 6½d. per lb.; Legs, 1s. per lb.; Loins, whole, 9½d. per lb.; Loins, best ends (about 6 lbs.), 11d. per lb.; Loin, chump, 9½d. per lb.; Necks, whole, 8d. per lb.; Necks, best end, 1s. per lb.; Necks, scragg, 6½d. per lb.; Oyster, 10d. per lb.; Shoulders, 8d. per lb.; Sweetbreads, per pair, 4s. to 7s.

Mutton (Finest English or Scotch).—Breasts, 4d. per lb.; Chops, 1s. per lb.; Chops, trimmed, 1s. 3d. per lb.; Forequarter, 9d. per lb.; Forequarter, small, 9½d. per lb.; Hindquarter, 11d. per lb.; Hindquarter, small, 11½d. per lb.; Haunches, 10½d. per lb.; Legs (8 lbs. and over), 11d. per lb.; Legs (under 8 lbs.), 11½d. per lb.; Loins, 11d. per lb.; Loins, small, 11½d. per lb.; Loins, trimmed, 1s. per lb.; Necks, whole, 9½d. per lb.; Necks, small, 10d. per lb.; Necks, best end, 11d. per lb.; Necks, middle, 8d. per lb.; Necks, scragg, from 5d. per lb.; Shoulders, 9d. per lb.; Shoulders, small, 9½d. per lb.; Saddles, 11d. per lb.; Saddles, small, 11½d. per lb.; Whole Sheep, 9d. per lb.; Half Sheep, 9½d. per lb.; Suet, 5d. per lb.

Pork (Finest English).—Legs, 9d. per lb.; Loins, whole, 9½d. per lb.; Loins,

hind, 10½*d.* per lb.; Fore Loin, 9*d.* per lb.; Hand and Spring, 8*d.* per lb.; Hand, 7½*d.* per lb.; Streaky, 9*d.* per lb.

Lamb (Finest English).—Hindquarters, 1*s.* 1*d.* per lb.; Forequarters, 11½*d.* per lb.; Loins and Saddles, 1*s.* 2*d.* per lb.; Legs, 1*s.* 1½*d.* per lb.; Shoulders, 1*s.* 1*d.* per lb.; Target, 11*d.* per lb.

Small retailers not infrequently find it advantageous to cook odd joints of meat, and so make a profit out of what might otherwise be a serious loss. In boiling meat put the joint into water sufficient to cover it—about a quart to a lb.—and bring it to a boil, then draw aside the cooking-vessel so that it may simmer, and take care that it never ceases to simmer. If the liquor wastes make up the deficiency with boiling water. The time allowed for boiling is usually a quarter of an hour for every lb., and a quarter of an hour over. These Cooked Meat. are the times for cooking beef or mutton; for pork, ham, or bacon, allow about half an hour per lb. In roasting meat put the joint before a very strong fire or in a very hot oven; after ten or fifteen minutes remove farther from the fire and allow the meat to continue cooking gradually, and baste it frequently with its own dripping. The average time for roasting is a quarter of an hour for every lb. and a quarter of an hour over, for beef, mutton, lamb, or veal; for leg or loin of pork twenty minutes per lb. and twenty over. It is estimated that meat loses on an average 5½ ozs. to the lb. in roasting and 4½ ozs. in boiling. Note that *Hams* require, according to age, from twelve to twenty-four hours' soaking before cooking, or they eat hard and salt.

Rabbits and **Hares** are over-abundant in Australia, and a large export trade has been rendered possible by the freezing process. From Victoria alone over three million pairs of rabbits are exported in a season, nearly all of which are consumed Rabbits. in the United Kingdom. Almost all of these are forwarded from the country to the Government cold stores, and are there inspected, classified, and packed by experts engaged by the Department of Agriculture. Standard sizes are fixed, and those animals reaching these are cleaned, carefully inspected, and packed into crates containing 24 each. This careful inspection is given so that only fresh, sound, good, and wholesome animals are exported. **Frozen Turkeys, Ducks, Geese, and Fowls** are also exported from Victoria to South Africa and London with

excellent results. These, the same as hares and rabbits, are forwarded from the country to the Government cool storage chambers, and there, under expert hands, are dressed, graded, carefully packed, and frozen prior to export. All rabbits, hares, and poultry inspected, graded, and packed in this way have the Department of Agriculture's stamp, "Approved for Export", placed on each crate. At other freezing works in the state where these are packed for export great care is also taken; at these all inspected under Government supervision have also the Department's stamp on crates.

The **Poultry and Game** department of a large retail provision store where there is no "off" license commonly includes **Poultry, Game, and Fish.** such lines as the following (we quote from a 1903 list by way of illustration, with the retail prices where given:—

Poultry.—Pullets, Surrey, 3s. 6d. each; Chickens, small, 2s. 6d. each; Chickens, large, 3s. 9d. each; Chickens, Surrey, 3s. 6d. each; Fowls, 3s. each; Fowls, Russian Capons, 4s. 6d. each; Ducklings, 3s. 9d. each; Ducks, 4s. each; Ducks, Aylesbury, 4s. 6d. each; Goslings, 7s. 6d. each; Geese, 9s. 6d. each; Turkey Poults, 6s. each; Turkey Hens, 8s. each; Turkey Cocks, 9s. each; Turkey, Italian.

Game.—Grouse, young brace, 9s.; Hares, English, 4s. each; Leverets, 2s. 6d. each; Partridges, young brace, 5s. 6d.; also Russian and Red Legs; Pheasants, brace, 5s. 9d.; Pheasant Cocks, 3s. 3d. each; Pheasant Hens, 3s. 3d. each.

Rabbits, wild, 1s. 3d. each; tame, 1s. 4d. each.

Birds.—Black Cock, 3s. 3d. each; Capercailzie Hens and Cocks; Gray Hens, 3s. 3d. each; Guinea Fowls; Guinea Fowls, Larded; Hazel Hens; Larks, 1s. 9d. per dozen; Pigeons, English, 1s. 2d. each; Wood Pigeons, 1s. 2d. each; Bordeaux Pigeons, 1s. 3d. each; Pintails, 2s. each; Plovers, 10d. each; Golden Plovers, 1s. 3d. each; Prairie Hens; Ptarmigan; Quails, Egyptian and Virginian, 1s. 4d. each; Snipe, full, 1s. 2d. each; Snipe, Jack; Teal, 1s. 4d. each; Widgeon, 1s. 9d. each; Wild Duck, 2s. 9d. each; Woodcock.

If there is also a **Fish** department it will probably include such items as the following:—

Fresh Fish.—Brill, whole, 11d. per lb.; Brill, cut, 1s. 2d. per lb.; Cod: whole, 6d. per lb., Head and Shoulders 6d. per lb., Middle cut 1s. per lb., Tail 10d. per lb.; Dories, 9d. per lb.; Eels, live, 1s. 6d. per lb.; Flounders, 2s. 6d. per dozen; Gurnet, each; Haddocks, 6d. per lb.; Halibut, 1s. 4d. per lb.; Herrings, fresh, 1s. 3d. per dozen; Mackerel, 7d. each; Mullet, Red, 6d. to 1s. each; Plaice, 8d. per lb.; Salmon (inclusive of offal): Jowl, Middle, Tail; Skate, crimped, 8d. per lb.; Smelts, 2s. per dozen; Soles: Slips, 1s. 6d. per lb., Medium 2s. per lb., Large 1s. 9d. per lb., Lemon 1s. per lb.; Turbot, whole, 1s. per lb.; Turbot, cut, 1s. 10d. per lb.; Whiting, 5d. each; Whitebait, 2s. 6d. per quart.

Shell and Dried Fish.—Bloaters, 1s. 6d. per dozen; Cod's Roe, per lb.; Cod's

Sound; Crabs; Crawfish; Crayfish; Dried Sprats, 1*d.* per bundle; Escallops, 1*s.* 2*d.* per dozen; Haddocks, 8*d.* each; Kippers, 1*s.* 3*d.* per dozen; Lobsters, 1*s.* 6*d.* each; Lobsters, potted, 7*d.*; Oysters: Natives, 3*s.* per dozen, Seconds 1*s.* 9*d.* per dozen, Caen Bays 1*s.* 6*d.* per dozen, Dutch, Deep Sea 1*s.* 3*d.* per dozen; Prawns, large, 1*s.* per dozen; Prawns, small, 1*s.* 3*d.* per 100; Red Herrings, 1*s.* 6*d.* to 2*s.* per dozen; Shrimps, Brown, 5*d.* per pint, Picked 1*s.* 9*d.* per pint, Potted 7*d.*; Smoked Salmon.

In buying Poultry and Game the points to be looked for in Ducks are supple feet, hard, plump breast (tame ducks have yellow feet, wild ones red); in Fowl, legs and combs Hints to Buyers. smooth, white legs, plump breast, fat on back, soft and pliable breastbone; in Goose, bill and feet yellow; in Turkey, eyes full and clear, feet moist and black; in Hares and Rabbits, narrow cleft in upper lip, smooth sharp claws; in Partridges, yellowish legs and dark-coloured bill. In buying Fish it is well to see that the flesh is firm, the eyes bright and not sunken, the gills red, and the scales in good condition. Flat-fish have a smooth and moist skin firmly adhering to the flesh; no blisters. Lobsters and Crabs move their claws when pressed in the eyes. The tail of a fresh lobster should retain its elasticity. Oysters should have the shell firmly closed. A "native", of course, is out of season in any month the name of which has not an "r" in it, viz. May, June, July, and August. Prawns and Shrimps should be crisp.

Defoe, the author of *Robinson Crusoe*, gives a striking description of the droves of **Turkeys** which used to be met with in the eighteenth century about Christmas-time by the traveller on the high-road between London and Nor- Turkeys. wich—birds *en route* from Norfolk to the London market to provide the Christmas fare. Cambridge, Norfolk, and Lincolnshire are still the great sources of supply for these birds, the Christmas bird *par excellence*, thousands of which are annually sent out in hampers, with the addition of sausages, and perhaps a Stilton cheese and a bottle of wine, as Christmas presents. These turkeys are killed usually by simply breaking their necks, and the breastbone is also usually broken before they are sent to the salesman in order to give the breast an appearance of plumpness. When the bird has been killed by an incision in the roof of the mouth the bleeding makes the flesh whiter. The larger the birds the higher their value per lb. Most of the

country birds are sent to London in their feathers, although for shipping they should first be plucked. Hen birds, which are thought to be daintier eating than "gobblers", are usually killed at the end of November. The cocks are not, as a rule, kept beyond their second year; at two years a bird not uncommonly weighs 30 lbs., and highly-fed prize birds have weighed as much as 40 lbs. Of late years there has been complaint of the decreased number of Norfolk turkeys. On the other hand, Irish turkeys have come more and more to the front, and large numbers of fine birds are now sent to the British market from Ireland. Great numbers of excellent turkeys are also sent over from France, especially Normandy. Meal-and-milk-fed birds are preferred for flavour, and, of course, the young, plump, well-fed bird is what most people desire. Turkeys received from abroad are sometimes in bad condition from having been packed before being thoroughly chilled after killing. **Canadian turkeys**, many of which are shipped from Toronto and New Brunswick, are plucked, graded, and packed in cases of eighteen to twenty-four birds, according to size, tissue-paper being placed between the birds, and a layer of straw on top. It may be mentioned that all the species of the turkey in the wild state are indigenous to North America; it was from that part of the world that the first turkey was brought to England by William Strickland, lieutenant under Sebastian Cabot, in the early part of the sixteenth century. The common wild turkey is about $3\frac{1}{2}$ feet long and 5 feet in extent of wing, and weighs from 15 to 20 lbs.; the female being smaller, usually about 9 lbs. They were formerly abundant, but are now comparatively rare except in thinly-settled parts of the country.

Another famous North American bird is the **Canvas-back Duck**, which many people think the most delicious of all water-fowl, the best of all being shot on the wing from behind screens of reeds on the shores of the Chesapeake Bay. Norfolk, Suffolk, and Lincolnshire are great feeders of **Geese** for the London market, the green geese and the Michaelmas geese being the recognized divisions of the trade. In March and April the Norfolk dealers buy in goslings from the farmers and cottagers, fatten them up on barley-meal, maize, wheat-tailings, and brewers' grains, and in six or seven weeks they are ripe for the green-geese market. The Michaelmas geese take their places under the

stages in August, and great numbers are fattened up for Michaelmas-day, when, according to tradition, goose is eaten in England because on that day Queen Elizabeth was dining on goose when she received the news of the defeat of the Spanish Armada. Many geese are also killed for the Christmas-tide market.

As with turkeys, there are complaints that home-bred geese are not so large or so numerous as they ought to be. Ireland sends us supplies of these birds, and excellent birds come from France, Hungary, Russia, and elsewhere. To the ordinary observer all geese look very much alike, but on the great goose market in Berlin the expert dealers divide the Russian geese into no fewer than twenty-one classes. Goose is the standard luxury of the German people, and Russia the main external source of supply, for although every German village has its flock of geese, and great numbers are bred and fattened at farms along the banks of rivers, ponds, and small lakes, the home-grown supply falls far short of the constant demand, leaving a large annual deficit to be filled by importations. In the season for this traffic the receipts of Russian geese at the Rummelsburg station, in the south-eastern quarter of Berlin, average about 15,000 daily. A special goose-train of from fifteen cars on ordinary days to thirty-five or forty on Mondays brings the birds from the Russian frontier. A Special
Goose-train. The cars are specially built and rigged for the service, and carry each about 1200 geese. Immediately after arrival, the whole train-load is inspected by a corps of sanitary officials. The fat geese are then distributed among the dealers and marketmen, while the others—the vast majority—are sent to be fattened at farms and feeding establishments in the outlying provinces. The inspection is exceedingly rigid. If a single goose dies *en route*, or is found sick with any disease that can be communicated to others, the whole car-load is placed in quarantine for a period of eight days. Contrary to the rule with turkeys, geese lower in price the larger they are above a certain size; perhaps the best selling size is from 7 to 9 lbs.

With regard to Fowl, the prime Dorking and other favourite breeds are not now kept so long on the farms and runs for fattening up as used to be the custom years ago. Breeders find it pays best to send the birds up to market when only ten or twelve weeks old. Dressed for cooking, such birds can be sold

for 3s. or 3s. 6d. each, whereas if kept for six months to become plump and full-grown they fetch no more than 5s. 6d. or 6s. **Chickens**, as distinct from the full-grown old birds, increase in value with their weight per lb., since the greater weight means added meat. The skin and flesh should be clean and white. The dark colour sometimes seen indicates that the blood has been left in the veins. If the fowl is killed by inserting a sharp narrow knife under the chin, so as to penetrate the brain and at the same time sever the main blood-vessel, death is caused quickly without unnecessary suffering, and the emptying of the blood-vessels renders the flesh white, improving the general appearance of the bird when plucked.

We have already mentioned Australian poultry. **Canada** is also an important contributor to the British market. The industry has been largely developed in two branches—the sale of plump, well-dressed chickens to commission merchants in Great Britain, and the sale of live chickens to firms who export them hither. The Canadian Government have fattening stations, and direct special attention to teaching the farmers how to rear plump, full-breasted young birds weighing about 4 lbs. each. Experiments in Canada have demonstrated that white Wyandottes and medium-sized Barred Plymouth Rocks are the two best breeds of poultry for market and eggs. Early hatched White Wyandotte or Barred Plymouth Rock pullets are good winter layers, and as the cockerels are placed in the fattening crates when they are three months old, and are ready for market when they are four months old, there is nothing patriarchal about Canadian chickens when put on the dinner-table. The chickens are put up in boxes holding a dozen birds apiece; the boxes are lined with parchment paper, and the birds are placed in them neatly, backs uppermost. In the poultry trade, as in so many others of the provision departments, appearance goes a long way.

Ducks are extensively bred in the Vale of Aylesbury, hence the name of “Aylesbury duck” for the white English breed. As the season when prices for ducklings rule high is early, quickness of growth is an important factor to the breeder, and the Aylesbury is the breed which for supplying ducklings quickly in the early months of the year has practically no rivals among the pure breeds of our own or any other country.

Ducks and Ducklings.

Ducklings can be produced ready for killing within seven to nine weeks from the day of hatching, and weighing 4 to 5½ lbs. Adult drakes weigh about 9 lbs. and ducks 8 lbs. The "Rouen" duck is of slower growth than the Aylesbury, but provides larger specimens, and is kept chiefly for the summer and autumn trade. Fully-matured birds weigh, drakes 10 lbs., ducks 9 lbs. The "Pekin" is chiefly of value as an egg producer. The "Indian Runner", met with a good deal in Cumberland, beats all ducks for laying, but for table purposes is small, adults weighing 3½ to 4½ lbs., and ducklings about 2 lbs. lighter. The flesh, however, is excellent, and the duck is therefore recommended if a trade can be done in small ducklings. The "Muscovy" duck grows to great size, the mature drake often scaling 12 lbs. Ducks undergo a change in feather when nine weeks old, after which they are no longer regarded as ducklings, and their market value is less on that account. The chief demand for ducklings is from February to July. When sufficiently fatted, ducks are starved for twenty-four hours and then killed by dislocating the neck. Plucking takes place immediately, whilst the body is warm, and the birds are packed when quite cold, being placed under weighted boards during the cooling process in order to compress the body and force the meat on to the breast.

Ptarmigan, black game, hares, capercailzies, hazel hens, Siberian partridges, and other game reach us in refrigerated steamers from most of the northern European countries. The *Capercailzie* is the king of the grouse tribe, a delicious-eating bird weighing 8 lbs. to 10 lbs. in the male and 4 or 5 lbs. in the hen bird, though frequently larger. *Ptarmigan* is the white grouse, immense quantities of which reach us from Norway and elsewhere. The Scotch or red **Grouse** is smaller than the bird from Sweden and Norway, but the flesh is excellent. The **Woodcock**, the flesh of which is much esteemed, and which may be kept fit for eating long after killing, is commonly about 12 ounces weight in England; in the Ardennes, and in Burgundy and some other parts of France, they weigh a pound, while Brittany birds are smaller. The belly of a woodcock should be hard and full when they are fat; and if the bird is young and tender the bones below the stomach will bend. **Partridges** are not eatable in the first few months of their growth; in August

Various
Wild Birds.

and September, when they have attained a fourth of their full size, and have fed on grains, they are better, but they are not at their best in flavour till the close of the year. The red-legged partridge, which we get from Russia and other parts of the Continent, is delicate eating, but not equal to the British bird. Enormous numbers of **Quails** are carried over to Europe from Quails and Pheasants. Egypt and Algeria, and the same kind of birds which fed the Israelites in the desert feed us to-day, being brought in thousands to Leadenhall market. A considerable trade in live quails (writes the Consul in Sicily) takes place yearly from Messina to the United Kingdom. The birds are caught in the neighbourhood of Messina, chiefly at Faro, Massa St. Giorgio, to the north, and at Galati, Giampileri, Santa Teresa, and Santa Stefano to the south of the town. They are kept from three to four days in Messina in cages before being shipped, and are fed on hemp-seed and ground corn, and are watered freely every day. It is estimated that from 90,000 to 100,000 are caught annually with running nooses and traps. The birds are shipped in cages from Messina to Genoa, whence they are sent by rail *viâ* Chiasso to the United Kingdom. Quail pie is an approved dish, but the most approved way of cooking a quail is to wrap it in a very thin slice of bacon, tie it up in a large vine leaf, and then roast it—so at least say the old gastronomers.

But in the opinion of most people the finest of all the wild birds is the **Pheasant**. This fine bird, of which it was estimated as long ago as 1880 that 335,000 are annually sold in this country at an average of 4s. apiece, is reared for us not only in Norfolk and Suffolk, and the coverts of country gentlemen all over the country, but also in many other countries. From the Austrian forests alone it is estimated that 70,000 pheasants and 700,000 partridges are annually obtained. In France pheasants are abundant, and their plumage is found as useful for decoration purposes as is their flesh for game pies. But of all the kinds the British-grown bird is best esteemed. The hen, which is considerably the smaller, has the most delicate flavour, and the birds are in their prime in October.

II. SOUPS AND PRESERVED VEGETABLES

In this chapter we deal for the most part with those table-delicacies which are composed of, or which usually include, some form or other of preserved vegetables. Desiccated soups, preserved peas, &c., and compressed vegetables fall into this class. The general principles of food-preservation, which have already been referred to in connection with preserved fruits and meats, hold good here also; for unless the vegetable is dried it can only be kept good for any length of time either by "sterilizing" it, or by treating it with some preservative, or by some system of cold storage.

For our present purpose the *preserved soups* may be classed as those which are tinned or bottled in the liquid form, and those which are sold in the dried state. The two groups are conveniently distinguished as "**Tinned Soups**" and "**Desiccated Soups**" respectively. The principal kinds of tinned soups now sold in the liquid state are *Bouilli*, *Chicken*, *Cockie-Leekie*, *Consommé*, *Game*, *Gravy*, *Green Pea*, *Hare*, *Hotch-Potch*, *Julienne*, *Mock Turtle*, *Real Turtle*, *Mulligatawny*, *Ox-cheek*, *Ox-tail*, *Oyster*, *Tomato*, and *Vegetable*, together with such invalids' preparations as *Beef-tea*, *Chicken Broth*, and *Mutton Broth*. A few of these will be briefly described, and for further details any good cookery-book may be consulted.

Bouilli is a French term for beef broth more especially, and generally for any meat broth in which vegetables and flavouring-herbs are contained.

Cockie-Leekie is a Scotch soup, typically prepared by boiling fowls in water with leeks, and seasoning with pepper and salt.

Consommé is a kind of clear broth, obtained by gently simmering for several hours meat, bones, and, preferably, calf's head and foot, the latter giving consistency to the product. The broth is skimmed from fat and débris, flavoured with vegetables and spices, strained, and, if necessary, clarified with a little bullock's blood.

Green Pea soup is made by boiling fresh or tinned peas until they are softened, crushing them, then mixing with meat bouillon, white "stock", butter, sugar, and flavouring to taste. The cheaper kinds of pea-soup are made with dried peas, and lard

is used instead of butter. Maize flour is also added in some cases.

Hotch-Potch is a Scotch vegetable soup, usually made with cabbage, carrots, onions, parsley, pearl-barley, turnips, and other such ingredients, all chopped fine, and then boiled for about a couple of hours in water or in mutton broth, and seasoned with salt and pepper.

Julienne is a vegetable soup of French origin, introduced about the middle of last century by the well-known firm of Chollet. It is sold chiefly in the dried form in 1-lb. packets for general use, or in quarter-hundredweight bags for large consumers, but is also tinned and bottled in the liquid form. See DESICCATED SOUPS, pages 213-216, for further details.

Mock Turtle Soup is made in several grades and from a variety of ingredients. The best sort is prepared from calves' heads and ham, mixed with a good brown-soup stock, lemon-juice to flavour, and Madeira. Various vegetables and seasonings are added.

Real Turtle Soup is prepared by boiling the flesh of the green turtle in white wine and water, flavouring the stock thus obtained, and then mixing it with about three times the quantity of other good soup, such as ox-tail, fortifying the whole with Madeira, and adding to it enough lemon-juice to give the desired piquancy of flavour. There are, of course, different qualities, the best kinds, as will be seen from the ingredients, being very expensive. One of the standard makes of tinned "Real Turtle" is retailed at 6s. and more per bottle of "best quality, gold label" soup.

Mulligatawny is a curry soup of East Indian origin. It is generally prepared by mixing curry-powder with a soup-stock, adding vegetables, such as carrots and turnips, flavouring with herbs and lemon-juice, and seasoning with salt and cayenne pepper.

Ox-tail is thus made. The tails, together with any bones, heels, or scraps of lean beef that may be handy, are chopped up and fried in a little fat. Afterwards they are simmered in broth for some hours, then the soup is mixed with melted butter, flavoured with savoury herbs, and seasoned with mixed spices, and, sometimes, ketchup.

Tomato Soup is prepared by crushing up scalded tomatoes,

boiling the pulp with water, rice, and butter, and passing the product through a sieve to separate skin, &c.

In all the above cases the soup, when ready, is filled hot into the tins or bottles, and then sterilized by heating in boiling water or with steam.

A few *broths*, such as those of chicken and mutton, are put up; the former mainly for invalids' use, and the latter chiefly, perhaps, for export and for use as ships' stores. They are prepared by boiling the cut-up meat with water, flavouring and seasoning materials, and a small quantity of pearl-barley or other thickening substance. A 1-lb. tin of mutton-broth, made by a well-known firm, was recently examined, and found to have the following composition:—

Liquid portion ("broth")	...	...	...	...	12 ozs.
Solids:—					
Lean mutton	...	...	2 oz.	}	4 "
Fat "	...	...	1 "		
Pearl-barley	...	...	1 "		
					16 "
Flavouring ingredients	...	...	...	...	A small quantity.

Of **Desiccated Soups** there are two chief classes, viz. those which are essentially meat preparations, and those which consist mainly or entirely of dried vegetables. The former kind are met with as "soup-tablets", "soup-squares", "solidified soups", or put up in tubes of paraffin-wax, and so on. The vegetable soups are packed both as "squares" or "tablets", and in packets and tins.

Soup-tablets are intended to produce soup when dissolved in hot water. Some of them are really good, nutritious articles—we are speaking now of the meat soups, or those which purport to be such—others have but small nutritive value, and some day the question will probably arise as to whether they are properly described as "soups" at all. These inferior products are not made from meat of any kind, but from gelatine, coloured with caramel and flavoured with herb extracts. Genuine high-quality meat-soup tablets are manufactured as follows:—The meat is carefully freed from fat and bone, minced in a machine, and then set to steep in cold and not too hard water, using about 20 gallons of water for 100 lbs. of

How Soup-
Tablets are Made.

meat. The water is then gradually warmed to a temperature not higher than 140° F., and maintained for some hours at or near this point, during which time the meat is kept constantly stirred by rotating mechanical arms which work inside the vessel. In about three hours' time practically all the soluble constituents will have been extracted from the meat, leaving undissolved scarcely anything but the fibrin and sinewy tissues. The mixture is now heated to near simmering-point, though not actually boiled (190° to 200° F.), when the liquid, which was previously clear, becomes cloudy from the coagulation of albumen, and a grayish scum rises to the surface. This is skimmed off, or removed by filtering the broth through linen. The reason for using cold or only moderately warm water in the early stages of the process is because boiling water would harden the meat by coagulating the albumen on the outside, so that the interior soluble juices could not escape properly from the pieces of meat. When the meat-broth has been filtered clear it is carefully evaporated down in shallow pans, still without boiling, until a little test-sample sets hard on cooling. The whole quantity is then poured into moulds and left to solidify, forming thus the squares and tablets. Salt to the extent of about 1 per cent of the weight of the meat is added to the broth during the extracting process. Prepared in this way, the soup-tablets are essentially like clear, solid beef-tea, and have the taste of this substance. They are generally translucent, with a pale-brown colour, and dissolve in water to a practically clear solution. But various flavouring and thickening ingredients may be added at the fancy of the maker.

A cheaper kind of tablet is made from chopped-up calves' feet, trotters, and similar articles in place of meat. Instead of being merely warmed, these ingredients are boiled for some hours, which converts all the tendons and bone-cartilage into gelatine, so that the product is more of the nature of a jelly than of a meat soup. As this jelly would of itself be insipid and almost colourless, it is salted, flavoured with various savoury herbs, and coloured with caramel. Otherwise the process is carried out as already described. Inasmuch as there is a certain amount of meat in the ingredients used, these soups are better than those which have been mentioned as made directly from

gelatine; but they do not compare well with the genuine meat-soup tablets.

To any of the foregoing soups vegetables may be added to give the particular character required. Soup-tablets are very liable to absorb moisture from a damp atmosphere, and they then turn mouldy. Hence they should always be kept in well-closed tins or boxes.

Vegetable Soups may consist either of dried vegetables only, or of dried vegetables with more or less of a gelatine or meat basis.

Julienne is prepared in both these forms, and will serve as a typical example. In the ordinary preparation it consists of cabbage, carrots, celery, leeks, lettuce, onions, parsnips, turnips, and, it may be, other vegetables, such as asparagus, beans, and peas, with a little sorrel and parsley. The vegetables are cut into strips whilst fresh, and each kind is dried separately. The dry ingredients are then mixed, in proportions which are supposed to be a manufacturing secret as regards the original Julienne, though presumably every maker considers his own formula to be as good as, or better than, the one first employed.

An average Julienne sample contains about 12 per cent of water, and yields about 4 per cent of ash.

For export purposes Julienne is put up as an inner cube of compressed dried vegetables, surrounded by an outer envelope of gelatinous "solidified soup"; the two are dissolved and mixed when required for use. The following is an analysis of a well-known make (Lazenby's):—

Gelatinous envelope	...	...	...	...	75 per cent.
Vegetables	...	...	...	...	25 "

100

Composition of envelope:—

Water	...	...	...	...	31.5 per cent.
Ash (mineral matter)	...	...	...	...	13.4 "
Common salt	...	...	...	...	6.6 "
Total nitrogen	...	...	...	...	8.4 "
Phosphoric acid	...	...	...	...	2.5 "
Insoluble in alcohol	...	...	...	...	40.4 "

Composition of vegetable portion:—

Carrots, onions, &c. (as above described), containing 20 per cent of water and 4 per cent of mineral matter (ash).

Dried potatoes are freely used in the cheaper kinds of desiccated vegetable soups, and other common ingredients besides green vegetables are pea, bean, maize, tapioca, and sago flours. Appended are the chief analytical figures given by a few desiccated soups. They are fairly typical of the general run of these articles, though naturally in such products there is a considerable range of variation:—

	"Household" Soup.	Pea- Soup.	Maggi's Consommé.
Water	13.3	11.0	7.4
Mineral matter (ash) ...	12.2	11.4	64.4
Common salt	8.4	7.4	58.9
Total nitrogen	3.0	4.1	3.5
Phosphoric acid	—	—	1.8
Soluble in water	47.2	41.2	—

The consommé, it will be seen, contains more than half its weight of salt. This, of course, acts as a preservative.

As allied to the desiccated soups, mention may here be made of "meat-biscuits". These are an American invention, and are convenient for military, shipping, and travelling purposes. They are made from a meat-broth prepared as described for soup-tablets; this broth is evaporated until about two-thirds of the water is expelled, and flour is then mixed with it to form a paste, which is moulded into biscuits and baked. Sugar, spice, and vegetables are also included in some makes of meat-biscuit. The proportion of flour used is about twice the weight of the meat taken for the broth.

The principle of Appert's process—sterilizing food-stuffs by heat and sealing them air-tight at the time—is applied to the preservation of vegetables, and especially to the more expensive kinds, such as asparagus, artichokes, and green peas. Almost precisely the same *modus operandi* is adopted as in the case of meats and fruits. By many manufacturers glass is preferred for packing vegetables in, but tins are also largely used. Generally, the vegetables are first cleaned and trimmed, then filled into the vessels with enough water to cover them, and usually also with a little salt. The bottles, jars, or tins, which may be either lightly corked or completely sealed according to the method adopted, are slowly heated in a bath of strong brine or of calcium chloride solution. Eventually the

bath is brought to the boiling-point (which is higher than that of pure water), and after a time it is allowed to cool down again. When glass vessels are used, the corks of the bottles, if hitherto kept loose, are now tightened, and covered with a layer of melted paraffin-wax; but the bottles are not removed from the bath until quite cold. This gradual heating and cooling is adopted for glass packages in order to obviate risk of fracture. If properly sterilized the vegetables will keep as long as the vessels remain unopened, because all the ferments, moulds, and other micro-organisms in them have been killed, and no living ones can have access to the vessels if the latter are perfectly sealed.

The chief sorts of vegetables preserved in this way are *Asparagus*, *Artichokes*, *Green Peas*, *Haricots*, *Macédoine*, *Mushrooms*, *Spinach*, and *Tomatoes*. A few notes upon each of these are appended.

Both American and French tinned **asparagus** are put on the English market. Round or square tins and glass jars are all used for the packing; but the tins, in large and small sizes, are mostly met with in this country. The vegetables **Asparagus.** are clean, trimmed, and cut to size, then placed upright in a basket of wire-gauze, and lowered into a bath of boiling water. At first only the lower ends are put in the water: these are boiled for a few minutes, then the asparagus is further lowered until one half or more of the length of the sticks is covered, and again boiled; finally the sticks are wholly immersed in the boiling water for a short time. The vegetables are then cooled and put into the tins with dilute brine, sealed up, and sterilized as already described. A simpler plan is to put the cleaned asparagus at once in the tins with the brine, cooking and sterilizing it at the same time; but the softer "heads" are in this way liable to be overcooked or the lower harder ends of the sticks to be underdone. Sulphate of copper is sometimes used to preserve the green colour of the asparagus.

Artichokes are usually quartered, but may be canned whole. As soon as they are cut up they are placed in water containing a little sodium bisulphite to prevent their becoming discoloured. Afterwards they are "blanched" by being placed for a few minutes in boiling water, which also contains some bisulphite as well as, frequently, a small quantity of copper sul-

phate to make the green colour permanent. After being rapidly cooled in water the artichokes are trimmed with scissors and the seeds removed, and then put up in tins or bottles, either with weak brine containing a little alum, or else in water only.

Fonds d'Artichokes are prepared much in the same way as the above, all the leaves and seeds being removed, and the dressed "bottoms" slowly cooked in willow baskets immersed in hot water before bottling. They are generally put up in plain water, in bottles.

Of **Green Peas**, some of the favourite varieties for canning are the English and American *marrow-fat* peas, the French *Petit Pois*, and the Italian *Extra Fins*. An important point Canned Green Peas. is to have the peas ready for preserving as soon as possible after picking. For the best qualities they should not be more than, say, 24 hours old. When the weather is warm fermentative changes are liable to be set up in peas very quickly, and after 24 to 48 hours the colour becomes impaired, and cannot be restored.

In large factories the peas are shelled by machinery, and then sorted into similar sizes. They are next placed in a basket of perforated metal, and "blanched" by being lowered into a bath of boiling brine for a few minutes until softened, after which the basket is removed and at once dipped into a tank of clean cold water. In the brine is usually placed the copper sulphate for preserving the green colour of the peas; about 1 ounce to each 10 or 12 gallons of brine is a common proportion. The boiling in brine destroys moulds, &c., and removes certain vegetable acids; also—and this is perhaps the chief advantage from the packers' point of view—it removes any readily-soluble mucilage or other matter, which would otherwise make the liquid in which the peas are put up become eventually turbid and unsightly. The peas are then canned in weak brine, generally simple salt and water, or sometimes with a little sugar in addition; after which they are sealed air-tight and sterilized.

As regards the use of copper sulphate for the "greening", there is no doubt that this chemical has been grossly misapplied in some cases. It acts by "mordanting" or fixing the Copper in Peas. natural green colour of the pea: it does not make old and yellow peas green again. From not realizing this, some

packers have been led to add excessive quantities of the copper sulphate to batches of peas which were not of good colour, in the foolish endeavour to produce again the green of the young fresh pea. This matter of the use of copper salts for the "greening" of vegetables is a somewhat vexed question. The metal forms a compound with the green colouring-matter of the pea, and this compound is not dissolved by water, or only to a very slight extent, if at all: this is shown by the fact that there is practically no copper in the liquid poured off from a tin of preserved green peas, though the peas themselves may contain relatively considerable quantities. But in the gastric juice it is not merely the action of water that the copper compound is subjected to. The juice contains free hydrochloric acid, and it is highly probable that this acid will dissolve the copper compound, thus allowing the dissolved metal to pass into the general circulation, and to have free play for the exercise of its poisonous properties. Nevertheless, it is not absolutely demonstrated that the copper is always, or wholly, or even largely, dissolved when taken into the system. In fact it is just on this point that much discussion has arisen in reference to the use of copper in vegetables. There is evidence pointing to the conclusion that the copper, when added to the vegetables, forms a compound which is insoluble in the human economy, and is therefore non-poisonous. There is also, however, evidence of a contrary character, and it is not clear that the whole of the copper added becomes, or remains, insoluble under all conditions.

The Committee on the use of Preservatives, who carefully considered this matter, remark in their Report (1901):—"It is highly undesirable that what is admittedly a poisonous substance should be used, even to the smallest degree, in connection with such food as may be consumed in considerable quantity. The public have got into their heads that vegetables ought to be green, and green they insist upon having them. Direct proof that vegetables containing copper are injurious to the consumer is from the very nature of the case difficult to obtain, and we must admit that we have not succeeded in obtaining it. . . . Be this as it may, recent events [this refers to the arsenic epidemic] have so incontestably demonstrated the serious and wide-spread mischief which may result from the consumption of food and drink containing even minimal quantities of poisonous metallic substances, that

we are strongly of opinion that such poisonous substances should be rigorously excluded." Acting upon this opinion, **Prohibition Recommended.** therefore, the Committee made a formal recommendation, "that the use of copper salts in the so-called greening of preserved foods be prohibited". This recommendation has not yet (1904) been given legal force. Indeed one member of the Committee (a medical man) dissented from it. He was, however, satisfied that often an unnecessarily large amount of copper is used, and he recommended, in lieu of prohibition, that the presence of copper should in every case be declared, and that its amount be restricted to half a grain of metallic copper per pound of the vegetables. This brings us to the question of the amounts of copper sulphate which are actually found in peas. The proportions recorded during the inquiry referred to ranged from about $\frac{1}{16}$ th of a grain up to 6.6 grains of metallic copper per pound of vegetables, and these amounts of copper correspond to $\frac{1}{4}$ th of a grain up to $26\frac{1}{2}$ grains of crystallized copper sulphate—the form in which the copper is usually added. Mr. J. W. Copeman, representing the London Chamber of Commerce, considered that 2 grains of copper sulphate per pound of peas is the minimum amount necessary for the trade, and that the maximum might be fixed at 2.7 grains. The former number corresponds to $\frac{1}{2}$ a grain of metallic copper, and the latter to rather less than $\frac{3}{4}$ of a grain.

Haricots Flageolets and **Haricots Verts** are well-known French preparations. The Flageolets are the young tender seeds of the white haricot bean, gathered and shelled before they **Haricots, Tomatoes, &c.** have turned white. The Verts are green haricot beans, of which the smallest and youngest are the most esteemed, and the largest growths are the cheapest. They are put up in tins and bottles substantially in the same way as described for peas.

Macédoine (of vegetables) is a mixture of several kinds of vegetables, put in both bottles and tins. The vegetables may be either mixed indiscriminately, or packed in separate layers—*e.g.* a layer of beans, then one of carrots, and so on. Usually such vegetables as carrots and turnips are cut up into small cubes. The whole preparation is sterilized in the usual way.

Mushrooms are peeled, then rendered firm by boiling for a few minutes in a brine containing, besides salt, small quantities of

alum, citric acid, and sulphurous acid. They are then washed in cold water, and canned in dilute brine which contains a little of the above acids. Small unopened mushrooms are preferred for canning. The French product has a good reputation in this country.

Spinach is packed either as chopped spinach or in the form of whole leaves. It is frequently "greened" with copper sulphate. The vegetable is generally tinned in brine, and the process is essentially the same as for peas, but with different length of time for boiling.

Tomatoes.—Whole tomatoes are slowly brought to boiling in very weak brine, then cooled, and tinned in brine containing about 2 per cent of salt. Sometimes the tomatoes are peeled (*e.g.* Italian tomatoes); these are first scalded, then peeled, packed in the tins, and sterilized. In addition to those tinned in this country, French, Italian, and American canned tomatoes are imported.

As regards the analysis of these tinned vegetables, perhaps the point of most general interest is the method by which the amount of copper is determined. Taking peas for example, the procedure is as follows:—A weighed quantity of the peas, Analysis. drained from the liquid in which they are packed, is crushed up and evaporated till dry in a small basin. Strong sulphuric acid is then mixed with the dry residue, and the mixture is again heated and finally incinerated. The ash thus obtained contains all the copper together with the ordinary ash of peas; it is therefore dissolved in nitric acid, and in the solution two small platinum plates are placed. These latter are then connected with the two poles of an electric battery, or with an electric installation, and when the current is passed, the whole of the copper is gradually removed from the liquid by electrolytic action, and deposited in the metallic state upon one of the platinum plates. This plate or "electrode"—the exact weight of which was previously known—is now carefully dried and weighed again with its deposit of copper, the increase in weight showing how much copper has been deposited. This weight of copper multiplied by 4 gives very nearly the corresponding weight of copper sulphate from which the metal was derived.

Canned Corn (or Maize) is very largely consumed in America. We may describe the manner of its production in Maine. After

the stocks of corn are husked by men, women, and children, the corn is placed in a cutting machine where the corn is cut from the cob. From the cutting machine the corn is carried to the "cooker and filler", where it is partially cooked as it passes from the top to the bottom of the cylindrical vessel called the cooker. Cans are fed into the cooker from above by means of long upright tubes. Immediately on being filled with the partially cooked corn they are carried along by a revolving disc on to an endless chain supplied with horizontal arms that carry the cans around a curved channel to the wiping-machines. After pushing through that device the cans are capped by hand as they pass by on the chain to the soldering-machine. Before reaching the machine each can is given a run round with acid in order to make the solder take. So deftly is this done that no acid ever gets into the can. The can is then pushed on to an immovable plane by means of arms that work by cams, and a set of twelve cans is soldered in six seconds. As soon as soldered, this set of twelve cans gives place to another set, and so on continually.

In many cases mere drying is a sufficient preservative process for vegetables. These foods generally contain constituents more stable than those which occur in animal tissues, so that they are easier to preserve than meat. Moreover, vegetables as a rule (though there are some exceptions) contain less water than most animal foods, and this makes them more easy of preservation. Whilst the more expensive kinds are preferably preserved in the moist state as described in the preceding section, the commoner kinds of vegetables can very well be kept in an almost unchanged state for considerable periods by drying and **compression**. This method has the great advantage of largely reducing the weight of the vegetables, and so cheapening the cost of transport; whereas in the case of goods tinned or bottled in water, the weight is, on the contrary, much increased. But of course the advantage in the matter of retaining the flavour rests with the goods preserved in the moist way.

The compressing of the vegetables is effected by first abstracting a certain proportion of the water by heat, and then putting the partly-dried vegetables in a hydraulic press. Good sound plants are chosen, and these are prepared just as they would be if required for cooking at once—

Compressed Vegetables.

The Compressing Process.

namely, by washing them free from grit and cutting away the tough and stringy parts. They are then dried in a current of warm air, being spread out in the drying-room on wicker frames or plates of perforated metal. The temperature is arranged so as to be from 120° to 140° F., the latter being considered by some authorities as much the better, since it is high enough to kill most of the ferment spores, and at the same time to coagulate the vegetable albumen, thereby facilitating the preservation and retaining the flavour. In large factories four drying-rooms are generally kept going, one cooling whilst another is heating, and one being emptied or filled whilst the others are in full draught. A fan, or in some cases a chimney-stalk, is used for drawing off the warm air and moisture; and the hot blast can be turned from one room to another as desired. If the vegetables are made too dry they cannot be satisfactorily pressed afterwards: they are prone to crumble in the press. The proper point is reached when they have well shrunk and have lost about 80 to 90 per cent of their original weight, but have not yet become brittle. At this stage they are piled in layers under the press, the proper thickness of layer being obtained by putting in iron plates at such distances that the layers of vegetables shall be about half an inch thick after the pressing is done. The pressed cakes are sometimes cut up into tablets by a stamp after leaving the press, and sometimes half-cut across during the act of pressing, so that they can be easily broken into tablets afterwards. The portions thus obtained are generally arranged so as to be about an ounce in weight, and are intended to furnish a meal for one person, so far as vegetables are concerned. For retail sale each portion is wrapped in paper, with directions for use.

Compressed vegetables are sometimes objected to as having a hay-like taste when cooked. This appears to be due, not to anything inherent in the process, but to the preliminary drying having been carried out at too low a temperature. The taste of hay in such vegetables is considered to be caused by certain fermentative changes which occur in the albuminoids, but if the drying-temperature is sufficiently high it coagulates the albumen, and prevents or retards the fermentation in question.

It may be mentioned that other foods besides vegetables are now compressed. Thus, apples, beef, and eggs are prepared by

what is known as the "gye process", and are sold as "compressed fresh foods".

Many preparations of vegetables which are dried but not compressed are now on the market. They may be a single vegetable, like dried potatoes, or mixtures of two or several vegetables. One of the best methods of preparing these is to first cook, or partially cook, them with high-pressure steam, and then dry them with hot air. They are largely put up for ships' stores and for military rations. Five or ten per cent of salt is sometimes added. **Dried Herbs** are bottled by some English firms, the chief being Marjoram, Mint, Parsley, Sage, Thyme, and Mixed Herbs. Mixtures of herbs and spices are also put up for special purposes, *e.g.* for use with turtle.

Compressed or dried vegetables should always be kept in a dry place. They are very liable to absorb moisture in a damp room, and will quickly become mouldy and unsaleable.

The normal proportions of water and mineral matter in these preparations will be gathered from the following analyses:—

	Water.	Mineral Matter (Ash).
Dried vegetables, compressed or not ...	9 to 12 per cent. ...	3 to 6 per cent.
Julienne mixture ...	12½ " ...	4 "
Dried and salted vegetables ...	12 " ...	15 ¹ "

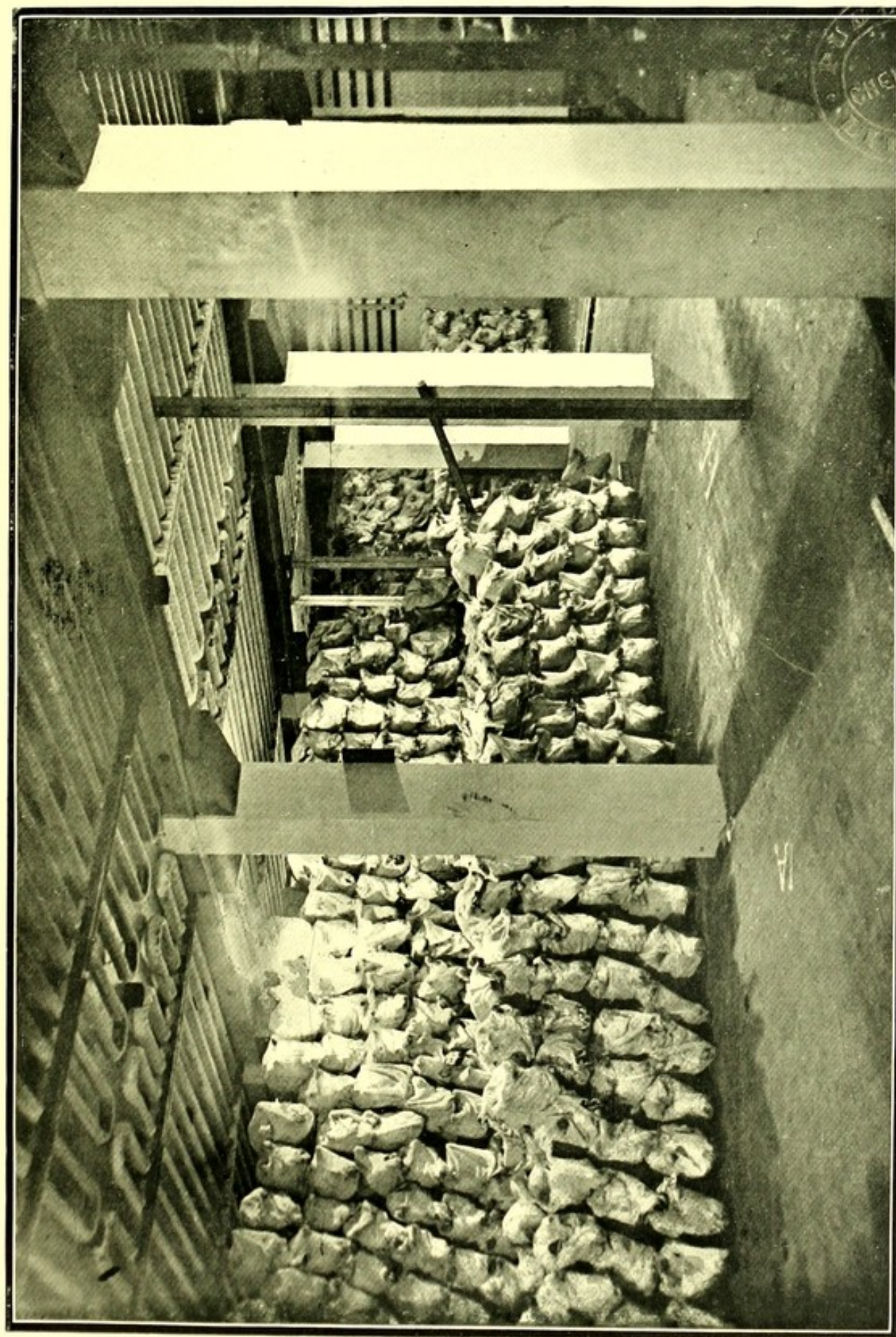
12. COLD STORAGE

It is now a very common thing for retail grocers, provision merchants, and butchers to employ the principle of cold for the preservation of food, with the object of avoiding the loss caused by stock spoiling, or of prolonging the marketing season, or of enabling themselves to choose their own time for selling. Many retailers nowadays—more especially in America—have their own refrigerating plant and cold chambers; others use the public cold stores now found in many towns and frequently owned by the municipal authorities. Other shopkeepers employ a refrigerator or ice-box, which might be compared to a cupboard or sideboard, made cold by being packed with ice. In the old days a good cool cellar was the stand-by of the shopkeeper dealing in meat; to-day,

¹ Including 11 per cent of salt.

COLD STORAGE VAULT

The accompanying illustration shows a typical vault or chamber at the important cold stores connected with Smithfield Market, the great centre of the London meat trade. At Smithfield are the London Central markets for meat, poultry, provisions, and fish, all owned and controlled by the Corporation of London, who levy a toll of a farthing on every 21 lbs. of meat, poultry, or provisions, and a toll also on fish-laden vehicles and fish. In such a market cold storage is a most important factor, and every year sees a growing demand upon the space available. Respecting the methods of conducting cold storage chambers full information will be found in the text.



From a photograph by J. H. Pledge

A COLD STORAGE VAULT, SMITHFIELD STORES, LONDON

when small houses and shops are frequently built without cellars at all, the use of a meat-safe kept cool by ice is in summer an absolute necessity.

The uses of cold for meat preservation being so generally known and recognized, therefore, we are not concerned to recall those "leading cases", as the lawyers say, of the mastodon embedded in the ice and thereby kept so fresh for thousands of years that the dogs of the hunter who found it when the ice thawed ate the flesh greedily; and of the lost Alpine traveller whose body was for thirty years saved from decay by the ice of the glacier in which it was found. Decomposition being due either to chemical action or to the activities of micro-organisms under certain conditions, we have to prevent those conditions being brought about, and the modes of prevention are to exclude air, heat, and moisture. Air or water may convey the minute germs of putrefaction, and heat may facilitate their action; but a certain degree of cold either kills or incapacitates them so that the meat or what-not keeps fresh. There being certain well-ascertained ways in which cold may be used to this end, the next question is how to produce the cold. An American named Gorrie in 1845 invented a cold-air machine which produced cold by applying a simple but most important natural principle—the principle that when air, gas, or some volatile liquid is expanded, it draws heat out of the substance surrounding it. Air, as most of our readers know, is composed of two gases, and is so elastic that it can be compressed into a liquid—a great quantity of air into a small quantity of liquid; or, on the other hand, it can be expanded by heating it so that it becomes thinner and thinner and lighter and lighter, until a bag of it, such as a fire-balloon, will rise high towards the sky. In gases or liquids at a given density, or state of "thickness", as people say, a certain proportion of heat seems always to reside and to be necessary. When we squeeze the gas or liquid into a smaller bulk we drive out of it a part of this latent heat, a part proportionate to the lessening of the bulk. If now we expand the gas or liquid so as to make it thinner than before, it seems to be under an imperative necessity to get back the lost heat, or more, in proportion to the thinness, and as the gas can only acquire this heat from the surroundings, the latter are thereby cooled to that extent. This,

The Science of
Cold Storing.

Machines for
Cold Producing.

in as simple terms as possible, is the process of refrigeration. Gorrie compressed ordinary air, dried it, and then expanded it, after which he discharged it into a cold room. The air-compression machine had been invented by Jacob Perkins, an American, in London in 1834. In 1857 James Harrison of Geelong brought the system into its commercial stage. In 1876 Linde of Munich applied the same principle in a machine for using ammonia instead of air; and in 1881 Raydt invented a similar machine for carbonic anhydride. In both these latter machines the ammonia gas or carbonic gas is compressed into a liquid and then turned into vapour. Another machine invented by Windhausen in 1878 is called the "absorption" machine; its principle being to let the expanded ammonia come in contact with water, then driven by heat from the water, and then condensed into a liquid.

In a special report to the Foreign Office (1900) the British Consul at Chicago states that in 1886 the first mechanical appliance for artificial refrigeration was erected in New York, and three years later in Chicago. This was the Pontifex machine, and from it all the other systems, which are now more widely used, have sprung. Cold-storage houses, where natural ice is used as the refrigerating medium, are rapidly giving place to artificial plant, and the making of ice has become a very important industry. The various uses to which refrigeration can be applied render it one of the most valuable agents in the preservation of all kinds of food products and other commodities, such as the seasoning of lumber, preservation of woollens and furs, the storage of dynamite to keep it at a safe temperature, in arboriculture to check the budding of trees, &c., brought from the Southern States in early spring. In oil-refineries, glue-factories, india-rubber works, packing-houses, dwelling-houses, hotels, restaurants, distilleries, breweries, soap and chocolate factories, and wine merchants' establishments, the science of artificial refrigeration is carried on successfully. Little has, however, so far been done in the application of artificial refrigeration to hotels and dwelling-houses during the summer months, as it is generally considered too expensive. In one of the Chicago clubs the system is practised with good results. A 20-ton machine is used, the refrigerating agent being anhydrous ammonia. The cooling pipes are placed in the store boxes, and immediately over the inside of

Refrigeration
in Chicago.

the drawers in the kitchen, where the meats and other articles of food are kept ready at hand. Meat is kept here at 35° Fahr., and milk, eggs, butter, and vegetables at 44° . The kitchen is on the fifth floor of the building. The consumption of coal per day is about 2 tons.

In Chicago there are four large cold-storage houses, representing some millions of cubic feet, each carrying on an extensive business in meat, eggs, poultry, butter, cheese, and fruits, &c. The systems in use in refrigeration are: The Systems
in Use.

(1) direct expansion by the use of either carbonic anhydride, *i.e.* carbonic acid gas, or anhydrous ammonia; (2) brine circulation or indirect expansion; and (3) air circulation. There are three processes in operation in mechanical refrigeration, namely, compression, condensation, and expansion of the gas. The compressor is a pump to compress the gas and force it into the pipes of the condenser under pressure. The condenser consists of coils of extra heavy iron pipes, in which the compressed warm gas is cooled by a continuous flow of water which liquefies the gas contained in the pipes. The expansion coils are continuous coils of pipes into which the ammonia liquid is carried from the condenser under pressure. As soon as the high pressure is removed the gas will expand to 1500 times its volume, drawing the heat from the air, thus producing a very low temperature.

In the **direct expansion** system the pipes through which the gas is allowed to escape from the condenser for expansion are placed either along the walls, or on the ceilings of the rooms to be cooled. In the **brine** or **indirect** system the gas is used to cool the water with a heavy solution of salt, contained in a well-insulated tank, through which the ammonia is expanded in coils of pipes. This draws the heat from the brine, producing a low temperature, and a brine or force-pump is used to pump the cooled water through the pipes around each room, thus absorbing the heat, and returning to the tank to be re-circulated. The brine, in the preparation of which a solution of chloride of sodium, or common salt, is used, should not flow faster than 60 feet per minute. Many prefer the brine system to direct expansion, contending that, should there be a leakage in the pipes, there would be an escape of ammonia, in which case a certain degree of danger would result. With the use of a brine

machine, in small plants, the compressor can be stopped for several hours after the brine is cooled, the brine-pump being kept working until too high a pressure is reached, when the compressor must be started again. On the other hand, it is claimed by the advocates of direct expansion that it is cheaper for small and moderately-sized plants, as the brine tank, pipe coils, and the pump to circulate the brine are dispensed with. In the use of **air circulation**, the air is cooled in a separate room, and circulated through the storage-rooms by means of rotary fans, and thence back to the cooling-room. These cooling-rooms contain pipes in which either ammonia, carbonic anhydride, or brine are circulated, thus cooling the air.

In the **compression** system the ammonia is pumped from the room in the form of gas, passes through the machine, and is compressed, after which it is condensed under high pressure, and—where an open-air or atmospherical condenser is used—water is caused to flow continuously over the pipes, thus carrying away the heat that has been released. The ammonia is then carried to the storage-rooms in the form of a liquid. When the pressure is released from the liquid it turns into gas, and absorbs the heat of the surrounding air. It is then pumped back to the compressor, and is condensed and liquefied ready for re-use. The same process is practised for carbonic anhydride or ammonia. In the **absorption** system the anhydrous ammonia, which is used as the refrigerating medium, is expanded in the same way, after which it is allowed to enter the absorber, where it comes in contact with water, forming aqua ammonia. From thence it is carried to a still or generator, when the ammonia gas is driven from the water, and is condensed and liquefied, ready to be used again. In the **brine** system special coolers are made, in which the ammonia liquid is expanded, and the brine is pumped through the coolers in opposite directions from which the gas is taken from the cooler by the compressor. The brine is pumped from the cooler, and in turn cools the rooms. It is then returned to a reservoir, warmed, preparatory to entering the cooler again. When the ammonia is compressed and liquefied it can be carried to any desired point, as the pressure on this liquid is in proportion to the temperature of the water used for cooling the condenser, and will vary from 100 lbs. to 200 lbs.

per square inch, according to the temperature of the cooling water.

At the St. Louis Refrigerating and Cold Storage Company's Plant, there is a street-pipe line system whereby the liquid ammonia is carried 5 miles from the factory, thus supplying with refrigeration the produce and commission men along the route. There are other cities in the United States where refrigeration is supplied in the same manner to hotels, private houses, grocers, butchers, restaurants, &c. There is no waste of gas, as the expanded ammonia is carried back to the factory by another pipe line, and so it is kept constantly circulating. This could not be done in using the brine system, because of the brine being heated before reaching the point where the cooling is to be effected.

The price of small ice-making or refrigeration machines depends upon the temperature required and the number of cubic feet of space to be cooled; in other words, the size of the machine required, and the amount of piping necessary. Price of Small Ice-machines. A 5-ton machine is considered the most satisfactory size for butchers' and grocers' shops. Assuming that a dealer or merchant desires to erect a cold-storage plant for his warehouses, he can reckon the tonnage of machinery required by ascertaining the number of cubic feet in his storehouses, and taking 1 ton to every 5000 cubic feet. A very compact German machine, introduced in 1903, is arranged to be propelled by gas, petroleum, or electricity.

There are small installations in this country, notably on game-preserving estates. A cold storage-room about 10 feet by 8 feet by 7 feet high, constructed throughout of non-conducting material, can be maintained at a temperature of 20° F. all the year round, keeping game, meat, milk, butter, &c., in perfect condition for months. A small quantity of pure transparent ice for the table can also be made. All this is effected by a small machine working five hours daily. The motive power at night is frequently used for dynamos for lighting the house after the refrigerator has ceased running. The cost of such an installation fitted up would not exceed £300.

Compression machines using carbonic-acid gas as the cooling medium are much in favour in the States for store-rooms of hotels

and restaurants, the harmlessness of the gas to victuals in the case of a leakage being its chief advantage. It is also odourless and non-corrosive. The cheapness of liquid carbonic-acid gas is also given as another point in its favour.

There is also a large domestic trade in refrigerators or ice-boxes. In the manufacture of these, two kinds of material are used, the exterior being made of quarter-sawn oak, or white-glazed tile, and lined inside with white-glazed tile. The ice compartment is placed above the space arranged for provisions. The sizes vary from 2 feet 11½ inches in length, 2 feet 2¼ inches in depth, and 6 feet 3 inches in height, to 4 feet 4¼ inches in length, 2 feet 2¼ inches in depth, and 6 feet 3 inches in height. Ice capacity of these boxes runs from 100 to 300 lbs., with shelf space from 12 to 18 square feet. Prices range from £10, 10s. to £35, 10s. An ice-box or refrigerator, specially made for the use of grocers for keeping butter on view, is described as weighing 980 lbs., holding 464 lbs. of ice; and it is 68 inches long, 39½ deep, 84 high. It has three rolls of glass, two thicknesses to each, so arranged that when they are opened the cold air is cut off and wastage prevented. At each end is an ice-door, and in the upper portion of the stand is a compartment, closed by double thick glass doors, in which are shelves for the display of fancy butter and similar goods, the idea being to make use of the box for display purposes in the middle of the shop. An American grocery journal remarks that: "The day is coming when a cold storage-room with plate-glass front will be the leading feature in grocery stores. It permits of the perfect preservation of perishable foods and their effective display, out of the reach of those who have a passion for handling things in sight, sampling fruits and picking at cheese. A roll-top refrigerator for butter, cheese, and eggs can be made a profit-paying investment, provided the glass is kept as bright as a diamond and the refrigerator sweet and absolutely clean. Few things so quickly disgust a customer as butter put up and delivered out of condition. The dealer can more than cover the cost of ice by increased sales if the refrigerator invites inspection."

In all parts of the United Kingdom cold stores either municipally or privately owned are now to be found, and can be used by traders according to a fixed tariff. In many cases the trader

can arrange to have at such a store a separate cubicle under his own key, and which can be regulated in temperature to suit his own requirements.

The charges vary little—so much per week or month. In London a ninth of a penny per lb. per month is the charge for cold-storing meat, butter, &c.; a pound of butter is stored for nine months for a penny. A general charge for *Butter* is 2*d.* per keg for one day, and 6*d.* for two to seven days, or 23*s.* 4*d.* per month per ton. *Cheese* is charged 3*d.* per cheese for the first month, and ½*d.* per cheese per week after. *Fish* is cold-stored at about 6*d.* a day or 1*s.* 6*d.* a week for a large box, and for small boxes in proportion; kippers, 1*d.* a week; crabs, 9*d.* a cwt. per week; salmon, 2*d.* a fish per week. *Fruit* rates are—plums, 1*d.* per basket per week; pears, do.; apricots, do.; apples, 6*d.* per barrel. *Vegetables*—beans, 3*d.* per bag per week; cabbages, 6*d.* per crate per week; other articles proportionately. *Game and poultry*—pheasants, 1½*d.* per brace per week; grouse and partridges, 1*d.* do.; hares, 1½*d.* each; fowls and ducks, 1*s.* per 2 cwts.; turkeys and geese, 2*d.* each; rabbits, ½*d.* each. *Milk*, 4*d.* per can for two days; 6*d.* for three to seven days. *Eggs*, 2-cwt. boxes, 1*s.* to 1*s.* 6*d.* per week.

As the cost of working and maintaining a cold store is much the same no matter how many people make use of it, the suggestion is offered that in some towns a few retailers might readily combine to run their own cold store. In such a case the division of the room into separate compartments, in which the temperature could be adjusted to the needs of the user, would probably be found necessary, there being considerable diversity in the temperatures required for different goods. On this point we cannot do better than quote further from the excellent report already mentioned as supplied to the Foreign Office.

Meats of various kinds are stored at temperatures varying from 30° to 45° Fahr., as shown in the following table:—

Degrees Fahr.				Degrees Fahr.			
Brined meats	...	...	35 to 40	Liver	...	...	30
Beef, fresh	...	...	37 „ 39	Mutton	...	...	32 to 36
„ dried	...	...	36 „ 45	Ox tails	...	...	32
Hams	...	...	30 „ 35	Sausage casings	...	...	30 to 35
Hogs	...	...	30 „ 33	Tender-loin, butts, ribs	...	...	30 „ 35
Lard	...	...	34 „ 45	Veal	...	...	32 „ 36

Fat meats are greatly improved by freezing, as the vesicles are broken, and the meat is thus made more tender. The tender-loin was formerly considered the best part, but is now almost unsaleable, as the sirloin, by freezing, becomes as tender and has a better flavour. Liver is harder to freeze than the meat itself. It is packed in boxes of 100 lbs. each, and takes 48 hours to freeze at a temperature of zero, and would not freeze any sooner if placed at 10° below zero. In Chicago, meats are generally carried at zero. After being thoroughly frozen they are held at 15° to avoid shrinkage.

Fish and poultry are treated similarly. Meat will shrink about 1 per cent, and fish from 2 to 6 per cent. This is the moisture which is taken from the surface and forms in frost on the pipes of the room. The correct temperature at which fish should be kept, after first being frozen, is said to be 25° . The largest fish storage-house in Chicago maintains a uniform temperature of 18° . Fish, after being frozen, is subjected to a process known as glazing, to prevent shrinkage. It can be preserved for an indefinite period, though six to eight months is generally considered long enough, being frozen in the spring and taken out during the scarce season. Fish may be packed in 50-lb. barrels between layers of crushed ice, the barrels being perforated at the bottom. Oysters will keep for one or two months at 40° , but should not be frozen. Average temperatures:—

Fish, dried	...	...	...	...	35° F.
„ fresh	...	...	...	...	25
Oysters, in shell	...	...	...	...	40°
„ in tubs	...	...	...	...	35

Temperatures (in all cases degrees of the Fahrenheit thermometer) for *fruits* and *vegetables* are as below:—

<i>Fruits.</i>				<i>Vegetables.</i>			
			Degrees Fahr.				Degrees Fahr.
Apples	...	...	32	Asparagus	...	...	34
Bananas	...	...	35	Cabbage	...	...	33
Berries (for three or four days)			35	Carrots	...	...	34
Fruits, dried	...	...	38	Celery	...	...	34
Figs, dates, &c.	...	...	35	Beans, dried	...	...	32 to 40°
Grapes	...	...	32 to 40	Corn, dried	...	...	35
Lemons	...	...	35 „ 45	Peas, dried	...	...	40°
Oranges	...	...	35 „ 36	Onions	...	...	32
Peaches	...	...	35 „ 45	Parsnips	...	...	34
Pears (for about one month)			38	Potatoes	...	...	35
Melons (for three or four weeks)			32	Tomatoes	...	...	35

The average temperature for apples is 32°. They are kept in barrels or boxes, and occasionally in bulk, and will, if good fruit, keep for one year. If stored during the month of October at 2s. to 3s. per barrel of 150 to 160 lbs., they will sell in May at 9s. The barrels should be placed on their sides. The weaker, though not necessarily the poorer quality, are sold first. Grapes should be very carefully selected and packed, and no bruised or decayed berries overlooked, as they would spoil the whole lot. They will deteriorate after cold storage. Malagas being hardier than Concords will keep longer, and retain their flavour better. Pears should be stored when firm, and used soon after being taken out, the temperature to be higher than for apples. It is recommended that all soft fruits be placed in cold storage when ripe. On being removed from cold storage, fruit should be allowed to warm gradually. Moisture should not be allowed to deposit on it, but if wetting cannot be prevented, the fruit should be spread out and dried quickly. Onions will keep for some months if put in sound and dry and packed in crates. They should not be stored with other articles. The following is a miscellaneous list:—

Degrees Fahr.				Degrees Fahr.			
Canned goods, fish, fruit—				Nuts, in shell	...	...	35 to 38
Fish	...	...	35	Maple syrup, sugar...	...	...	40 „ 45
Fruits	...	...	35	Oil	...	...	35
Meats	...	...	35	Poultry, freezer	...	...	5 to 10
Four and meal	...	...	40	„ cooler	...	...	29
Apple and peach butter	...	...	40	Syrup	...	...	35
Chestnuts	...	...	33	Tobacco	...	...	35
Cigars	...	...	35	Beer, ale, porter, &c.	...	...	33 to 42
Furs, woollens, &c.	...	...	25 to 32	„ bottled	...	...	45
„ undressed	...	...	35	Cider	...	...	30 to 40
Game, freezer, long storage	...	...	0 to 5	Ginger ale	...	...	36
„ cooler, short storage	...	...	27	Wines	...	...	40 to 45
Hops	...	...	35	Claret	...	...	45 „ 50
Honey	...	...	37 to 40				

The cold storage of *butter* and *cheese* (eggs are fully dealt with in the chapter on Eggs) is, of course, a subject in which many grocers and provision merchants are specially interested. A Californian dairying authority describes a method used by one of the largest creameries of storing butter during the flush season for the purpose of speculating against the advancing market. The butter is packed solidly in six large tanks or vats.

Butter in
Cold Store.

6 by 8 feet and 10 feet deep. These receptacles resemble silos, and are made of brick and concrete. During each of the last four or five years these have been filled with butter until the advance in the prices warranted putting it on the market. The butter is then taken from the tanks, moulded into squares, and shipped. In the Foreign Office report quoted above it is mentioned that butter may be kept either cool or frozen, but that the latter process is more in practice in Chicago, the flavour and quality being well preserved. Ordinary cold-storage butter may be kept at 32° to 35° Fahr., while for freezing, a temperature of 20° is recommended, and when carried for any length of time, say four or five months, the prevailing temperature in Chicago is 5° below zero. In America it is found that June is the best month to store butter, which, made in this month, is packed in wooden tubs, spruce or ash being preferred. These tubs are sometimes covered with burlap to preserve their cleanliness. When taken from the freezer during the autumn months or early winter it is allowed to thaw in the natural way, the flavour, it is asserted, being stronger and more developed than when frozen. Butterine and oleomargarine will carry at about the same temperature. In 1903 some discussion took place in the correspondence columns of *The Grocer* as to the **temperature for butter**, and Mr. Ayer, a large Montreal exporter, wrote:—"Our American (U.S.) cousins can teach us a lesson in keeping butter. During the year 1902 more than 500,000 packages were put away in cold stores in their large cities and carried at the uniform temperature of zero (32° below freezing-point) and kept there for from four to six months; when taken out it was practically as good as new-made, and sold within 2s. 6d. to 5s. of the freshest and best arrivals. I have seen thousands of packages of butter frozen for months at a very low temperature, as low as zero, which kept its sweetness and flavour, and was practically as good as new-made, at the end of the period. After a long experience and many tests I now assert that whilst butter for consumption within fourteen days of being made may be kept in a higher temperature, if the butter is to be kept for a longer period, say for one month, it should be kept under 25° , and if for a still longer period it should be kept at 15° or less, according to the length of time it is to be held. The principle is a simple one. Exposure to air causes butter to deteriorate. The lower the

temperature the less the deterioration. If frozen as soon as made, say to under 15° for a shorter period, or down to zero for a longer period, the butter is rendered impervious to air and all outside influences, and the sweetness or freshness and flavour are retained. Thus, when frozen at a low degree and thawed out, as in the case of New Zealand and Australian, the butter appears and keeps as if it was fresh made, whilst if the same butter had been held at 30° it would not have kept perfect, and would have opened unsatisfactorily and deteriorated very rapidly." On the other hand, Mr. John Burn, of Leith, wrote:—"I give it as my opinion that butter stored in good condition, in good packages, and held at a low temperature, (unfrozen) will keep in like good condition for a lengthened period, and when taken out of cold store will maintain such condition longer than if frozen. That is my experience and the experience of others in the trade whom I have consulted."

As regards **cheese**, the Chicago experience is that cheese will keep one year, if necessary, in cold storage. Temperature, 31° to 32° , with a variation of not more than 1° . Cold-Storing Cheese. It should be in ripe condition before being stored, which is generally from June to January. Dampness should be excluded from the room, otherwise the cheese will become mouldy. In England the cold storing of cheese is not as yet very generally practised, and in 1902 the mishaps which befell a retailer in a rather large experiment of that nature were the subject of litigation. From the evidence it appeared that in the opinion of experts the proper temperature for the storage of June-made American cheese was 38° to 40° , and that a quantity of such cheese which was stored at a temperature of below freezing-point was thereby spoilt. The jury gave damages to the owner of the cheese as against the proprietors of the cold store, but this was reversed on appeal. In the United States and Canada considerable attention has been given of late years to the subject of **ripening cheese in cold storage**. Experience has shown that if cheese is ripened at high and inequable temperatures its flavour, texture, and keeping quality may be adversely affected. By reducing the ripening temperature from 65° to about 40° , and placing the cheese in cold storage within a few days of leaving the press, improved results have been obtained, the value of the cheese per lb. being raised and the commercial "life" of the cheese

lengthened. Describing experiments at the Ontario Agricultural College, *The Times* of July 28, 1902, said:—"The saving of loss in weight, by ripening at an average temperature of 37.8° for the season, was upwards of 2 per cent on cheeses weighing about 30 lbs. each; in a large factory this is an important item, and would alone meet the cost of cold storage for cheese in hot weather. The quality of the cheeses was found to depend upon the order, as regards time, in which they were placed in the cold storage, those put in directly from the hoops ranking first. An increased yield representing at least 1 lb. of cheese per 1000 lbs. (equal to 100 gallons) of milk may be expected as a result of modifying the method of manufacture and ripening at a lower temperature than has been usually supposed necessary. The assertion that cheese kept in cold storage for any length of time will quickly spoil when exposed to an ordinary temperature was not corroborated, but further experiments are in progress on this point. A cheese transferred directly from the hoop into a dry box and placed in cold storage, without any turning, ripened satisfactorily, though with a large amount of mould. A cheese put into a box after ripening in the ordinary room for a week gave similar results. Undesirable bacteria such as are found in cheese seem unable to grow at a temperature of 38° , and consequently bad flavours in cheese, caused by bacteria, do not increase in cold storage." It may be added as regards storage that great care should be taken to avoid storing together articles which may be injuriously affected by each other's flavours. Cheese, for instance, may spoil butter.

13. THE PROVISIONS HAND

The provision department of an ordinary grocery business is that which usually gives the proprietor most anxiety, and consequently most demands his constant care and attention. This being so, how necessary is it that those whom he chooses to assist him in working it should be men thoroughly up to their work and willing to carry out his plans and instructions. One might almost paraphrase the old proverb and say, "Look after the provisions, the groceries will look after themselves". We will endeavour to sketch, therefore, an approximation to an ideal pro-

**The Ideal
Assistant.**

vision hand and what duties he ought to perform, with a view to making his department prosperous.

To begin with, he should have a good head for figures, for much calculation will be required of him, and if he has profited by his mental arithmetic class at school so much the better. He must be clean, indeed, have a great abhorrence of all dirt, for it is a primary qualification of a provision department that brightness and cleanliness shall reign in it. Otherwise, customers will turn their eyes—and nose—away, no matter how good be the articles with which the department is stocked. The assistant must also possess a not insignificant degree of patience and obligingness, for customers are apt to display much care in the choice of the particular cut of bacon they desire. He must have persuasiveness that will induce a client who wants “back” to try for this once “streaky”, when his counter is inclined to be overloaded with the latter portions of the side. He must have strength of body, and especially of wrist, that the knife may make no uncertain and ragged entrance through his want of decision and dexterity. Nor must we forget to mention that the provision assistant should have taste and “knack” in making displays of goods, and especially in dressing the window.

Of course, the arranging of the provision window will be one of his duties, and will call for the exercise of much taste and judgment. He will not make a heavy-looking display in summer. In winter when the goods he handles keep better in the keener air and lower temperature, he will make a “stocky” window. Piles of Cheddar cheese and sides of bacon with the fresh-looking straw between them, rows of hams, whole casks of butter and boxes of fresh (all neatly ticketed) will invite the passer-by to step in and get a taste of the quality. In summer our assistant will seek by interspersing a few fresh green plants among less imposing piles of lighter goods to give a suggestion of daintiness and coolness to cream, fancy cheese, potted meats and tongues, cooked hams, smoked sausage, and other incentives to jaded appetites at breakfast or luncheon time. He will, however, keep an eye on all, that nothing be in the window too long, and all perishable lines he will withdraw at night, and relegate them to the cool slate shelves of the cellar ready to come out freshly for the next day's trade.

The Provision Window.

On Mondays he will superintend the thorough scrubbing down of all parts of his counter, shelves, butter-blocks, and utensils. He will see that the porter or warehouseman, whose duty it is, does not shirk any difficult corner, removing all goods which require it, and rearranging them when the shelves, &c., are dry. He will then sort the eggs, noting what stock requires renewing, put his cut bacon in order, and arrange the cheese and smaller goods for the day's trade.

We must here call attention to what is a very important part of the provision assistant's duty, namely, stock-taking. Though

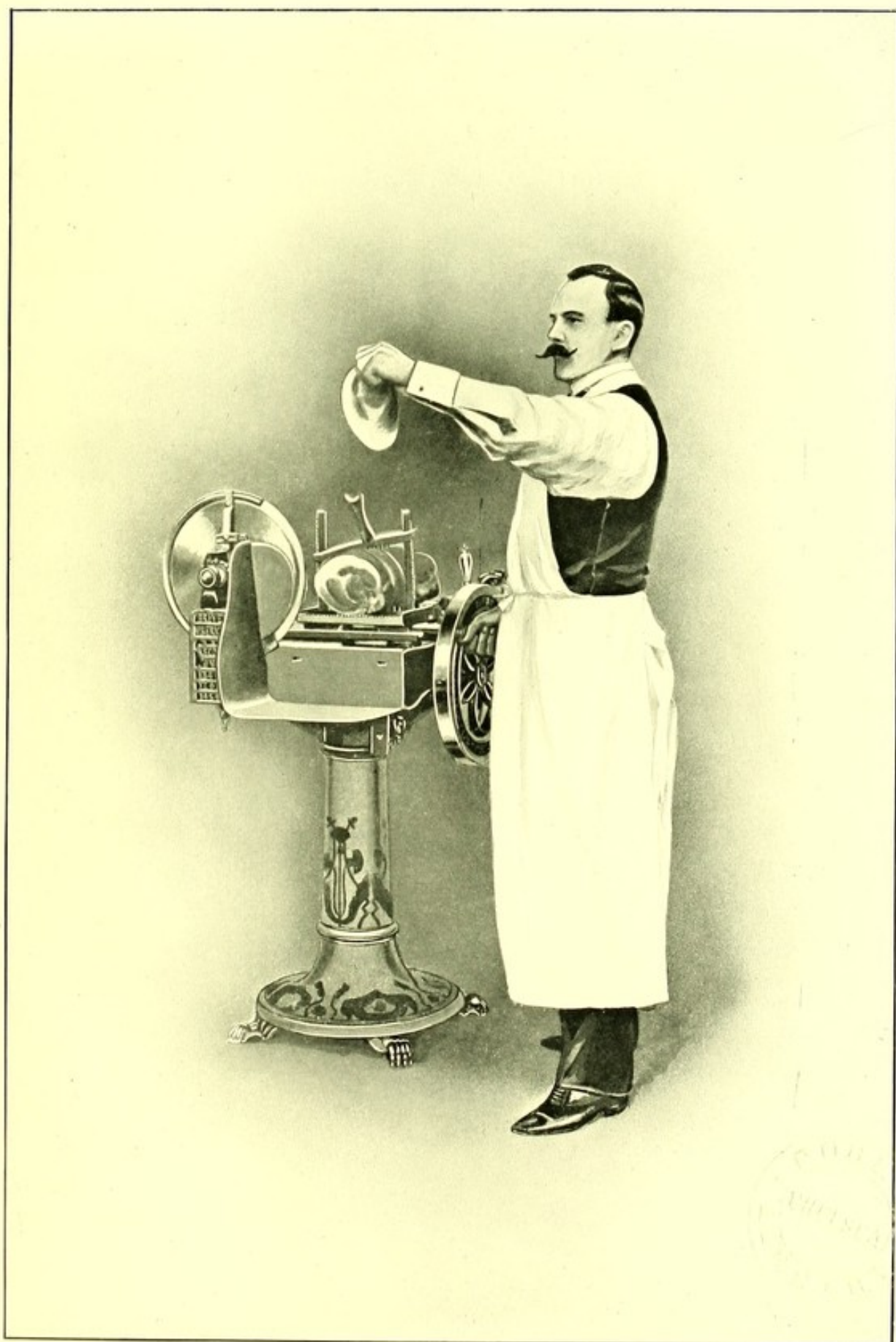
once in six months, or once in three months, may be as often as it is necessary to take the grocery stock, yet it is the practice of all those who wish their provision department to yield the best result to take stock every four or two weeks, and even weekly. Of course to do this, cash-takings for provisions must be kept separate from all others, and the lines from this counter entered in the ledger must be extracted day by day and totalled, so that at the end of the week an account can be had of all outgoings in the department. The incoming goods must also be entered up in a stock-book, and every Monday morning (in the case of a weekly stock-taking) all goods in stock must be carefully weighed. By these simple means it can soon be discovered whether the provision department is making any gross profit, and what that profit is. Thus a check on the method of the salesmen, the prices which are obtained for the various cuts of bacon, the butter, cheese, &c., is had, and abuses, mistakes, or bad management are discovered in ample time to apply a remedy.

Another very good practice will commend itself to the assistant in this department, which, when the prices of bacon fluctuate, he

will use to discover the cost at which he ought to sell the various cuts in order to make a profit. He cuts up a side, first weighing the whole and calculating what it cost. He then weighs each part of the divided whole, reckons what each piece will fetch at the proper selling price, and totals all up. The cost price subtracted from this total will then tell him how much profit the side will make if no waste ensues. The question of waste, as all traders know, is important, and the good provision hand has always this in his eye when he is at work. A good rule is not to cut up more than the day's probable sale will warrant.

BACON-SLICING MACHINE

The ingenious machine illustrated has recently excited much attention among grocers and provision dealers, owing not only to its practical use in slicing bacon, bread, or meat, but because it has been found highly efficacious as a window attraction. The public always like to inspect working machinery, and the extreme nicety with which this machine does its work invariably commands admiration. When first introduced, shown at work in the window, it attracted crowds.



BACON, BREAD, AND MEAT SLICING MACHINE

(Berkel's Patent)



He will, for instance, not scruple to make a good display on Friday or Saturday, while staying his knife in the early part of the week. In any case, he will endeavour to wind up the week with as little cut "stuff" as he possibly can—in fact, with as little stock as possible—in order that fresh supplies may be ordered for delivery on Monday or Tuesday, and that as little as possible may be left to take in to stock on Monday morning. But, of course, the nature of the trade of the locality will be his guide in this particular as well as in others.

For the rest, the provision hand prepares the goods ordered in his department for despatch with the general orders from lists supplied him by the canvassers. He also mentions to these latter from time to time the kind of goods, particular cuts of bacon, new lines on his side, &c., which it would be well for them to "push". He acquires by experience and observation a knowledge of regular customers' peculiar likes and dislikes, and thus is able always to see that they have what they want. In fact he takes that intelligent interest in his work, without which no provision department, or any other business, can possibly become as successful as it ought to be.

14. HANDLING PROVISIONS

In supplement to what has already been said, the following notes on the subject of "Cutting up provisions", being written by a practical salesman, will doubtless be of interest.

It is often the case that when a youth has entered into an apprenticeship as a grocer and provision-dealer's assistant, he gives a decided preference to the grocery department, with the result that in after years, when perhaps he wishes to establish a business of his own, he finds that he knows far too little about the very branch of his trade which, if well understood, may be made to pay the best, but which, without practical knowledge, is liable to become a source of loss instead of gain. It is therefore recommended that every young aspirant, who hopes for future success, should see to it that one year at least of his apprenticeship is spent exclusively in the provision department. Meantime not only assistants, but also young business men will doubtless

appreciate a few hints that may lead to a sounder judgment in dealing with provisions.

There is an adage, oft repeated, that "an article well bought is half sold", so that we shall do well in the first place to give our attention to buying.

The **best kinds of bacon** to purchase so as to maintain a high-class trade are undoubtedly Wiltshire, Irish, or Danish. Wiltshire is usually the finest in flavour, if at times a trifle too salt for the London palate; Irish, however, is nearly always excellent, mild, and nice-looking meat; as also is Danish. A peculiarity of the latter is that it fries to more waste of fat than the other two; but, as it can usually be purchased 2s. per cwt. cheaper, it is a useful selection for a medium trade. But for a ready-money trade among the working classes, it is essential to study the capacities of their purse, and provide something cheaper. Canadian Pea-fed meets

Bacon this demand. Being small meat it has small bones, and
Buying. cuts up economically, and is of a lean, rosy appearance. Note, however, that the colour soon goes off, so that the bacon should only be cut when the brisk trade commences. Russian is just now (1904) bidding for favour, but connoisseurs do not relish it, as, like mutton suet, its leaves its flavour on the tongue. In selecting bacon for quality, choose that which has a smooth rind; also let the rind be thin which peels off easily; no unsightly teats down the streak, nor should it be very broad across the side. If you note these conditions, you will get young meat tender and good.

Buy your bacon, if possible, once a week, not once a month, as it dries away quickly, especially if hung up on a rail. This method of hanging is best in summer-time; but in winter, during frost, I would advise leaving it packed under a wrapper, with straw between each side. Green bacon, however, is always best hung up in an airy place.

When pork is cheap it pays to go to market and make a few purchases with a view to curing your own bacon for the time being. In this manner you can often save money, and also please your customers, who usually have a decided preference for local productions. When the sides of the pig are cut down, saw off only a small back-bone, leaving plenty of lean on the side. Lay the sides in a trough, and spread over them some common salt, borax, saltpetre, sal-prunella (refined saltpetre or nitrate of potash),

and bay salt. Turn your meat over every day for a week, rubbing the mixed salt well in; then hang up your sides for another week. After that you may begin cutting up, and the flavour of this meat will probably get you new customers. (For further information on curing, see chapter on BACON.)

Canadian and States hams and bellies should be washed on arrival to remove the borax used for packing them. The bacon should be merely dipped and washed as taken from the box. After this, some retailers throw the meat into large butts of water to soak for four or five days; then take the pieces out and beat into shape, and hang upon hooks from a number of cross-bars in the drying-room. But soaking is not suitable for all bacon; for Canadian Pea-fed it is not recommended. Always sell the driest bacon first. Canadian bacon requires a quick sale, as, like Danish, it is mild-cured. Borax-cured hams or bacon will not, of course, keep nearly so long as salt-cured meat. During hot weather rub into the hocks and gammons a preparation of borax, pepper, and ground rice, to preserve from taint, and to keep off the flies.

In **cutting up a side** of bacon cut it on the slant, making the first division beside the first short rib. Cut your gammon off within half an inch of the knuckle, so as to get a good lean loin. Cut the flank narrow and small, so as to leave more meat on the most profitable cut. Do not let flanks accumulate, but sell off at some price while yet fresh; they will sell readily at $4\frac{1}{2}d.$ per lb. the first day. Or if you have a trade for cut rashers, mix them off with odd pieces of collar at about $6d.$ per lb. It is often difficult to sell "streaky" as fast as the back parts, but customers should be educated to take equal quantities of each, so as to average the sales. In cutting up rashers from the back, slip the point of the knife under the bone, and turn sideways while you cut the intervening slices between the bones; this will dispense with the wasteful practice of taking the bones out. Bacon is sold most fairly when sold—as bought—with the bones included. When the rind is hard, leave it on till you have sliced all the rashers required; then lay the blade of your knife flat, and slice off the rind in one piece. This can be done very neatly with practice, and it will save customers cutting the rind from every rasher, also save your time and patience, and the edge of your knife.

Bacon
Cutting.

Should your gammons and hocks hang on hand, slit them up from the knuckle—inner side—and take out the bones, then roll them with strong string; being lean the rolls can thus be cut up easily and profitably into rashers. With a view to work off to advantage all odd pieces, a few dishes should be used for cut rashers, which, being often replenished, will command attention, and the prices realized will be much better. It is well to ascertain the average selling price when the market changes. Cut up a complete side into saleable pieces, and reckon up the total at fixed rates, deducting amount of cost, so as to show the net profit. You will not often realize more than 3s. 6d. a side, except when prices are low; then should be your "harvest time".

In the Cheese department it is a regrettable fact that America should have the monopoly of patrons among the cheese-eating public. This is certainly not because people like Cheese. American cheese best, any more than epicures prefer old mutton to tender lamb; the reason lies in the fact that cutting grocers have promoted a craze for economy, and housewives now take it up as a hobby. Their worthy husbands still prefer a nice succulent ripe British Cheddar to the imported article, and it is my conviction that if provision merchants were to promote the sale of British Cheddar, Leicester, Gloucester, and Derby cheese, a large business would soon be established for these. In buying these cheeses select those with solid edge and of close texture, having a clean mild flavour at the commencement of the season; but riper selections may be bought for immediate use. Small retailers may note that remnants of these can often be bought as cheaply as Canadian, and sell at sight. All cheese must be stored in a dry, cool cellar, and turned over every day or two, and well brushed. Gorgonzolas have been much cut down in price, and if this is persisted in, the public will ultimately lose their liking for this class of goods, and will only eat it when they go on the Continent and get the richer productions. These cheeses, like Stilton, need some care, and should only be bought as requirements demand. It must be recognized that the Canadian cheese is profitable cheese to retail; and on their first arrival the weaker makes can be bought at a low figure, and sold off sharply at a good profit. But only attempt to stock those that are well made, clean in flavour, and that do not cling to the cheese iron when tasting.

Some cheeses are either bitter or hot in the mouth; these go very rank if kept long.

Where practicable it is best to keep pieces of cut cheese in a glass case, as the wind soon dries it up and spoils the appearance, a semicircular glass-fronted case is recommended for this purpose. Some provision merchants have a glass front put to their counter and stack piles of cheese among tinned provisions. This plan looks very effective, and keeps the goods clean and in good condition. Cut pieces, however, should be freely shown in the window and otherwise on busy days.

The **Butter Trade** has many local characteristics. In the suburbs and most large cities the favourite butter is Danish, in large casks, while Irish is often a good second, if not ^{Butter} better; but in the spring of the year Dutch is nearly as ^{and Eggs.} good, and can be bought much cheaper. If butter is patted up, the pats should be washed in boiling water every night or morning, and kept in cold water in which is sprinkled a little salt and borax. For a small trade the Dutch or Danish rolls are suitable; but in country places customers prefer local dairy butter, or, as a substitute, Dorset or Devonshire. These can usually be bought at from 10s. to 12s. 6d. per doz. lbs. Normandy "baskets" have a nice flavour, as also have Brittany; but these must be only bought for a quick ready-money trade. Irish butter improves every year, and is now (1904) coming in, mild and of fine texture. The flavour is exquisite in the finest grade. Irish should take the place of Danish when the prices are more favourable.

All butter that has been turned out in the shop during the day should be removed into the cellar for the night, as it will thus preserve its sweetness much longer.

In **Lard** there is nothing better than home-made, such as is procured in the neighbourhood of Leicester, where a special study is made to produce a good article. Next to this in quality comes Waterford, and as a good useful line at a low price the Chicago pails are hard to beat.

The **Egg Trade** is an uncertain one. Those are fortunate who get a good supply of new-laid. The next in value are Irish, Danish, and Austrian, which, if bought from latest arrivals, are reliable and saleable. In the autumn of 1903 there were strong complaints in the trade press that the north of England was

deluged with Russian eggs that had been shipped into Denmark, repacked in Danish wood-wool, and reshipped to England as Danish eggs. In the same manner Styrian eggs are counterfeited by Austrian and Roumanian. There is also reason to suppose that cold storage is carried to an illegitimate and imprudent extent in the egg trade, with the result of lessening the demand by disgusting the consumer.

The class of goods handled in a provision department, as in others, will depend upon the locality, but the retailer should always endeavour to maintain a reputation for quality and value. Be very chary of buying "bargains" in provisions; buy only what your judgment tells you will sell, and do not pay too much attention to what your competitors are doing. A few further miscellaneous hints from men in the trade are the following:—The provision department, to be successful, requires the closest attention in its management; the essentials are quality, freshness, cleanliness. Study the markets, and buy reliable goods. Bacon, especially, needs constant watching; always secure good-quality meat. Competent hands only should handle bacon, so that it be "cut properly" and "sold profitably". Have a method in cutting bacon in the most remunerative way suitable to your trade; "practise" economy in avoiding "loss by waste"; too many cuttings show bad management. Cheese requires special selection; it should always have a fresh appearance; avoid dryness by not cutting and exposing too much; appropriate rind equally. One cannot afford any loss in these days; weigh and charge the half-ounces; small items count up and add considerably to the profit both in bacon and cheese. Butter should always be kept as fresh and firm as possible, and sent out nicely patted up, which customers appreciate; keep the refrigerator in going order throughout the summer. A well-dressed provision window secures increasing trade; ticket your goods boldly and attractively; have the whole department "spick and span", keeping the latest and best-paying lines "well to the front". A watchful eye should be kept on all goods. Give the egg trade special attention; avoid breakages in delivery to customers. Check the weight of all provisions upon delivery, examine tinned goods, and claim immediately for shortages or faults. A smart salesman must create opportunities and act promptly upon them. Ticket everything,

Miscellaneous
Hints.

and sell at the price. The proprietor should check frequently the prices ticketed, and calculate accordingly. Make this a rule, for it is a loophole to serious loss. Allow no bargaining between salesman and buyer, as it leads to dissatisfaction amongst customers, "dishonesty" amongst assistants, and "distraction" to the grocer. An increasing and profitable trade can be done in butter by having a regular supply of finest quality; work it up in rolls and prints under own brand. Poultry and game, eggs, cooked and potted meats, fancy cheese, &c., are profitable lines if disposed of while fresh. Take stock often—weekly if possible,—weigh closely, advertise conspicuously, personally supervise the whole, and the success of the provision department will be ensured.

The following list of foods in season is from the *News of the World Almanack*:—

Foods in
Season.

January.—Meat: Beef, mutton and pork. Poultry: Turkeys, geese, ducks, fowls, pigeons, rabbits. Game: Partridge, pheasant, ptarmigan, quail, snipe, widgeon, teal, woodcock, venison. Vegetables: Jerusalem artichokes, beetroot, cabbage, carrots, turnips, onions, watercress, leeks, spinach, celery. Fruit: Apples, pears, foreign grapes, medlars, oranges, rhubarb. Fish: Bream, carp, cockles, cod, dory, flounders, haddocks, ling, lobster, mackerel, mullet, plaice, soles, smelt, shrimps, whiting, oysters.

February.—Meat: Beef, mutton, veal, pork. Poultry: Turkey, geese, fowls, ducks, pigeons, rabbits. Game: Partridge, pheasant, teal, widgeon, woodcock, hare. Fish: Flounders, cutfish, salmon, plaice, soles, cod, carp, bream, bloaters, shrimps, scallops, smelts, turbot, whitebait, whiting, oysters. Fruit: Apples, pears, medlars, oranges, rhubarb. Vegetables: Asparagus, beetroot, sprouts, carrots, celery, endive, leeks, onions, sea-kale, spinach, savoy.

March.—Meat: Beef, mutton, pork, veal, lamb. Poultry: Fowls, ducks, chickens, ducklings, pigeons, rabbits. Game: Hares, ptarmigan. Fish: Bloaters, bream, brill, carp, cockles, cod, dory, eels, flounders, halibut, salmon, plaice, mullet, smelts, soles, turbot, trout, whitebait, whiting, oysters. Fruit: Apples, pears, grapes, oranges, rhubarb. Vegetables: Artichokes, asparagus, beetroot, cabbage, carrots, onions, turnips, sea-kale, spinach, mint.

April.—Meat: Beef, mutton, veal, lamb. Poultry: Fowls, ducklings, chickens, pigeons, rabbits. Game: Ptarmigan. Fish: Salmon, trout, soles, turbot, plaice, halibut, carp, crab, dory, flounders, ling, lobster, mackerel, shrimps, smelts, oysters. Fruit: Grapes, oranges. Vegetables: Carrots, spinach, cabbage, onions, leeks, tomatoes.

May.—Meat: Beef, mutton, lamb, veal. Poultry: Fowls, chickens, ducklings, green geese, pigeons. Fish: Salmon, trout, turbot, lobster, crab, plaice, soles, halibut, cod, herrings, mackerel, shad, shrimps, sprats, sturgeon, whitebait, whiting. Vegetables: Peas, beans (French), carrots, new potatoes, sea-kale, broccoli, savoy, cabbage, spinach, onions, asparagus, salads, tomatoes. Fruit: Green gooseberries, oranges, pines, grapes, forced strawberries.

June.—Meat: Beef, mutton, veal, lamb. Poultry: Fowls, ducks, ducklings, chickens, pigeons, green geese, guinea-fowls. Fish: Salmon, trout, cod, carp, bream, brill, turbot, soles, plaice, mackerel, halibut, herrings, mullet, eels, shrimps, whitebait, whiting. Vegetables: Onions, carrots, new potatoes, peas, beans, broad beans, broccoli, cabbage, cucumbers, tomatoes, savoys, vegetable marrow. Fruit: Strawberries, cherries, gooseberries, red and black currants, raspberries, pines, grapes, oranges, melons, apricots.

July.—Meat: Beef, mutton, veal, lamb. Poultry: Fowls, chickens, ducks, ducklings, green geese, guinea-fowls, pigeons. Fish: Salmon, trout, sturgeon, cod, eels, bream, bull, ling, mackerel, turbot, soles, shrimps, lobster, crabs, whiting. Vegetables: Peas, beans, spinach, new potatoes, broccoli, vegetable marrow, endive, tomatoes, cucumber, mint herbs, savoys, cabbages, onions, carrots. Fruit: Raspberries, gooseberries, currants, late strawberries, peaches, apricots, nectarines, English grapes, melons, oranges, pines, apples, pears, cranberries.

August.—Meat: Beef, mutton, veal, lamb. Poultry: Fowls, chickens, ducks, pigeons. Game: Grouse (August 12th), venison. Fish: Soles, salmon, trout, turbot, ling, eels, brill, plaice, mackerel, haddock, mullet, shrimps, whitebait, whiting, crabs, lobster. Vegetables: Beans, broccoli, peas, cabbage, carrots, spinach, tomatoes, salads, cucumber, beetroot. Fruit: Oranges, apples, pears, peaches, apricots, nectarines, plums, greengages, pines, grapes, melons.

September.—Meat: Beef, mutton, veal, pork. Poultry: Geese, fowls, chickens, ducks, pigeons. Game: Grouse, partridges (September 1st), venison, ptarmigan, quail, hares. Fish: Salmon ends middle of September, turbot, lobster, crab, bloaters, bream, brill, haddock, eels, halibut, herrings, plaice, mullet, mackerel, shrimps, trout. Vegetables: Beans, peas, cabbage, spinach, tomatoes, cucumber, vegetable marrow, onions. Fruit: Damsons, figs, grapes, pines, nectarines, plums, greengages, quinces.

October.—Meat: Beef, mutton, veal, pork. Poultry: Turkeys, geese, fowls, chickens, ducks, pigeons, guinea-fowl. Game: Grouse, partridge, pheasants (Oct. 1st), ptarmigan, wild fowl, venison, hares, leverets, blackcock, wild duck. Fish: Soles, turbot, herrings, lobster, brill, plaice, eels, shrimps, whiting, skate, oysters. Vegetables: Artichokes, cabbage, salads, tomatoes, cucumber, celery, beetroot, cauliflower, spinach, onions, carrots, turnips. Fruit: Grapes, pines, melons, oranges, apples, pears.

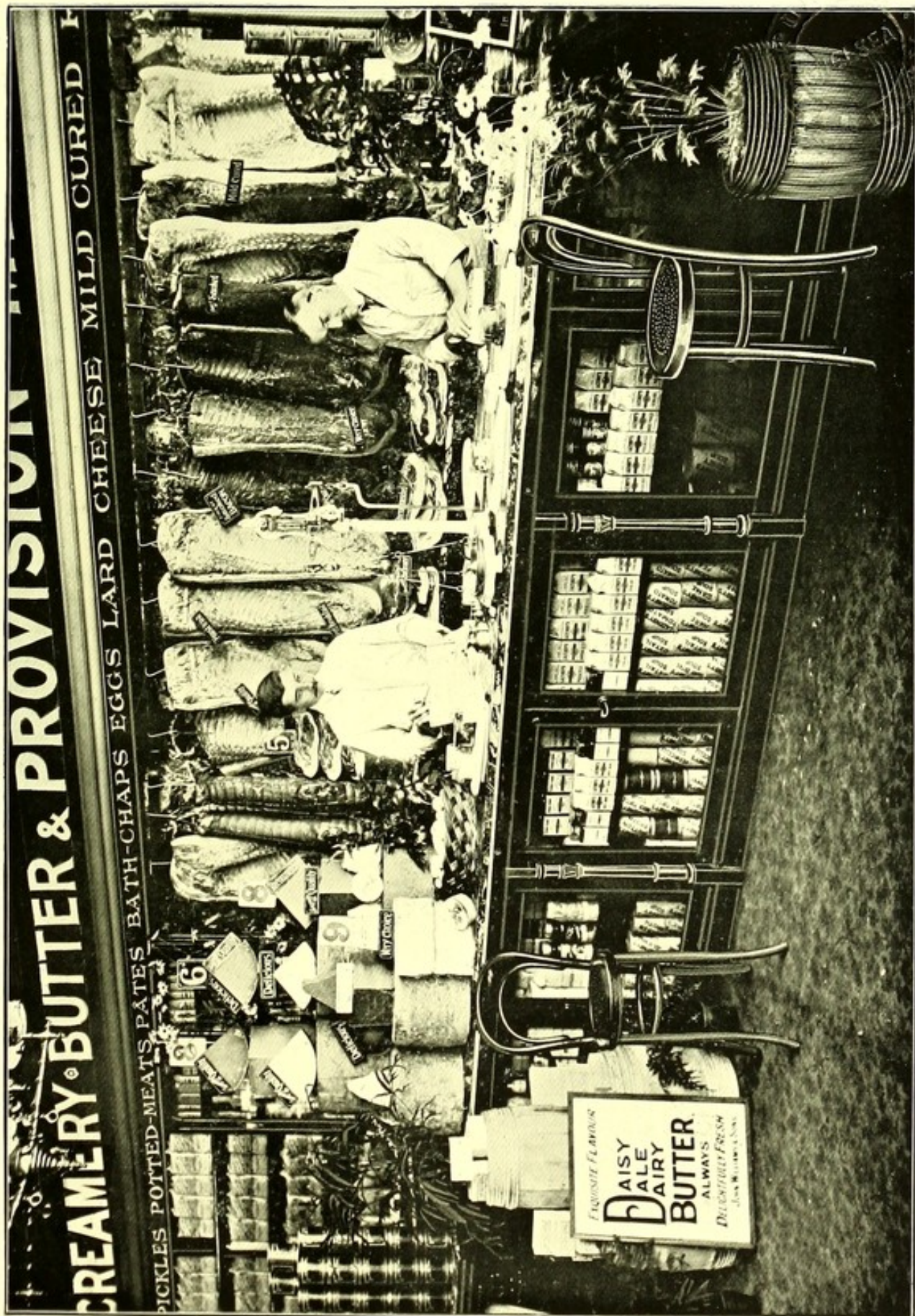
November.—Meat: Beef, mutton, pork. Poultry: Turkeys, geese, ducks, fowls, chicken, pigeons. Game: Pheasants, grouse, partridge, wild duck, wild fowl, ptarmigan, venison, woodcock. Fish: Oysters, cod, brill, turbot, halibut, mackerel, lobster, sprats, smelts, skate, herrings, haddocks, oysters. Vegetables: Artichokes, cabbage, carrots, parsnips, sea-kale, tomatoes, onions, Brussels sprouts. Fruit: Grapes, medlars, oranges, pines, filberts, apples, pears.

December.—Meat: Pork, beef, mutton. Poultry: Geese, turkeys, fowls, chickens, ducks, pigeons. Game: Pheasants, partridges, ptarmigan, wild ducks, wild fowl, woodcock. Fish: Turbot, lobster, brill, halibut, herrings, ling, plaice, mackerel, oysters. Fruit: Oranges, grapes, nuts, apples, pears. Vegetables: Artichokes, Brussels sprouts, onions, leeks, savoys, cabbages, carrots, broccoli.

The arrivals of new season's supplies of provisions upon the wholesale markets are always duly noted in the trade papers, and

THE PROVISION COUNTER

Our illustration is intended to give a notion of how that important part of a grocery and provision shop, the provision counter, may be effectively arranged. The stock is ample, varied, well-selected, and appetizingly displayed. Cleanliness in every detail, from the sides of bacon to the assistants' aprons and knives, is a primary essential in displaying and handling provisions. Where a shop is at all liable to be dusty, a very useful adjunct to such a counter as that shown is a glass-sided case for the butter—the glass polished to crystal brilliance, as a matter of course. A few green-leaved plants may also be introduced, sometimes with good effect.





these should be watched for information on that point. Dates of cheese fairs, &c., are given in the diaries of the trade papers. Canadian butter sells on the British markets usually from May to the following February or March; while Australian and New Zealand butters arrive in October and November, and these latter, having good keeping qualities, have an effective period the longer on that account. By the end of November the London market is usually well supplied with anti-podean butter. Danish butter of pure grass quality is forthcoming in June. The season, as we have seen in the chapter on BUTTER, has much to do with quality, and this is noteworthy, especially in regard to cheese. Thus the best Scottish Cheddar, having the finest and fullest flavour, is made in July and August, when the richest and ripest grass is available for the cows. Cheese made in April and May, when the cows are fed on hay and artificial foods, is known as "fodder" cheese, and is not so good or so rich as that made in June, July, or August; nor is the flavour so fine in the cheese made when the grass has got past its best in September and October. The grocer and provision dealer watch the seasons not only with an eye to supplies, but to sale. With the first week in September, for instance, the "Pie and Sausage" season begins, and many grocers then commence a large trade in pork pies, polonies, and sausages of all kinds. Oatmeal, peas, haricot beans, soups, and similar goods also come more into demand in the cold weather.

15. FOOD STANDARDS

The scare which arose in 1903 owing to the occurrence of many cases of poisoning, which were traced to arsenic in beer, led to the appointment by the Government of a Royal Commission, which in December of that year issued a highly important report. So far as the immediate subject of enquiry was concerned the Commission's recommendation was that the presence of a hundredth of a grain or more in the gallon of any liquid food, or in the pound of any solid food, should render the vendor of such food liable to penalties under the Sale of Food and Drugs

Acts (which see in the subsequent chapter on FOOD LAWS). The report, however, took a much wider scope than this, and as it is tolerably certain to be brought sooner or later within the range of practical politics, in which event it will have a most important concern for the grocery and provision trades, attention paid to it here will doubtless be well bestowed. In brief, the report recommended the establishment of **Official Food Standards** and of a **Court of Reference** to deal with matters relating thereto.

“We are of opinion”, said the Commission, “that official standards must be prescribed if the Sale of Food and Drugs Acts are to be satisfactorily applied to control the purity of food. We term these ‘standards for the purpose of the Sale of Food and Drugs Acts’ rather than ‘standards of purity’, and . . . we think it important to insist upon the obvious distinction which has to be made in this respect. The standards we are considering are not models of purity for the manufacturers to aim at. Their object is to afford satisfactory means of judging whether in a given substance there has been substantial failure to secure purity, a failure which, on official authority, is held to call for the imposition of penalty. For example, in relation to deleterious substances, where the offence lies in selling something not of the nature, substance, and quality demanded by the purchaser, the ‘standard’ would take the form of a definition of the minimum degree of purity which can be accepted as fulfilling the purchaser’s demand—no more than so much boracic acid, no formalin, not more than so much arsenic, or whatever is necessary in the interests of the consumer to safeguard the particular food. We consider that the Local Government Board (under advice as indicated in this report) should be the authority to prescribe, and from time to time vary, standards for the purposes of the Sale of Food and Drugs Acts. (Or the Board of Agriculture, where matters affecting the general interest of agriculture are concerned. Special duties in such cases have been imposed on the Board of Agriculture by the Sale of Food and Drugs Act, 1899; and certain standards have already been prescribed by the Board, in accordance with the provisions of the Act, and after enquiry by a Departmental Committee, in respect of milk and cream.) Obviously, account would need to be taken of sundry medical, physiological, chemical, and administrative

Royal
Commission
on Arsenic.

questions in fixing such standards. It is necessary that these considerations should be properly balanced, and that manufacturers should be fairly dealt with. The means by which these requirements can be fulfilled were considered by the two Committees to which we have above referred. The Committee on Food Products Adulteration, which was mainly concerned with the questions of preventing adulteration and impoverishment of food, and more recently the Committee on Preservatives and Colouring Matters in Food, alike came to the conclusion that food standards in certain instances were essential to efficient administration. Both Committees realized the impossibility of satisfactory standards being fixed by the central authority in the absence of full preliminary enquiry, and they recommended the establishment of a Board (Court, Permanent Commission, or Standing Committee) of Reference, which should consist of a small number of scientific men, nominated by the Crown or departmentally, as the authority to advise on points arising in connection with the Sale of Food and Drugs Acts, and requiring special expert consideration, and to prescribe the standards which should be fixed for the purposes of those Acts. We are of opinion that if a Government Department, the Local Government Board (or Board of Agriculture in cases where the general interests of agriculture are concerned) is to impose standards for the purposes of the Sale of Food and Drugs Acts, it is essential that its action should be based upon the advice of a scientific body of this nature. We do not think that the proposed Board of Reference should be an administrative body. It should be a consultative board, available on the application of the Government Department concerned, to pronounce on specific points which are specially referred."

The Royal Commission allude in the above to the **official standards** for **milk** which have already been fixed. These standards are: for milk not sold as skimmed, separated, or condensed milk, 3 per cent of milk-fat and 8.5 per cent of milk-solids other than milk-fat. For skimmed or separated milk (not condensed) 9 per cent is the minimum of milk-solids. The Boards of Agriculture and Fisheries have also, in virtue of the power given by the Food and Drugs Act, 1899, laid down a partial standard for **Butter**, by declaring that

Milk, Butter,
and Margarine.

it must not contain more than 16 per cent of water. There is also a partial standard for **Margarine** fixed by the same Act of Parliament, the amount of butter-fat which that article may contain being limited to 10 per cent.

In the **United States**, under an act of Congress approved June 3, 1902, the Secretary of Agriculture (in consultation with the Committee on Food Standards of the Association of American Standards. Official Agricultural Chemists and other experts) has proclaimed official standards for a considerable number of food products. In each instance the standard is preceded by a definition, thus:—

Meats

Definitions.—1. *Meat* is any sound, dressed, and properly prepared edible part of animals in good health at the time of slaughter. The term “animals” as herein used includes not only mammals, but fish, fowl, crustaceans, molluscs, and all other animals used as food. 2. *Fresh meat* is meat from animals recently slaughtered or preserved only by refrigeration. 3. *Salted, pickled, and smoked meats* are unmixed meats preserved by salt, sugar, vinegar, spices, or smoke, singly or in combination, whether in bulk or in packages.

Standard.—*Standard meat, fresh meat, and salted, pickled, and smoked meats* are such as conform respectively to the foregoing definitions.

Manufactured Meats

Definition.—1. *Manufactured meats* are meats not included in definitions 2 and 3, whether simple or mixed, whole or comminuted, in bulk or packages, with or without the addition of salt, sugar, vinegar, spices, smoke, oils, or rendered fat.

Standard.—*Standard manufactured meats* conform to the foregoing definition. If they bear names descriptive of composition they correspond thereto and when bearing such descriptive names, if force meats or flavouring meats are used, the kind and quantity thereof are made known.

The full list of official schedules of foods had not been completed by the United States authorities at the time of writing, but up to 1904 the following standards had been proclaimed, and in view of the connection between the States and this country in the food trade these are well worthy of notice by way of guidance, although on this side the Atlantic they have, of course, no legal force:—

Lard.—*Lard* is the rendered fresh fat from slaughtered, healthy hogs. *Leaf lard* is the lard rendered at moderately high temperatures from the internal fat of the abdomen of the hog, excluding that adherent to the intestines. *Standard lard* and *standard leaf lard* are lard and leaf lard respectively, free from rancidity,

containing not more than one (1) per cent of substances, other than fatty acids, not fat, necessarily incorporated therewith in the process of rendering, and standard leaf lard has an iodine number not greater than sixty (60). *Neutral lard* is lard rendered at low temperature.

Milks.—*Milk (whole milk)* is the lacteal secretion obtained by the complete milking of one or more healthy cows, properly fed and kept, excluding that obtained within fifteen days before and five days after calving. *Standard milk* is milk containing not less than twelve (12) per cent of total solids and not less than eight and one-half (8.5) per cent of solids not fat, nor less than three and one-quarter (3.25) per cent of milk-fat. *Blended milk* is milk modified in its composition so as to have a definite and stated percentage of one or more of its constituents. *Skim milk* is milk from which a part or all of the cream has been removed. *Standard skim milk* is skim milk containing not less than nine and one-quarter (9.25) per cent of milk solids. *Buttermilk* is the product that remains when butter is removed from milk or cream in the process of churning. *Pasteurized milk* is standard milk that has been heated below boiling, but sufficiently to kill most of the active organisms present, and immediately cooled to fifty degrees (50°) Fahr. or lower, to retard the development of their spores. *Sterilized milk* is standard milk that has been heated at the temperature of boiling water, or higher, for a length of time sufficient to kill all organisms present. *Condensed milk* is milk from which a considerable portion of water has been evaporated. *Sweetened condensed milk* is milk from which a considerable portion of water has been evaporated and to which sugar (sucrose) has been added. *Standard condensed milk* and *standard sweetened condensed milk* are condensed milk and sweetened condensed milk respectively, containing not less than twenty-eight (28) per cent of milk solids, of which not less than one-fourth is milk-fat. *Condensed skim milk* is skim milk from which a considerable portion of water has been evaporated.

Milk-fat or Butter-fat.—*Milk-fat* or *butter-fat* is the fat of milk. *Standard milk-fat* or *butter-fat* has a Reichert-Meissl number not less than twenty-four (24) and a specific gravity not less than 0.905 (40° C./ 40° C.).

Cream.—*Cream* is that portion of milk rich in butter-fat which rises to the surface of milk on standing, or is separated from it by centrifugal force. *Standard cream* is cream containing not less than eighteen (18) per cent of milk-fat. *Evaporated cream* is cream from which a considerable portion of water has been evaporated.

Butter.—*Butter* is the product obtained by gathering in any manner the fat of fresh or ripened milk or cream into a mass, which also contains a small portion of the other milk constituents, with or without salt. By acts of Congress approved August 2, 1886, and May 9, 1902, butter may also contain additional colouring matter. *Standard butter* is butter containing not less than eighty-two and five-tenths (82.5) per cent of butter-fat. *Renovated* or *process butter* is the product obtained by melting butter and reworking, without the addition or use of chemicals or any substances except milk, cream, or salt. *Standard renovated* or *process butter* is renovated or process butter containing not more than sixteen (16) per cent of water, and at least eighty-two and five-tenths (82.5) per cent of butter-fat.

Cheese.—*Cheese* is the solid and ripened product obtained by coagulating the casein of milk by means of rennet or acids, with or without the addition

of ripening ferments and seasoning. By act of Congress, approved June 6, 1896, cheese may also contain additional colouring matter. *Whole milk* or *full cream cheese* is cheese made from milk from which no portion of the fat has been removed. *Skim-milk cheese* is cheese made from milk from which any portion of the fat has been removed. *Cream cheese* is made from the milk and cream, or milk containing not less than six (6) per cent of fat. *Standard whole-milk cheese* or *full-cream cheese* is whole-milk or full-cream cheese containing in the water-free substance not less than fifty (50) per cent of butter-fat.

Miscellaneous Milk Products.—*Whey* is the product remaining after the removal of fat and casein from milk in the process of cheese-making. *Kumiss* is mare's or cow's milk, with or without the addition of sugar (sucrose), which has undergone alcoholic fermentation.

Sugar and Sugar Products.—*Sugar* is the product chemically known as sucrose (saccharose), chiefly obtained from sugar cane, sugar beets, sorghum, maple, or palm. *Standard sugar* is white sugar containing at least ninety-nine and five-tenths (99.5) per cent of sucrose. *Granulated, loaf, cut, milled, and powdered sugars* are different forms of standard sugars. *Maple sugar* is the solid product resulting from the evaporation of maple sap. *Massecuite, melada, mush sugar, and concrete* are products obtained by evaporating the purified juice of a sugar-producing plant, or a solution of sugar, to a solid or semi-solid consistence in which the sugar chiefly exists in a crystalline state. *Molasses* is the product left after separating the sugar from massecuite, melada, mush sugar, or concrete. *Standard molasses* is molasses containing not more than twenty-five (25) per cent of water nor more than five (5) per cent of ash. *Syrup* is the product obtained by purifying and evaporating the juice of a sugar-producing plant without removing any of the sugar. *Sugar-cane syrup* is a syrup obtained by the evaporation of the juice of the sugar-cane or by the solution of sugar-cane concrete. *Sorghum syrup* is a syrup obtained by the evaporation of sorghum juice or by the solution of sorghum concrete. *Maple syrup* is a syrup obtained by the evaporation of maple sap or by the solution of maple concrete. *Sugar syrup* is a product obtained by dissolving sugar to the consistence of a syrup. *Standard syrup* is a syrup containing not more than thirty (30) per cent of water nor more than two and five-tenths (2.5) per cent of ash.

Glucose Products.—*Starch sugar* or *grape sugar* is the solid product obtained by hydrolizing starch or a starch-containing substance until the greater part of the starch is converted into dextrose. Starch sugar or grape sugar appears in commerce in two forms, anhydrous and hydrous. In the former, the sugar is crystallized without water of crystallization; in the latter, it is crystallized with water of crystallization. The hydrous varieties are commonly known as 70 and 80 sugars; 70 sugar is also known as brewers' sugar, and 80 sugar as climax or acme sugar. (a) *Standard 70 sugar* or *brewers' sugar* is hydrous starch sugar containing not less than seventy (70) per cent of dextrose and not more than eight-tenths (0.8) per cent of ash. (b) *Standard 80 sugar, climax* or *acme sugar*, is hydrous starch sugar containing not less than eighty (80) per cent of dextrose and not more than one and one-half (1.5) per cent of ash. (c) *Standard anhydrous grape sugar* is anhydrous grape sugar containing not less than ninety-five (95) per cent of dextrose without water of crystallization and not more than eight-tenths (0.8) per cent of ash. The ash of these standard products consists almost entirely of chlorides and sulphates of lime and soda.

Glucose, mixing glucose, or confectioners' glucose is a thick syrupy substance obtained by incompletely hydrolizing starch or a starch-containing substance, decolorizing and evaporating the product. It is found in various degrees of concentration, ranging from forty-one (41) to forty-five (45) degrees Baumé. *Standard glucose, mixing glucose, or confectioners' glucose* is colourless glucose, varying in density between forty-one (41) and forty-five (45) degrees Baumé, at a temperature of one hundred (100) degrees F. (37.7° C.). It conforms in density, within these limits, to the degree Baumé it is claimed to show, and for a density of forty-one (41) degrees Baumé contains not more than twenty-one (21) per cent of water and for a density of forty-five (45) degrees not more than fourteen (14) per cent. It contains on a basis of forty-one (41) degrees Baumé not more than one (1) per cent of ash, consisting chiefly of chlorides and sulphates of lime and soda. *Glucose syrup or corn syrup* is glucose unmixed or mixed with syrup or molasses. *Standard glucose syrup or corn syrup* is glucose syrup or corn syrup containing not more than twenty-five (25) per cent of water nor more than three (3) per cent of ash.

Candy.—*Candy* is a product prepared from a saccharine substance or substances, with or without the addition of harmless colouring, flavouring, or filling materials. *Standard candy* is candy containing no terra alba, barytes, talc, chrome yellow, or other mineral substances or poisonous colours or flavours or other ingredients injurious to health.

Spices.—*Spices* are aromatic vegetable substances used for the seasoning of food. *Standard spices* are sound spices, true to name, from which no portion of any volatile oil or other flavouring principle has been removed. *Allspice or pimento* is the dried fruit of *Pimenta officinalis*, Lindl. *Standard allspice* is allspice containing not less than eight (8) per cent of quercitannic acid (calculated from the total oxygen absorbed by the aqueous extract); not more than six (6) per cent of total ash; not more than five-tenths (0.5) per cent of ash insoluble in hydrochloric acid, and not more than twenty-five (25) per cent of crude fibre. *Anise* is the fruit of *Pimpinella anisum*, L. *Bay leaf* is the dried leaves of *Laurus nobilis*, L. *Capers* are the flower buds of *Capparis spinosa*, L. *Caraway* is the fruit of *Carum carui*, L.

Cayenne and Red Peppers.—*Red pepper* is the red, dried, ripe fruit of any species of *Capsicum*. *Cayenne pepper or cayenne* is the dried, ripe fruit of *Capsicum fastigiatum*, DC., *Capsicum frutescens*, L., *Capsicum baccatum*, L., or some other small-fruited species of *Capsicum*. *Standard cayenne pepper* is cayenne pepper containing not less than fifteen (15) per cent of non-volatile ether extract; not more than six and five-tenths (6.5) per cent of total ash; not more than five-tenths (0.5) per cent of ash insoluble in hydrochloric acid; not more than one and five-tenths (1.5) per cent of starch by the diastase method, and not more than twenty-eight (28) per cent of crude fibre.

Cinnamon and Cassia.—*Cinnamon* is the dried bark of any species of the genus *Cinnamomum* from which the outer layers may or may not have been removed. *True cinnamon* is the dried inner bark of *Cinnamomum zeylanicum*, Breyne. *Cassia* is the dried bark of various species of *Cinnamomum*, other than *Cinnamomum zeylanicum*, from which the outer layers may or may not have been removed. *Cassia buds* are the dried immature fruit of species of *Cinnamomum*. *Ground cinnamon or ground cassia* is a powder consisting of cinnamon, cassia or cassia buds, or a mixture of these spices. *Standard cinnamon or cassia* is cinnamon or cassia containing not more than eight (8) per cent of total ash and not more than two (2) per cent of sand.

Cloves.—*Cloves* are the dried flower buds of *Eugenia caryophyllata*, Thunb. (*Caryophyllus aromaticus*, L.), which contain not more than five (5) per cent of clove stems. *Standard cloves* are cloves containing not less than ten (10) per cent of volatile ether extract; not less than twelve (12) per cent of quercitannic acid (calculated from the total oxygen absorbed by the aqueous extract); not more than eight (8) per cent of total ash; not more than five-tenths (0.5) per cent of ash insoluble in hydrochloric acid, and not more than ten (10) per cent of crude fibre.

Coriander, &c.—*Coriander* is the dried fruit of *Coriandrum sativum*, L. *Cumin seed* is the fruit of *Cuminum cyminum*, L. *Dill seed* is the fruit of *Peucedanum graveolens*, Benth and Hook. *Fennel* is the fruit of *Foeniculum vulgare*, Gaertn.

Ginger.—*Ginger* is the washed and dried, or decorticated and dried, rhizome of *Zingiber officinale*, Roscoe. *Standard ginger* is ground or whole ginger containing not less than forty-two (42) nor more than forty-six (46) per cent of starch by direct inversion (copper-reducing matters by direct inversion calculated as starch); not more than eight (8) per cent of crude fibre; not more than eight (8) per cent of total ash; not more than one (1) per cent of lime, and not more than three (3) per cent of ash insoluble in hydrochloric acid. *Limed or bleached ginger* is whole ginger coated with carbonate of lime. *Standard limed or bleached ginger* is limed or bleached ginger containing not more than ten (10) per cent of ash, not more than four (4) per cent of carbonate of lime, and conforming in other respects to standard ginger.

Horse Radish.—*Horse radish* is the root of *Cochlearia armoracia*, L. *Standard grated or ground horse radish* may be mixed with vinegar. *Mace* is the dried arillus of *Myristica fragrans*, Houttuyn.

Mace.—*Standard mace* is mace containing not less than twenty (20) nor more than thirty (30) per cent of non-volatile ether extract; not more than three (3) per cent of total ash; not more than five-tenths (0.5) per cent of ash insoluble in hydrochloric acid, and not more than ten (10) per cent of crude fibre. *Macassar or Papua mace* is the dried arillus of *Myristica argentea*, Warb. *Bombay mace* is the dried arillus of *Myristica malabarica*, Lamarck. *Marjoram* is the leaves, flowers, and branches of *Origanum majorana*, L.

Mustard.—*Mustard-seed* is the seed of *Sinapis alba*, L. (White Mustard), *Brassica nigra*, Koch (Black Mustard), or *Brassica juncea*, Coss. (Black or Brown Mustard). *Ground mustard* is a powder made from mustard-seed, with or without the removal of the hulls and a portion of the fixed oil. *Standard ground mustard* is mustard containing not more than two and five-tenths (2.5) per cent of starch by the diastase method and not more than eight (8) per cent of total ash.

Nutmeg, &c.—*Nutmeg* is the dried seed of *Myristica fragrans*, Houttuyn, deprived of its testa, and with or without a thin coating of lime. *Standard nutmegs*, ground or unground, are nutmegs containing not less than twenty-five (25) per cent of non-volatile ether extract; not more than five (5) per cent of total ash; not more than five-tenths (0.5) per cent of ash soluble in hydrochloric acid, and not more than ten (10) per cent of crude fibre. *Macassar, Papua, male, or long nutmeg* is the dried seed of *Myristica argentea*, Warb., deprived of its testa. *Paprika* is the dried ripe fruit of *Capsicum annuum*, L., *Capsicum longum*, DC., or some other large fruited species of *Capsicum*.

Pepper.—*Black pepper* is the dried immature berries of *Piper nigrum*, L. *Standard black pepper* is black pepper free from added pepper shells, pepper dust, and other pepper by-products, and containing not less than six (6) per cent of

non-volatile ether extract; not less than twenty-two (22) per cent of starch by the diastase method; not less than twenty-eight (28) per cent of starch by direct inversion (copper-reducing matters by direct inversion calculated as starch); not more than seven (7) per cent of total ash; not more than two (2) per cent of ash insoluble in hydrochloric acid, and not more than fifteen (15) per cent of crude fibre. One hundred parts of the non-volatile ether extract contain not less than three and one-quarter (3.25) parts of nitrogen. *Long pepper* is the dried fruit of *Piper longum*, L. *White pepper* is the dried mature berries of *Piper nigrum*, L., from which the outer coating, or the outer and inner coatings, have been removed. *Standard white pepper* is white pepper containing not less than six (6) per cent of non-volatile ether extract; not less than fifty-three (53) per cent of starch by the diastase method; not less than forty (40) per cent of starch by direct inversion (copper-reducing matters by direct inversion calculated as starch); not less than four (4) per cent of total ash; not more than five-tenths (0.5) per cent of ash insoluble in hydrochloric acid, and not more than five (5) per cent of crude fibre. One hundred parts of the non-volatile ether extract contain not less than four (4) parts of nitrogen.

Saffron, &c.—*Saffron* is the dried stigmas of *Crocus sativus*, L. *Sage* is the leaves of *Salvia officinalis*, L. *Savory*, or *Summer Savory*, is the leaves, blossoms, and branches of *Satureia hortensis*, L. *Thyme* is the leaves and ends of blooming branches of *Thymus vulgaris*, L.

Cocoa and Cocoa Products.—*Cocoa beans* are the seeds of the cacao-tree, *Theobroma cacao*, L. *Cocoa nibs*, or *cracked cocoa*, is the roasted, broken cocoa bean freed from its shell or husk. *Chocolate*, *plain* or *bitter*, or *chocolate liquor*, is the solid or plastic mass obtained by grinding cocoa nibs without the removal of fats or other constituents except the germ. *Standard chocolate* is chocolate containing not more than 3 per cent of ash insoluble in water, 3.50 per cent of crude fibre, and 9 per cent of starch, nor less than 45 per cent of cocoa-fat. *Sweet chocolate* and *chocolate coatings* are plain chocolate mixed with sugar (sucrose), with or without the addition of cocoa-butter, spices, or other flavouring materials. *Standard sweet chocolate* and *Standard chocolate coating* are sweet chocolate and chocolate coating containing in the sugar—and fat—free residue no higher percentage of either ash, fibre, or starch than is found in the sugar—and fat—free residue of plain chocolate. *Cocoa* or *powdered cocoa* is cocoa-nibs, with or without the germ, deprived of a portion of its fat and finely pulverized. *Standard cocoa* is cocoa containing percentages of ash, crude fibre, and starch corresponding to those in chocolate after correction for fat removed. *Sweet* or *sweetened cocoa* is cocoa mixed with sugar (sucrose). *Standard sweet cocoa* is sweet cocoa containing not more than sixty (60) per cent of sugar (sucrose) and in the sugar—and fat—free residue no higher percentage of either ash, crude fibre, or starch than is found in the sugar—and fat—free residue of plain chocolate.

Both the United States and Canada have passed special legislation dealing with butter. The Canadian Butter Act (1903) absolutely prohibits the manufacture, importation, sale, or possession of "oleomargarine, butterine, or other substitute for butter manufactured wholly or in part from any fat

Canadian
Butter.

other than that of milk or cream", also of **renovated** or **process butter**, namely, "butter which has been melted, clarified, or refined, and made to resemble butter". A similar prohibition applies to butter containing over 16 per cent of water; whilst the mixture with butter of any acid, alkali, chemical, or any substance whatever, to cause the butter to absorb water, milk, or cream, is forbidden. Disregard of these prohibitions or misuse of the word "creamery" is visited with severe penalty.

The responsibilities of the British retailer pending the adoption of official standards (and which would still continue were such declared) are explained in the final volume of this work in the chapter on **FOOD LAW**.

16. ADULTERATION AND SAFEGUARDS

The Law—as we show in a later chapter—holds the retailer in the first instance responsible for sophistications, impoverishments, substitutions, adulterations, chemical degradations, and other food offences of which in many cases it is absolutely impossible for him, the mere retail distributor, to be guilty. Therefore he must protect himself, not only by learning and observing the requirements of the Law, but by taking care not to be deceived, and where he is necessarily in the hands of those who supply him, insisting upon the safeguard of a proper warranty. In fact, the sheet-anchor for him, in conducting his trade with safety, is to secure warranties upon nearly all articles he purchases. These warranties to be effective must be obtained from the firms selling the articles directly to him; and it is essential that a young beginner should note this fact, because so-called warranties are sometimes proffered which are entirely valueless in case of a prosecution, whereas a *bona-fide* warranty from the firm selling the article at once exonerates him. It may be said that warranties should be asked for on every article of food that has been manufactured or ground—that is to say, every article that is not sold in its natural state; and even then it is questionable whether some articles which are sold professedly in their natural state may not have been so tampered with as to demand a warranty. Take, for

instance, **Root Ginger**. It is certainly desirable to have a warranty with this article, as it may be spent and "faked up". In buying this class of goods, unless purchasing personally direct from the firm, it is well, in the case of every written order sent up, either to gum an adhesive label on the letter, or, better still, have printed at the foot of a postcard the following:—

This order is given on condition that goods are guaranteed pure within the meaning of the Food and Drugs Act, 1875, and all acts amending same.

There is really no reason why such a guarantee as the above should not be placed on every merchant's invoice, if he is selling honest goods. But in practice it will be found that few firms give warranties unless specially asked for them. Warranties
needed.

As a matter of course, a warranty should be obtained with all **Butters** and **Cheese**, except what may be termed fancy cheese, with a distinctive name, such, for instance, as "Little Wilts", "Imperial", "Bondon", &c.; and it would be found unsafe to sell even these without a warranty, if it were ever proved that they contained something injurious to health. Deficiency in cream or the addition of extra fat might not be deemed adulteration in such goods, as they are sold with a prefix to the word "cheese"; but if a customer comes into one's shop and asks simply for "cheese", that customer must be served with "the substance usually known as cheese, containing no fat derived otherwise than from milk", so that with all the ordinary classes of cheese cut on a retailer's counter, it is desirable that warranty of purity should be obtained. Than **Butter** no article has been the subject of more legislation and litigation, and a specific warranty should be insisted upon with every purchase. "Guaranteed genuine butter and not to contain more than 16 per cent of moisture" is a form of guarantee that is satisfactory, and should be followed by the wholesaler's signature. **Lard** and **Margarine** have been known to offend as to excessive moisture, and the former also as to foreign fat. It has been held by some magistrates, and in the interests of the public very properly so, that margarine containing over 16 per cent of moisture defrauds the purchaser. Consequently a warranty is desirable in the case of margarine, and the same remark applies to lard. For small deliveries of butter from the local farmers a pass-book may be adopted as presenting less difficulty than a

regular system of invoicing, and it would also form a useful record for reference as to the quantity bought and the price paid at any particular date. The pass-book might be commenced thus:—

I, _____, hereby guarantee that all butter sold by me, and invoiced in this book, is guaranteed to be genuine butter, and not to contain more than 16 per cent of moisture.

(Signed)

.....

Each entry in the book should also be signed, or at least initialled by the vendor. Such a form of warranty as this would doubtless hold good in any court. (See FOOD LAW for further discussion of the form of a warranty.) Such a pass-book might also be used where a trade is done in **Fresh Milk**, in which case it would often be inconvenient and irksome to both seller and buyer to have an invoice and warranty with every delivery. Or a kind of general guarantee can be adopted in the case of a running contract, such as:—

I, _____, hereby undertake to supply you _____ with _____ gallons of milk daily for _____ months. And I guarantee that all milk supplied will be genuine full cream milk in accordance with Act of Parliament.

(Signed)

.....

Date.....

Where fresh milk is sold, if only in “penny glasses”, by way of refreshment, care must be taken to supply only pure milk (unskimmed).

With regard to the sale of the above-mentioned goods, note that margarine and mixtures have to be sold as margarine, and must not contain more than 10 per cent of butter-fat. **Precautions in Selling Provisions.** Margarine-cheese requires the same formalities as margarine. Both must always be properly labelled. If in packages the name must be marked or branded; to attach a label to the package is not sufficient. Every tub, cask, or basket containing margarine must be marked with the word “Margarine”. In keeping margarine in stock take care that it remains in the

branded or marked tub, and do not take off the mark or detach the label. Margarine, when exposed for sale, must bear a label with the word "Margarine" in letters $1\frac{1}{2}$ inches square. Care must be taken not to let the label fall off when the lump is in cut; and duplicate labels should be kept so that when washing down the slab or cleaning the labels the lump may never be without a label. To prevent mistakes every lump of margarine on the block should be labelled, even though it is not exposed to the view of the customer. Margarine when sold must be handed to the customer wrapped in a wrapper with only the word "Margarine" on it, in capital block letters at least half an inch in length. Margarine-cheese when sold must be wrapped in a wrapper with only the words "Margarine-cheese" on it, in capital block letters at least half an inch in length. To avoid getting the two articles mixed it is well to keep butter and margarine quite separate and away from one another. **Condensed Skimmed or Separated Milk** must bear a label with the words "Machine-skimmed Milk" or "Skimmed Milk" in large legible type.

Another obligation to be noted by all **wholesale** dealers in margarine or margarine-cheese, is that they must register their names with the local authority, and keep a register showing the quantity and destination of all margarine and margarine-cheese sold by them to be sold again. The definition of a wholesale dealer is one who sells to sell again. The "local authorities" for registration are:

City of London—Public Health Department, Guildhall, E.C.

County of London—The Borough Councils.

County and other boroughs with populations of over 10,000—

Town councils.

Smaller boroughs and provincial towns—County councils.

There is no prescribed form for the registry of sales by the wholesaler himself. A book ruled in some such form as this might be found convenient; it could be made up by any printer:

Date.		Quantity.				Name.	Address.	Remarks.
		Tons.	Cwts.	Qrs.	Lbs.			

With regard to other Provisions, it is elsewhere explained that under the Merchandise Marks Act it is an offence to describe goods falsely; the law, for instance, will not allow American bacon to be sold as "Wiltshire", or Canadian hams as "Scotch". Therefore, if a customer asks for any particular kind of **Bacon**, **Ham**, or **Cheese**, that kind must be supplied; or if it cannot be supplied the true class of the article which is offered in its place must be stated distinctly. Customers not infrequently ask—for their own purposes—to have provisions misdescribed on the bill given with them; on no account should this be done. Apart from the illegality, such a request may as likely as not be a deliberate trap, as prosecutions often show!

Perishable Goods also demand attention. Tinned goods may be defective, through too long keeping or improper canning. Tins may be "blown" or bulged out by the gas produced inside them by the decomposition of the contents. **Perishables and Tinned Goods.** Pork, brawn, sausages, rabbits, green fruit, onions, and similar goods may likewise go bad and become unfit for human food from various causes. Careful watch should be kept that all such deteriorated goods are withdrawn from stock, as the risk of exposing them for sale, even inadvertently, may be very serious. In fact such goods should neither be exposed for sale nor kept upon the premises, for inspectors have keen noses, and magistrates have been known to treat with contumely the plea that bad eggs are being kept for shampooing purposes! If goods cannot at once be got rid of, put them out of the shop altogether, and label them "Damaged—not to be sold". For blown tins, if returned within a reasonable period, the wholesale dealers are usually quite willing to make the retailer an allowance, so that there is no excuse for keeping such goods in stock; periodical inspections should be made in order to clear them out. The general public betray an amusing ignorance of canned-goods trade conditions when they enquire if a tin of salmon is "fresh", or a pot of preserve, or a sample of dried fruit. Either such an article is perfectly good or it is absolutely bad and unfit for food. These articles being produced only at a certain period, will in most instances retain their quality for a whole year, but beyond that they are often unsafe. Consequently if the grocer is familiar with the proper seasons for each "line" he will not be liable to

buy heavily just at the fag-end of the old season. Two articles of a grocery stock *improve* with keeping, viz. **Sardines** and **Pickled Walnuts**, neither of which are worth eating when quite new. It will pay, especially in the case of sardines, to keep always a good stock so as to ensure the fish being matured. Two-year- and even three-year-old sardines are much better eating than one-year-old stuff, and very indifferent fish, put on one side for twelve months, will then turn out very good, provided, of course, that they were packed in good oil. **Canned Lobster** is perhaps the worst keeping of all the numerous articles sold in tins. In regard to canned goods generally, it is good policy to buy in fairly large quantities when the quality is known to be satisfactory, as if customers get a tin of apricots, or salmon, that turns out of excellent quality, they like to get the same "brand" again, and will buy that brand more freely than any other even if equally good. Hence it will pay the grocer to sell a known brand even though he might be able to get another equally good one at rather less money. In fact, either in canned goods or in groceries generally, it is doubtful whether the man who is always changing his brands with the notion of "keen buying" really gains anything by so doing, while he certainly throws away one of his best "safeguards"—that of dealing with a firm whom he knows, and who should have a reputation to lose as well as a desire to keep his custom.

The responsibility of the retailer of canned goods does not extend, of course, to instances where such goods are improperly treated or kept by the public after they have left his hands. It might be well that grocers generally should endeavour to make it generally known amongst their customers that such goods as salmon, meat, fruit, &c., should not be kept in the tins after the latter have been opened. It has been suggested by Mr. F. Gibbon, a well-known Leamington retailer, that packers of all such goods should print on the labels—

Caution:—Immediately after opening, the contents of this tin should be turned out into a glass or earthenware vessel.

Observe that when an article of food is deemed injurious to health there is no legal protection in labelling it so as to apprise the customer, though this plan may serve a purpose in some cases.

One of the articles which has been more troublesome to the trade than any other of recent times is **Tinned or Bottled Peas**. The position is most unsatisfactory, inasmuch as while the public will enquire for them, and purchase them, knowing that there is a portion of copper in all green preserved peas, spasmodic raids are made upon traders in various parts of the country, and a partial stoppage of the trade occurs for a time, after which all goes on as before. There is an impression that if grocers in purchasing preserved peas will be careful to obtain a guarantee that there is not more than $\frac{1}{2}$ per cent of metallic copper per pound in the peas, little risk of prosecution is likely to arise if the fact of the copper being present is announced on the packet in such a manner that the purchaser cannot reasonably fail to see the notice. The reason why this belief exists is that $\frac{1}{2}$ per cent per pound accords with the recommendation of Professor Tunncliffe, who, on the occasion of the enquiry into this subject by the Departmental Committee on Food Preservatives, gave a minority report expressing the belief that this quantity was not dangerous. Some retailers, taking advantage of this report, have obtained warranties from the pea-packers and agents, and label the tins and glasses as follows:—

The contents of this package are guaranteed to be prepared with not more than $\frac{1}{2}$ per cent of metallic copper per pound, and thus accord with the recommendation of Professor Tunncliffe, the practical chemist of the Departmental Committee appointed to consider the question of Food Preservatives.

It must not, however, be concluded that all risk of prosecution is obviated by the use of this label. Doubtless it *ought* to form a good defence, but magistrates can, if they choose, convict, on the ground that copper being in a broad sense an injurious article to take, ought not to be permitted in the minutest form in an article of food. (See Sale of Food and Drugs Act, sec. 8, quoted in **FOOD LAW**.)

Regarding the purchase of **Groceries** with warranty, note that **Coffee**, if purchased ready ground, either loose or in tins, if sold *as* Grocery coffee and not as coffee and chicory, should be properly Warranties. guaranteed genuine. **Cocoa** is another article to which inspectors are constantly turning their attention. In regard to **Cane Sugars** and **Syrups**, the retailer should always be able to fall back upon the vendor's warranty. Syrup should be "guaranteed

free from glucose". Sugar cannot be safely sold as "Demerara" unless it is so guaranteed by the wholesale merchant; and indeed it is safer always to sell this class of sugar as "West Indian". **Pepper** and **Spices** are favourite subjects for sophistication, and a specific warranty with every invoice is highly desirable. The labels on the packages are in many instances practically a warranty. **Spices**, and more especially **Ginger**, are frequently robbed of a considerable part of their strength and flavour before being sold, and though "pure" are not "genuine". Ginger that has been treated so as to deprive it of its essential elements is called "spent" ginger. Low quotations from unknown dealers in these goods should be looked upon with the greatest suspicion. In **Baking-powder** the special point to be watched is that there must be no alum in it. **Crushed Linseed** must contain the natural amount of oil or is held to be "impoverished". **Preserves** must be guaranteed "as labelled". **Lime Juice**, **Lemon Squash**, &c., are sometimes pounced upon by the law for preservatives, such as salicylic acid, that are frequently used in them. **Vinegar**, if sold as "malt vinegar", must be guaranteed as such, and in all cases must be warranted "free from injurious acids". **Ground Rice**, **Carolina Rice**, **Castor Sugar**, **Oatmeal**, **Olive-oil**, **Corn-flour**, **Arrowroot**, **Chicory**, **Honey**, **Borax**, **Bees'-wax**, **Egg-powder**, **Beef Extracts**, **Jellies**, **Marmalades**, **Temperance Drinks**, **non-Alcoholic Wines**, **Mustard**, are also types of articles, and will suggest many others, in respect to which the retailer ought always to have a proper guarantee for his own protection.

There are several articles of a grocer's stock—arrowroot was one of them up to the time of writing—that the wholesale merchants refuse to warrant, and as importers and merchants sometimes agree amongst themselves on these points, it is well to note that there is no protection for the retailer in such forms of "warranty" as "Sold as imported", "Guaranteed pure as imported", and "Guaranteed sold as imported". But when we have Government departments urging magistrates to be more severe, and when retailers run the risk, as now, of imprisonment in adulteration cases, it is obvious that proper warranties must be demanded. Goods which we have specially in mind in this connection are ground rice, caraway seeds, arrowroot, desiccated cocoanut, corn-flour, and cream of tartar.

Drugs, such as **Cream of Tartar**, tartaric acid, bicarbonate of soda, &c., must be warranted genuine within the requirements of the British Pharmacopœia ("B.P."), or "commercially pure", as the case may be; and though it is often difficult to get wholesalers to guarantee these goods, the point should be pressed, as they are frequent subjects of prosecution.

The **Sale of Groceries** also demands some special precautions. See that all **Mixed Goods** are legibly marked as such, and, if possible, give also a verbal declaration. After serving a mixed article be careful not to return the surplus from the scales or scoop to a bin containing the pure article. Do not open a tin or package for an inspector if the goods are usually sold in the tin or package. When **Coffee** is asked for and a price named below that of pure coffee, the customer should be informed what is the lowest price of pure coffee and the price of a mixture, and if the latter is sold care should be taken that the label, "This is a mixture of coffee and chicory, &c.", is not covered up. In the same way with cocoa and chocolate powder, mustard condiment, &c.; "prepared" cocoa should be sold under the label "Chocolate powder—this is sold as a mixture". In sugar, as mentioned above, "Demerara" is apt to be a pitfall; "Yellow Crystals" are not "Demerara", but must be sold as yellow crystals. Tapioca, again, must not be sold as sago, however certain the retailer may feel that the customer means pearl tapioca when she asks for "sago". In the case of Golden Syrup, the Metropolitan Grocers' Association in 1899 advised its members to sell all such syrup as "Prepared golden syrup: manufactured from glucose and sugar", and that this label should be placed on vessels brought by the customer as well as refiners' packages. In 1904, again, owing to prosecutions for the sale of pepper containing an undue percentage of husk, the Federation of Grocers' Assistants went so far as to recommend that grocers should abandon the terms "white pepper" and "black pepper" and sell only "ground pepper"—a recommendation, however, to which some of the most respectable grocers took strong exception.

The retailer should carefully read the reports of prosecutions which actually take place, as reported week by week in the press, and should see that for every article on which a prosecution has been founded, a guarantee is obtained.

Precautions
in Selling
Groceries.

17. THE STABLE AND THE HORSE

It must be admitted that in too many cases the stable is a weak point in a trader's establishment. It is taken for granted that any draughty, low-roofed, badly-ventilated, and insanitary stable is good enough for the poor horse; although, as much from the point of view of policy and economy as from humanity, this is an entire mistake. The strongest of our domestic animals, the horse is also one of the most delicate and susceptible to disease; and if your stable is of such a kind as to give your horse a chronic cough, inflamed eyes, or spoil his lungs or his digestion, you will have to pay for the lesson that if it pays to keep a horse at all it pays to treat him well. All stables should be erected on dry ground and properly drained; stalls not less than 8 feet wide by 10 feet long; the whole place lofty and well ventilated at the top, and with plenty of light. It is not a good plan to have a loft over the stable. The stall should be paved with small bricks or round stones, so that water may run away freely behind the horse. The manger, which should be watertight, should be a small three-cornered iron or enamelled structure in one corner of the stall at the side opposite to the rack; and the hay-rack should not be too large, and never above the horse's head. If the manger is of wood and the horse bites it, iron strips such as those used to protect wine-cases may be nailed on. In the same way, if you have a wooden partition between the stalls, it may be protected by being bordered with iron. The windows of your stable should be so arranged that when they are opened for extra air the aperture is higher than the horse, as it is very easy to give a horse a cold by putting him in a draught when he is heated from violent exercise. At the same time remember that, if your stable is small, the more need for it to be well ventilated. The drainage also is of great importance; be very careful that you have no open drain or cesspool in your stable, but that the drain is carried outside.

Look to its
Sanitation.

It is well to be liberal with whitewash, especially if your stable is small; and as a horse loves a clean bed and good air, as well as good grooming, you will do well to clean out your stable every morning if you desire to keep its occupant in good condition.

Feeding has also to be regarded as a most important factor

in maintaining good condition. If you want your horse to work well you must feed him well; but not too well, a rather lean horse being equal to more exertion than one that is too fat. Most horses, perhaps—at any rate in this country—are fed on hay and oats. That food usually keeps them in good health, and enables them to do their work daily. Maize (“Indian corn” in England and “mealies” in South Africa) is frequently substituted for oats; but straw is not a suitable substitute for hay, as some people seem to imagine. Beans are cheaper than oats, reckoning their flesh-forming properties; but they are too heating, and are apt to cause swellings from inflammation. They are sometimes substituted, with the addition of a little straw, for a portion of the oats in a horse’s daily ration, and it is said that they may be advantageously fed to horses required to perform long-continued, sudden, or severe labour. In some countries where oats are scarce barley is used; but it should be of good quality, and the quantity required is larger than that of oats. For an ordinary small-sized animal in hard work, or a larger horse in slow work, the following is a suitable daily ration:—Oats, 15 lbs.; hay, 10 lbs.; beans, 5 lbs.; bran, 2 lbs. Another is: Oats, 16 lbs.; hay, 12 lbs.; maize (Indian corn), 4 lbs.; beans, 2 lbs.; bran, 1 lb. A third, suitable for a heavy horse in full work, is: Oats, 16 lbs.; hay, 15 lbs.; maize, 3 lbs.; beans, 3 lbs. If the horse is idle, half the quantity of oats and about a dozen pounds of hay may be given. With regard to the use of maize, which is a great deal more used in America, where it is plentiful, recent experiments have shown that it may be advantageously substituted for oats. Two of the Paris horse-companies began in 1870 to feed maize, and the results were so satisfactory that one of them has since abandoned the use of oats, while the other has continued to feed oats and maize at a very considerable saving. Maize and oats are similar in composition, but oats contain a great deal of indigestible hull, while in maize there is very little skin. In preparing food for horses it is very important that grain should be properly cleaned. Feeding with this precaution neglected has frequently been the cause of illness amongst horses from tares and other seeds. Cleaning also removes mineral matter and dust, which are sometimes the cause of colic and intestinal obstruction. No advantage appears to be

Feeding
the Horse.

A Daily
Ration.

gained by grinding the grain, as horses, unless old, prefer to crush it themselves. On the other hand, it has been found profitable to chop the coarse fodders, and straw can be mixed with the hay when this is done. Sometimes hay is replaced in the ration of horses by other fodder-plants, such as lucerne, sainfoin, and red clover. But perhaps it would hardly be wise on the part of an inexperienced horse-owner to try too many experiments. As a rule it is better to err on the side of giving too much Method and Meals. than too little food, especially if the horse be doing pretty hard work. It is also well to arrange matters methodically. The horse needs three meals a day. The food should be kept locked up, and, having been duly mixed, the day's ration should be divided into three bags, one for each meal, and the bags given each day to the driver. Regular hours for feeding and working are as necessary as careful driving; and it is not every person in charge of horses who gives due attention to these points, which mean so much to horse and master. With regard to drinking, note that horses are particular in wanting good pure water, fresh, and not too cold.

With regard to the choice of a horse, note that for hard work, such as drawing a "shop on wheels", it is no use to buy a horse under five years old. Frequently a pony is used for In Buying a Horse. soliciting orders, and a big horse and covered van for delivery purposes. A pony standing about 14 hands is much used by grocers in small delivery-vans. The most useful are not quite pure-bred, but with good strong legs and strong quarters. A great many are bred in Wales, and a good Welsh cob is hard to beat for this kind of work, being hardy in constitution, an excellent puller for size, sure-footed, and stylish in action. In all work-horses it is important that they should be deep and well-sprung in the ribs, with a very small space between the last rib and the hip, and the legs short from knee to pastern.

Professor James Long, writing in the *Manchester Guardian*, gave the following useful hints:—"When a horse is presented for examination, one of the first things which an expert Defects to Look for. desires is to see him move, walk, trot, and canter, that he may display any fault of limb which he may possess; and yet there are some faults which are not recognizable until a horse has travelled some distance. After brisk action his wind may be

examined, but here some little experience is necessary to detect an abnormal condition, except in a bad case, which speedily reveals itself. Having examined the wind, attention may be given to the eyes, which most men should be able to understand; and then the head and ears may be handled, in order to see that there are no sores or imperfections. If the hand is run down the mane and on to the withers, the would-be buyer may be able to ascertain whether there is any swelling or healed wound or suspicious place suggesting that fistula has been or is actually present. If the body of the horse is apparently healthy and hard, attention may next be given to the legs. An awkward gait in walking may indicate that the eyes are not good and that the horse is not certain of his steps. It is important that in examining the legs and feet of a horse the examiner should know for what he is looking. If both fore-legs are sound they will be both alike, for a swelling or bony excrescence on one leg which is absent from the other will at once suggest a defect. Among the chief defects to look for are splint, spavin, enlargements of any kind, side bones, greasy heels, sand crack, thoroughpin (which is an enlargement of the back part of the hock), contraction of the feet, and what is called 'founder'. There are other diseases of the foot, such as ringbone, thrush, a disagreeable complaint in the frog, and lastly I may mention what is termed forging, or over-reaching, although I have omitted diseases which will at once occur to the experienced hand. One of the chief troubles of the horse is splint, a hard or bony enlargement which appears inside the fore-leg and below the knee. Much might be said upon this complaint, which sometimes exists without detriment, but the amateur will be wise to make himself acquainted with the actual condition and form of a perfect leg before examining a horse which he intends to buy. The hand which is accustomed to handle the legs of a horse will quickly observe anything wrong, and the eye will recognize a well-made and sound foot, although bad treatment by stablemen and farriers frequently accounts for good feet spoiled. If a scar is noticeable something more should be learned about it, for it may mean that something ugly exists behind it, or that the horse is a kicker. The hips should be evenly placed, and the stifle-joints should prove normal in size on either side. On level ground the horse should stand level, his four legs

Legs and
Feet.

straight, with no indication of the animal resting one as though it were weak or weary when he is quite fresh; still less should there be any inclination to bend a leg as though the knee were weak from his having been down. A broken knee should be discernible by anyone. When a horse is moving his legs should be kept at the same angle, the feet not turned outwards or inwards; and they should be well lifted, and not dragged slovenly along, as in the case of horses which have sometimes been down. Every effort should be made to ascertain whether the horse jibs or starts freely, whether he is bad-tempered, and sometimes the ears indicate this fact by the way in which they are Does he Jib or Shy? now and then laid back; whether he is a kicker, or can be quickly handled in the stable for feeding and harnessing, saddling for the ride, or putting into the shafts. Is he a shyer? Watch when he passes a tree or a heap of stones on the roadside, and if the opportunity offers listen for the wheezing which may accompany bad wind. It is not every man who understands how to gauge the age of a horse by his teeth; but here it may be well to look up some work on the subject in which illustrations of the teeth at different ages are shown, comparing the details and illustrations with the mouth of a horse whose age is known. An intelligent person will be able to differentiate between the first teeth of the colt and the permanent teeth of the adult, not only by their size, but by their form and narrowness at the neck. With the permanent teeth up, they may be examined on the surface for the marks which subsequently appear, or, what amounts to the same thing, for the removal of the marks, which is occasioned by age. A horse is regarded as aged at eight years old, but highly capable men can tell the age of a horse approximately for many years afterwards. It is the practice of many sellers as well as buyers who are in the horse-dealing business to make the most of the fact that a horse is aged, although the term is, as I have suggested, applied to a given age, beyond which his years are not discernible by an average man from the front teeth. But this is an altogether arbitrary practice. Many horses do their best work after eight years, and should never be rejected. I have owned animals from twenty-five to thirty years old which have been good servants almost to the last, but which were in their first youth at eight years old."

The diseases of a horse are matters for the vet. rather than for the grocer himself, but a few words as to the symptoms of the more common ailments may be useful. Restlessness and shifting on the feet, and frequent lying down, indicate inflammation of the feet, acute founder, or *laminitis*, caused perhaps by over-exertion, chill, drinking cold water when heated, or eating new hay or oats. A gentle purgative will sometimes relieve this, or fomenting the legs and feet with warm water. Swelled legs or weed is the result of over-feeding and too little exercise, and also suggests a purgative. A foetid discharge from the frog is called thrush, and is caused by standing in foul litter. Similar filthiness and neglect in grooming, or not drying the legs after washing, also causes a skin inflammation known as grease, usually in the hind-feet. Broken wind is caused by musty hay or straw or over-feeding, and may be relieved by good feeding and slow work. Diarrhœa may indicate worms or too succulent feed. If the animal appears to suffer paroxysms of pain at intervals of a few minutes, becomes excited, and throws itself about in the stall, the cause may be merely flatulency or the more serious inflammation of the bowels. In the latter the pain is more continuous, and the animal shows his agony by kicking at his belly and whisking his tail; the services of the vet. are urgently needed. Food that ferments too easily, or drinking cold water when heated, are often the cause of this malady. A discharge at the nose and eyes, with sneezing, indicates a cold, and is called catarrh. The body needs clothing warmly, and bran mash should be given, with a mild purgative if there is constipation of the bowels. Loss of appetite and dulness, with inflamed eyes and a watery discharge from the nose, are the symptoms of influenza; and a common but more dangerous form of this disease is called pink-eye. Widely-dilated nostrils and quick, laboured breathing, with or without the foregoing symptoms, indicate inflammation of the lungs.

We cannot recommend the grocer to act as his own vet., but a few simple remedies may be named. Thus, in grease and thrush wash the affected part with soft soap and apply a little ointment made of zinc sulphate and vaseline, and give the horse 4 ounces of sulphate of soda daily. For swelled leg bathe with a lotion made of 3 parts tincture of arnica, 1 part

acetate of lead, and 8 parts water; also administer a purgative. When horses' feet suffer from the cold mud in frosty weather they may be dressed with a mixture of 1 part of carbolic acid, 8 parts liquid acetate of lead, and 64 parts glycerine. For flatulent colic give a purgative ball containing aloes, 5 to 10 drachms, enemas of warm water only, and 1 or 2 ounces of laudanum. An ordinary purgative is linseed-oil, a pint or a pint and a half. A tonic, which may be given twice daily after the worst stages of various kinds of colds, may consist of $1\frac{1}{2}$ drachm sulphate of iron, 20 grains sulphate of quinine, 2 drachms dilute sulphuric acid, and 10 ounces of water. As an embrocation 1 ounce hartshorn, 2 ounces turpentine, 2 ounces spirit of camphor, $\frac{1}{2}$ ounce laudanum, and 6 ounces olive-oil is recommended. Note that all horses that are suffering from over-work, old age, or leg and foot troubles are much benefited by a run at grass for a month or two in summer and autumn, receiving during that time no extra artificial food. Horses are sometimes affected by toothache, and need their teeth inspected by the vet.

In approaching a horse standing in his stall, he should first be made to "stand over" to the right side with his hind-quarters, prior to entering the stall. Well-trained horses will readily stand over to the right side when they hear The Horse in his Stall. the word "stand over" or "over" uttered in a commanding tone of voice, and all young horses should be taught to do this. It is a risky, not to say dangerous, practice to approach an animal from behind without giving him a warning with the voice, as nervous horses may easily lash out if approached unawares. The omission of the precaution to make a horse stand over when entering his stall is not infrequently the cause of a person being kicked. It is the proper thing always to approach a horse standing in his stall on the near side, except in the case of one being examined, when we first look at him from the left side, and then enter the stall on the right side to view him from the right. Never attempt to go up to the horse while he is moving across to the other side of the stall, but wait till he is perfectly steady. Then walk straight up to him. Avoid dodging suddenly about him, for nothing tends so much to make a horse nervous, and unless he is a remarkably quiet horse he may let out just when least expected.

The management of horses on the road cannot be subjected to

a set of rules, for horses, like human individuals, vary greatly in temperament; but a good rule of general application is kind treatment. Whenever he makes a mistake he should be checked, but in proportion to its nature and with due regard to his temperament. Note that in checking a horse for a mistake he has committed, it should always be done at the moment the mistake occurs, and then he can reasonably be expected to understand what the punishment means. If a horse stumble he should be pulled together smartly, but never punished.

Horses of peculiarly excitable temperament, and possessing thin skins, sometimes become practically unmanageable in consequence of the irritation caused by flies. They have been known to throw themselves down, bolt, and otherwise lose control of themselves when persistently annoyed by flies. Although this form of irritation cannot possibly be absolutely prevented, it can be ameliorated to a great extent by applying a little oil to the more tender parts—the ears, nose, flanks, inside of the legs, the sheath, and the hips under the tail. The oil should be lightly rubbed on with a piece of cloth, but not so thickly as to clog the hair and cause dust to adhere to it.

The nature of the work of many horses, such as vanners, &c., necessitates their occasionally being left alone when delivering goods. In all such cases the pressure should be removed from the shoulders by turning them across inclines if practicable, or otherwise braking the wheels. During rough blasts of rain and snow the hind-quarters of horses should always be turned towards them, as that is the position they assume under natural conditions. Numerous accidents occur by horses backing round to avoid showers of rain and hail.

Finally, remember the “Rule of the Road”:

The Rule of the Road is a paradox quite
In driving your carriage along;
For if you go left you are sure to go right,
But if you go right you go wrong.



