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THE GROCER'S HANDBOOK

THE GROCER'S HANDBOOK

A TEXT-BOOK FOR THE GROCERY TRADE

BY

W. H. SIMMONDS

Editor of "The Practical Grocer"; Formerly Editor of "The Grocer and Oil Trade Review"

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PREFACE

In the following pages an attempt has been made to meet, to some extent at any rate, the requirements of the Syllabus of Technical Instruction for Grocers' Assistants, which was drawn up in 1907 by the Technical Education Committee in connection with the British National Association of Grocers' Assistants. The Committee was constituted as follows:—

Education Representatives:—Sir William Anson, Bart., M.P.; Professor J. Wertheimer, B.Sc., B.A., F.I.C., F.C.S.; Dr. Macnamara, M.P.; H. H. Francis Hyndman, Esq.; Principal C. T. Millis, M.I.M.E. (Borough Polytechnic); Principal Sydney H. Wells (Battersea Polytechnic); Principal Reg. S. Clay, B.Sc. (Northern Polytechnic).

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Trustees:—Sir Jeremiah Colman, Bart., J.P., D.L., Messrs. D. R. Evans, and H. E. Eaton.

Secretary:—J. Aubrey Rees.

The Committee's objects are defined as being:—

1. To urge the Local Authorities and others interested in promoting Technical Education to institute Special Classes for Grocers and their Assistants.

2. To encourage those engaged in the Trade to attend these Classes by holding Examinations and granting Diplomas to those displaying the most expert knowledge of their trade.

It is the hope of the Editor and the Publishers of this little book that it may assist in the laudable work the Committee has in hand, and may contribute to the spread, among grocers' assistants, of that trade knowledge which will assist them in their calling and increase their efficiency as servants of their employers and of the public whose food they distribute.

The Editor's acknowledgments are specially due to the Gresham Publishing Company for permission to quote from the pages of *The Practical Grocer*, which have been largely drawn upon. He has also to own the great assistance he has derived from the technical lectures delivered from time to time by various trade experts in connection with the grocers' associations, and duly reported in the pages of *The Grocer*, to which journal and its excellent annual, *The Grocer Diary*, he is indebted for permission to draw upon such reports and for much other valuable information.

The plan of the work is very simple. First are given full particulars concerning the COMMODITIES HANDLED—a most multifarious section, as may well be imagined by anybody familiar with the interior of the modern "household stores". For easy reference to these commodities an alphabetical index is given, whilst the study of them is facilitated by the plan of grouping them in suitable chapters.

Then follow chapters dealing with SHOP ROUTINE (including Stock-keeping), BOOK-KEEPING, and LAW, in which will be found in a concise form such information as it is essential for the retail trader to possess.

REFERENCES

"The Practical Grocer: A Manual and Guide for the Grocer, Provision Merchant, and Allied Trades," in four volumes. By W. H. Simmonds, with contributions by specialists, trade experts, and members of the trades. Illustrated. Published by the Gresham Publishing Company, 34 Southampton Street, Strand, London, W.C.

"The Grocer and Oil Trade Review Diary." Published at *The Grocer* Office, Eastcheap Buildings, London, E.C.

The Federation of Grocers' and Provision Dealers' Associations, Ceylon House, 49 Eastcheap, London, E.C.

The National Association of Grocers' Assistants, Ceylon House, Eastcheap, London, E.C.

The National Amalgamated Union of Shop Assistants, Warehousemen, and Clerks, 122 Gower Street, London, N.W.

The Technical Education Committee: Secretary, J. Aubrey Rees, 49–51 Eastcheap, London, E.C.

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Chapter I.—TEA

The chief tea-growing countries are China, India, and Ceylon, although Japan and Java also contribute largely to the world's supply. China, which grows a vast quantity for its own consumption, was also at one time the chief exporter to Great Britain and other countries, but has long been displaced by India and Ceylon as a supplier of the British tea market. Nevertheless, in the most recent official statistics China was placed as sending out some 200,000,000 lb. of tea each year, while India exported in a recent year nearly 220,000,000 lb.—her record output. Ceylon also exports about 150,000,000 lb. a year.

For the British market tea comes from India to the extent of about 58 per cent of the total imported, from Ceylon 34½ per cent, from Java 5 per cent, and from China 2½ per cent only. On the other hand, Russia derives nearly all her tea from China, and the United States rely on China for more than a half of their total supply. Australia imports some two-thirds of her tea from India and Ceylon, and the remainder mainly from China via Hong Kong or direct. Canada obtains of her total supply a third from Japan, a sixth from China, and the remainder from India or Ceylon either direct or through the United Kingdom. Besides China, India, Ceylon, Japan, and Java, tea is grown on a smaller scale in Natal, Mauritius, the Straits Settlements, the Caucasus, Fiji, Johore, Brazil, South Carolina, and elsewhere.

The plant demands a tropical or sub-tropical climate, with a rainfall of not less than 60 in. a year, or more than twice the quantity of rain that falls usually in England or Scotland.

In **India** the chief tea-growing regions are the two provinces of Eastern Bengal and Assam, and Bengal; the former comprising Assam proper, Sylhet, Cachar, Darjeeling, Jalpaiguri, and Chittagong, and the latter including Chota Nagpur. Nine-tenths of the Indian tea is grown in these provinces. The other tenth is grown in Dehra Dun and Kumaon, in the United Provinces; the Kangra Valley in the Punjab; and the Neilgherry district, Wynaad, and Travancore, in Madras.

In **Ceylon** over 400,000 acres of land are planted with tea. Ceylon teas have rapidly advanced in public favour of late years, and have achieved a commanding position in the British market, the best kinds competing well with the Darjeeling teas of India. It was recently estimated that there were some 600 "marks" of Ceylon tea, as compared with nearly 650 of Indian.

In **China**, Kwang-tung, Kiang-si, Kiang-su, Fu-kien, and Che-kiang are the provinces which export most tea, the chief ports for its exportation being Foochow, Hankow, Canton, Macao, Shanghai, and Hong Kong. The great emporium of the black-tea trade in the interior is Ho-kow (Ho-how). Canton, where the East India Company's tasting staff used to be stationed, has given place in that respect to London.

DESCRIPTION

Tea is of the natural order *Ternstrœmiaceæ*, genus *Camellia*, sub-genus *Thea*. So far as is known, the tea plant is a native of Assam and Upper Burmah, although it has been cultivated for a thousand years and more in China. It is an evergreen which in full growth attains a height of 30 or 40 ft., with a stem 1 ft. or more in diameter; but in cultivation it is usually cut down to a bush of from 3 to 6 ft. high. In India the plant most commonly grown is the result of a cross between the Assam and Chinese varieties.

The tea plant bears a white flower something like the

British "dog-rose" which spangles the hedges of the Old Country. Flowers, however, are of no use to the tea-grower, except for those of his plants which he keeps for seed. The tea leaf in all its varieties has looped or meshed veining, and a margin toothed with short spines. It is glossy, shiny in appearance, and rather tough.

The tea plant is grown in India and Ceylon from seed which is raised in seed gardens resembling ordinary orchards. The seed, which is something like an English hazel-nut in appearance, is placed in wet sand to germinate; the sprouts are planted out in nursery beds; and when about six to eight months old the young seedlings, a foot or so high, are transplanted to the plantation, where they stand in rows about 4 feet apart from one another. The plants are pruned from the second year onwards, and the tops cut so that the shrubs are not too high for plucking.

Plucking the tea leaves from the tea plant is an operation which goes on repeatedly in the course of a season as successive "flushes" of leaves appears on the bushes. The first shoots of the new growth of the season (towards the end of March in India) form what is termed the "first flush", and when this is ready the gathering commences. Most of the leaves are picked from the upper part of the shrubs. The end of the shoot with the bud, and either one, two, or three leaves, are picked off, the number of leaves depending upon whether fine, medium, or coarse tea is required.

In Darjeeling the bud itself yields "golden tips" or "silver tips", which form the finest tea. Next comes the top leaf, which gives "orange pekoe" or, if large, "pekoe". The second or lower leaf yields "pekoe" or, if large, "pekoe souchong". How these are arranged in further classes will be seen later. When the youngest leaves of the "flush" have been picked, the remainder of the shoot is left to form "flushes" again in the further course of the season, more gatherings taking place at intervals of a few days. The "first flush" teas are preferred in China and Japan, but not in India and Ceylon.

In China there are at most four or five tea harvests in the year, the first plucking taking place in April, the second about the beginning of May, the third in June or July, and the fourth and fifth from July to September. The tea from the first crop is reckoned best in colour and flavour, and the crops which follow are commonly of inferior quality.

In India and Ceylon the "first flush" leaf is deemed inferior to those later plucked.

In Assam tea-plucking goes on from March to November; in Ceylon it takes place throughout the year. Thus there is no special month for "new season" Ceylon teas; they are arriving at all times.

Classes of Tea.—The fine downy leaves at the tip of the shoot make the Chinese **Pekoe** (the words *Pak-ho* mean "white hairs"); the next leaves, the **Souchong** (*Siaou-chung*, "little plant"); then comes the **Bohea**, while the larger and rougher leaves yield the **Congou** (from *Kung-fu*, "labour").

The Indian practice is that the bud leaf yields the best tea of all, or **Golden Tip**, which is sometimes plucked separately and sold at a fancy price. The first leaf gives the **Orange Pekoe**, the second the **Pekoe**, the third leaf the **Pekoe Souchong**, and the fourth leaf the **Souchong**. Thus all quantities may be obtained from the same bush and on the same day.

The same thing applies even to the larger classes—"Black", "Green", and "Oolong". The late Herbert Compton, in his interesting little book, *Come to Tea with Us*, which deals chiefly with the Indian product, writes:—

"There are many sorts of tea, but, generally speaking, they may be classed under three heads, viz.:—

"(1) *Black tea*, in which the leaf is fermented or, as modern science has half decided, oxidized, and dried over the fumes of charcoal or in heated air.

"(2) *Green tea*, in which the leaf is desiccated in its green state before fermentation has time to set in, by a process of cooking and curing it in hot iron pans.

"(3) *Oolong tea*, which is a sort of half-and-half product, being green tea cured over charcoal fumes or in heated air instead of in iron pans.

"It would be perfectly possible to make these three varieties of tea from the leaf of the same bush and on the same day. Moreover, given favourable quality in the flush, each variety could be graded from the choicest to the commonest, from tea worth 3*s.* per lb. in Mincing Lane to tea worth less than 3*d.* per lb.—all, likewise, the product of the same bush on the same day—provided the said bush was large enough to produce sufficient leaf for the experiment. I have no doubt that this will surprise you; but then, that is one of the things I have set out to try and do in this little, humdrum, dry, grocery book.

"Black tea, which is the tea we drink in England, is 'plucked' (that is, the green, growing leaves are picked) one day and made into tea on the next. Green tea and Oolong tea are picked from the bush and made into tea all on the same day, although, for convenience' sake, the process of 'colouring' the former is often deferred till another day."

Varieties of Tea.—These, with their distinguishing characteristics, we may conveniently classify under the respective headings of Indian, China, Japanese, &c.

Indian Teas

Orange Pekoe (Darjeeling): A small, curly, tightly twisted leaf, brownish-black and orange-tipped. *Pekoe*, very similar. In Indian and Assam teas generally, *Flowery Pekoe* and *Orange Pekoe* are smaller, more curly, and more full of tips than Pekoe. Colour from grey-black to black.

Pekoe Souchong and *Souchong*, larger and looser than the Pekoes. Colour, brownish-black to black. *Souchong* (Assam): A large, coarse, rough leaf of dead grey-black colour.

Broken Pekoe: Brownish-black in colour; often contains deep orange tips, and gives on infusion a liquid darker and with more body than the foregoing.

Broken Souchong, *Fannings*, and *Dust* give a dark, thick liquor, but not so strong as that from the whole leaf.

Ceylon Teas

Orange Pekoe and *Pekoe*, rather smaller than Indian teas of these classes, with a more dead-black colour, and the tips more orange or golden.

Broken Pekoe gives a dark-coloured infusion, "with more body but less life" than the former.

Pekoe Souchong and *Souchong*: Curly-leaved, almost dead-black; less tipped than the Pekoe. Liquor sharper and more pungent, but coarser than that from the Pekoes.

Ceylon teas generally are stated to keep not so well as others, and should therefore be used as quickly as practicable when a chest has been opened.

China Teas (Green)

Hyson and *Young Hyson*: A rather long, fairly well twisted leaf, silvery green, yielding a clear, pale, pungent liquor with sharp, strong flavour. The "young" is the more delicate in flavour. *Feong Mee* and *Sow Mee* are kinds of Hysons.

Gunpowder: Small, short, tightly-rolled, good green colour, and said to be flavoured with the sweet-scented olive. Liquor, clear pale straw-colour, pungent, with a sharp but delicate and slightly bitter flavour.

Imperial or *Pearl*: A large leaf of green, bluish-green, or silver-green; coarser in flavour than Gunpowder.

Twankay is a low-quality green tea of coarse flavour.

Pingsuey is one of the Gunpowder teas, and according to some authorities these are merely Hysons selected

China Teas (Black)

Monings: Greyish-black, curly, more or less tipped. Soft smooth-drinking teas, sometimes "malty" or "tarry" in flavour; less pungent and full-flavoured than Indian teas. *Kintuck*, *Ningchow*, *Oapack*, *Oonam*, *Oonfa*, and *Shantam* are kinds of Monings.

Kaisows: Rather curly; reddish-black colour. More "life" than Monings and fresher in the cup, but less full-flavoured than Indian. *Soomoo* is a subdivision.

Souchongs have delicate flavour, and are perhaps the finest of the black teas. The leaf (*Souchong Lapsang*) is almost dead-black, large and loose in make, and with a slight curl. Used either by themselves or in blends.

Oolongs: Rough and coarse, with a somewhat greenish appearance. Pungent, faintly "herby", or bitter. For *Formosa Oolongs* see Japanese, below.

Pekoes have the characteristics of the fine downy leaves at the tip of the shoot. It is said that the finest Pekoes, grown on the northern slopes of the Bohea Mountains, are seldom sent out of China. *Scented Orange Pekoe* has a dark-green, longish leaf in some cases, and a small curly leaf in others.

Congous are made from the leaves that are coarser than the Pekoes and Souchongs, but not so coarse as the common *Bohea*. *Tayshang Congou* is one of the recognized varieties. *Pekoe-Congous*, or *Packlings*, show a smallish leaf, reddish-black, tightly-twisted, and curly.

Scented Capers: Small, shotty; some black and glazed, others greenish-black or olive-coloured. Used solely for flavouring.

Bohea: Like black tea in appearance, but with the general character of the green. The commonest kind of tea drunk in China.

Japanese Teas

Oolongs (Japanese and Formosan) hold the mean between black and green tea, and have a special perfume and flavour which are liked by some consumers, but not by all, however. This tea bears marks which are regarded as distinguishing the following qualities:—

1st, choicest; 2nd, choice; 3rd, finest; 4th, fine; 5th, superior; 6th, good; 7th, fair; 8th, common.

Japanese teas are classified as follows:—

Hikicha or *Tencha*: A powdered tea, used only on state occasions, or for the "cha-no-yu" or tea ceremony.

Green Tea: (*a*) Gyokuru, or pearly dew; (*b*) Sencha, the tea commonly drunk.

Bancha: Cheap tea from last year's leaves, stalks, &c.

Black Tea and *Oolong*.

Besides the above classes of tea it will be convenient to mention here the following:—

Caper Tea, plain or scented, sometimes black and sometimes green, is composed of the dust of various teas made into hard grains with gum or rice-water. Small grains sifted from Scented Caper (see China Teas) are called *Ouchain* or *Glazy Ouchain.* The scent is imparted to the leaves of such teas by heaping over them, at one stage in the manufacture, odoriferous flowers such as the sweet-scented olive, the chulan flower, or some kinds of jasmine or gardenia.

Brick Tea (largely exported from China to Russia) is so called from being made in cakes the shape of bricks. Both large leaves and young shoots are used. After being softened by steam they are pressed in wooden moulds to form the bricks, and then allowed to dry in the air where protected from the sun. When quite dry each brick is wrapped separately, and a red ticket affixed bearing Chinese characters in black. The bricks, which are about 8 in. long, 4½ in. broad, and ¾ in. thick, are as hard and sonorous as wood. Among the Mongols they are used as money. In colour Brick Tea is bright green, dark green, or nearly black, the bright green being the best and the black the lowest quality. The second quality bricks are commonly twice the size and weight of the first.

Maté is the so-called Paraguay "Tea", the dried leaf of a shrub called *Ilex paraguayensis,* a species of holly.

Kat, or Arabian "Tea", is the sun-dried leaf of the *Catha edulis.*

Cracker or **Sassafras** "Tea" is made from the fragrant bark of the root of an American laurel.

The leaves of the climbing vine, *Smilax glyciphylla,* and of a small shrub of the myrtle family, have been used as so-called "tea" in Australasia and elsewhere.

MANUFACTURE

Tea manufacture is carried on mainly by hand processes in China and Japan, but almost entirely by machinery in India and Ceylon. There is also a difference in the method of curing. In India and Ceylon this process is conducted by the aid of artificial heat; in China and Japan the sun's heat is used for drying. It may be remarked that the United States government have a tea plantation where experiments have been specially carried out in order to test the Chinese principle, and in 1907 it was announced that the sun-cured tea was found most successful. But this is a matter which has not escaped the attention of progressive planters in Ceylon and India also. On the other hand, the fact that the Indian and Ceylon leaf is hardly touched by the workpeople's hands after reaching the factory is held, and with good reason, to be a great point in favour of its wholesomeness as compared with the Chinese product, whatever may be the case with the teas of cleanly Japan.

Tea manufacturing processes in India include (1) withering or limping, (2) rolling or curling, (3) fermenting, (4) drying or firing, (5) sorting and cutting, (6) final firing. The whole process can be completed in twenty-four hours.

For **withering**, the leaves are spread on coarse cloths upon "chungs" of bamboo lattice, or wire trays, to be partly dried either by a few hours of exposure to the air at its natural temperature, or, more quickly, by passing over it a current of air artificially warmed. The leaves then pass to the **rolling** machine, where pressure bursts the leaf-cells and liberates their juices, while a little twist is given to the leaf itself. The rolled leaves are then spread in layers on wet muslin lying upon a cool floor, and there **ferment or oxidize**—the scientists are not absolutely agreed as to which—a process which occupies a few hours. This is said to be due to the presence of an enzyme. After a second rolling the tea is "fired" or dried in a machine supplied with hot air, the temperature at one stage being as high as 300° F. In this **firing** process the slightly yellowed leaves are blackened by the heat.

The leaves have now become what is called *rough tea*—the manufacture is complete, but the tea requires **sorting**. That is, it is picked over carefully and all the bits of "red" or old leaf, bits of bamboo, or other debris, removed.

Then the tea is **sieved** or sifted to classify it. The smaller, choice, and fine teas are classified as "unbroken" or "whole" teas. The larger leaves, which will not pass through the sieve, go to a cutting or breaking machine, which breaks them into the "broken" teas we know, such as "broken pekoe", "broken orange pekoe", "pekoe dust", "broken souchong", "fanning", and so on.

The manufacture is complete, but before being packed, as the teas may have acquired an injurious amount of moisture from the air during the sorting process, they are again passed through a drying-machine—sometimes called a *sirocco*, from the name of the Eastern hot wind—and while still warm from this they are packed in the lead-lined chests with which we are so familiar, these being marked with the garden mark, the name of the tea, and the consecutive numbers for shipment.

The **manufacture of China tea** varies according to whether **black tea** or **green tea** is required. The essential difference is that the black teas are fermented before the roasting or firing takes place, while the green teas are not. The green teas of China and Japan are chiefly used in the United States; they are also in the United Kingdom to a small extent for special flavouring in blends.

Green tea is thus made. The leaves, spread out on bamboo trays, are placed in a box over a boiler, the steam of which softens them. They are then exposed on tiled floors or on bamboo trays out-of-doors in the shade. Stalks and dirt having been removed, the leaves are put in a small iron pan and heated over a brisk fire, being stirred meanwhile by the hand. They are next rolled on a rattan table, and having received the approved twist or curl, are put in flat trays to cool. A second roasting over a slow charcoal fire in an hour or so fixes the green colour. Sieves of different sizes are used to sort the leaves, and in the course of this process a third, and sometimes a fourth or fifth, roasting takes place, and a winnowing fan gets rid of dusty impurities.

Sometimes green teas are "faced" to improve their colour, such ingredients as Prussian blue, French chalk, indigo, soapstone, or turmeric being employed for this purpose. The leaves are moistened with water, reheated, the powdered colouring matter shaken over them, and the whole well mixed.

Black tea is made by "tossing" and fermenting the leaves in a heap after the preliminary process of withering and before the first roasting, after which the tea is exposed out-of-doors, and then alternately dried and rolled until the leaves are dry, crisp, and dark-coloured.

JUDGING VALUE

An old and successful grocer of great practical experience writes on the subject of retailers' tea-buying as follows:—

"I think it may be laid down that a man who buys less than six chest lots, and those rather frequently, should not in these days attempt to blend. He cannot do with small stock and small purchases, say less than six, at 4½*d.* and duty, = 10½*d.* (to sell at 1*s.*); six each of Ceylon and Indian (and flavouring teas extra) for 1*s.* 4*d.*, to cost 6½*d.* and duty; ditto for 1*s.* 6*d.*, cost 8½*d.*; and six at 1*s.* 0½*d.*, for 2*s.* Here are fifty chests, to say nothing of Capers, Pekoes, Oolongs, &c., for flavourings. Add Moyunes, Gunpowders, &c., and you have altogether a hundred chests which must be in the tea room, besides apparatus for blending, which runs into capital. On the other hand, the grocer who does not blend can, if he goes about it rightly, buy well with three chests for each blend—say 1*s.*, 1*s.* 4*d.*, 1*s.* 6*d.*, and 2*s.*, making a total of twelve chests in all; and thus working with one-eighth of the stock he would require so much the less capital, to say nothing of avoiding the dusty work of blending and the waste of time in tasting 'originals'. Consequently, for those who are starting in the tea trade, and who are in doubt whether to blend or to buy blends, the practical advice is—at all events *begin by buying blended teas*, but learn what is likely to suit your customer, and be sure that you *watch*, and taste what blenders send you. Large blenders have, of course, many and great advantages, and they can buy and use teas which small men cannot touch without great danger."

A point which makes for the protection of the retailer in buying his tea as suggested above is that nowadays competition is so keen that the wholesale blender is forced in his own interest to give good value. The retail buyer's rule should be: Buy good tea and push it; good tea is in reality the cheapest and most economical. Study quality, character, uniformity, stocking, suitable storage, and moderate profit.

It does not follow that a tea bearing a certain mark will always be of the same quality; what is specially good one season is not necessarily equally good the next. When a retailer finds a tea bearing a particular mark, it is well not to talk about it so as to create a demand and send up the price (!), but quietly to look out for it another year.

Avoid over-fermented and over-fired tea. Reject all teas which give a dull dark-brown colour in the infused leaf. Such tea has been over-fermented or else burned in the manufacture. In the former case it will very probably become sour if kept for any length of time; in the latter case it will yield only a dull, flat liquor. To produce a light, pungent, rasping liquor, the leaf must have been but lightly fermented, while fully fermented tea yields a deep-coloured but soft-flavoured infusion.

Methods of Judging.—Tea is judged by a variety of tests and by more senses than one. Its colour, appearance, more or less twisted leaf, and the presence or absence of dust, are first observed. Then it is "nosed" or smelt after breathing into it, to discover whether it has been burnt by over-firing, made tarry by being smoked, or turned sour by over-fermenting. The next and great test is the liquoring. For this scrupulous care is needed. The water needs attention—the judge must know whether it is hard or soft, if (like the professional taster) he does not used distilled or, at any rate, filtered water; and this water must be freshly drawn, freshly boiled, and just boiling—not over-boiled. The measured tea, on which boiling water is poured, is then observed, and the "agony" of the leaf noted, also its fragrance and its colour, the character of the infusion, its taste and aroma, how long time is required to bring these out, and, finally, the appearance after infusion. Good leaf that has undergone a moderate fermentation produces a tea which gives a full, brisk, fresh liquor, with the flavour and aroma at their best.

The essential qualities of good tea are flavour, thickness, pungency, and appearance, the most important of these being flavour, the least important appearance. But in some districts consumers pay attention to appearance.

Good tea ought to be crisp to the touch, well-twisted, and free from excessive stalk. Stalk in tea produces no liquor whatever, and floats on the surface of the brew. All good tea should be free from any peculiarity of smell, such as "cheesiness" and "sourness", and ought not to be over-fired. No tea deteriorates so quickly as burnt tea.

Another point to remember is the difference between "thickness" and colour. Thickness produces fullness or "creaminess" on the palate; a coloury tea may have next to no taste whatever.

A sure indication of good tea may be found in the appearance of the wet infused leaf or "out-turn". If the wet leaf be dark you may safely assume you are examining poor tea. The finest teas have an out-turn approaching the colour of a new sovereign. Another feature of good tea is that when it is allowed to cool the liquor assumes a white colour, as if milk had been added to the infusion. This does not apply in every case of good tea, but it is a feature of very pungent teas, and is more pronounced in cold weather than in warm weather.

Leaf closely twisted takes longer to yield its qualities on infusing than does open, flat leaf. Leaf with a brown shade generally liquors best. Yellow leaf with a greenish shade usually denotes pungency. Rich golden leaf is commonly a sign of high grade.

In the cup the ideal colour of good tea is a reddish-golden tint, and the liquor always looks rich and full-bodied, though never muddy. As a rule, the blacker the infusion the worse the tea.

Tea-tasting.—The tea-taster's outfit consists of a number of small teapots and flat-shaped cups, a pair of scales and a half-ounce weight, a silver spoon rather larger and deeper than the ordinary tea spoon, and a kind of sand-glass like an egg-boiler, but arranged to run out in five minutes or six as may be desired. Filtered or sometimes even distilled water is used; the tea is carefully weighed; the water is boiled up at once after being drawn, and is poured on the tea the moment it comes to the boil. The tea is then watched carefully as it liquors, and the bouquet noted. It stands a given time—some teas require longer than others to bring out their qualities; but from three minutes to five or six is the time allowed for most. Some qualities are extracted earlier than others in the infusion process.

The best time for tasting is the morning, when the palate is clean and fresh; and if we banish alcohol, tobacco, sweets, and spices from the daily dietary (for it is necessary to train the palate), we shall with practice find that our sense of smell and taste will make our judgment comparatively easy. "We weigh up our teas", says an authority, "into china or earthenware pots, being quite sure that these are perfectly clean, and that all traces of tea from the last tasting have been removed. A weight of leaf equal to that of one farthing is infused; but care must be taken to weigh the tea *evenly*, as it is quite easy to obtain at least three different results from the same sample by weighing in separately the large and small, and a mixture of both. What we desire is to obtain a fair sample of the bulk in our tasting-pot. Our next care is to see that the water we use is well up to boiling-point; but it is of equal importance that it is not overboiled, as both are practically useless for extracting the best qualities from the leaf. When a blue film comes over the water it is right; when the water becomes grey or white it is overboiled. After the tea has been infused for six minutes (commonly), the theine in it has reached the point at which its detectable qualities are most pronounced, while the tannin has not yet become active or apparent to the taste. The liquor must be poured off and drained, after which the infused leaf should be turned on to the top of the lid and carefully nosed and inspected. It is often possible at this point to detect defects which are passed in nosing the dry leaf. The colour of the infusion should be a rich copper-brown or approaching to olive. In tasting, it is easiest to judge of the quality of the liquor when it is sipped at the right temperature. (Tasting tea too hot means destroying the palate.) Care must be taken to expectorate immediately after sipping; otherwise the palate will become vitiated. The liquor should be a rich brown, neither muddy nor light; and if as it cools it creams down to a rich chocolate colour, we may be fairly sure it is good tea. For 'creaming down' ordinary milk is the best to use; if the tea has been soured in the curing, this will show in the milk."

PREPARATION FOR SALE

Tea manufacture we have already dealt with. We now come to its preparation for retail sale.

Tea-blending.—Blending is resorted to for the purpose of securing the kind of tea required by the consumer, and to maintain uniformity of style and quality; while a further object is to produce a tea which is distinctive as well as good where a grocer appeals to discriminating customers. "The whole secret of successful tea-selling," observed a successful tea-retailer, "is to get tea which thoroughly suits *the water of the locality* in which it has to be consumed. Teas that thoroughly suit hard water are generally failures in soft water, and vice versa. To find out what teas are likely to best suit your own trade, you must try them in the actual water of the locality in which you are going to sell them. It is not enough to try them in the district a few miles away, as the water-supply varies in almost every town, and there may be the greatest difference between places only a few miles apart." Whether the retailer buys his tea ready blended or blends for himself, this point as to the water which will be used by the consumer in actually "making" her tea is of the first importance.

The blender has also to consider the taste of the consumer, some districts and classes preferring *strong* tea, others *flavour* rather than strength, while some pay special attention to the appearance of the tea itself. The main points in good tea-blending are laid down as being (*a*) regularity of leaf; (*b*) flavour; (*c*) body or fullness; (*d*) regularity of style. Of these, flavour is no doubt the point of chief importance, but regularity of style is also recognized as a necessity if a tea trade is to be kept and increased.

Experimenting with different teas in the particular water to be used with them is recommended; and having thus ascertained the individual qualities of different teas, the blender proceeds to try the effect of two or more of them in combination. In *The Practical Grocer* will be found particulars of a number of blends which have been in actual use in London wholesale tea houses; but formulæ of such a kind are of course merely quoted by way of illustration, since the characteristics of tea vary greatly and from time to time. The tea-dealer, writes a member of that trade, "will have a thick tea for foundation, a pungent tea for point, and a flavoury tea for the palate. There is the thick, heavy, flavourless tea of the valley, the thin pungent tea of the hills, and many intermediate classes. Few of these would be suitable for drinking alone. Roughness has to be overcome in one, point given to another, fullness to both. The flat tea has to have point imparted to it. The full tea requires flavour, and so on." For hard water strong and pungent Assams are used, while fine Ceylons, Darjeelings, and Kintucks are most suitable for soft water. Monings, which will keep a year, are often used as a basis. For giving a distinctive flavour to a blend a fine Ceylon, Formosa Oolong, or Foochow Pekoe may be used in the proportion of one in sixteen, or one in twelve.

The water, it must again be insisted on, is always to be borne in mind in blending. If the water be hard it would be a mistake to compose a blend of fine soft liquoring teas, for the flavour could not be sufficiently extracted; and this, of course, means a waste of tea, and therefore a waste of money. The thing to aim at is to make a particular blend for a particular water, so that this water may extract every good quality out of the blend and allow nothing to be wasted. Utilize every good quality of a tea, and if two teas blended together are not superior to each of the component parts, do not blend them. Again, note that a fine flavoury tea must not be used with a rough tea, for the rough tea will absorb and drown the flavour of the fine tea, and the result cannot but be a loss.

Milling is a process sometimes necessary to improve the appearance of large-leaf teas, a machine or mill being used for the purpose. Mechanical **mixers** are also employed in order to incorporate the ingredients of a blend thoroughly; and after this has been done the tea is put in air-tight canisters and kept in a warm temperature, as regular as possible, for at least a week, in order that proper "**assimilation**" may take place. Practical tea merchants are agreed that blended teas are greatly improved by being stored in a warm room for five or six weeks; but, except with special teas, deterioration rather than improvement takes place after that length of time.

Wholesale Tea-blending.—In the wholesale tea trade a blend of tea may require any number of different varieties, from two up to twenty. The taster, having decided on the blend, writes it out in the instruction book, from which the mixers are required to work. On the top floor of the building the various teas are placed in their proper proportions in a wooden hopper; when this is full a slide at the bottom is drawn, and the tea falls into a hollow sphere of iron, which revolves slowly on a central axis, the tea being mixed by the resistance of a set of blunt knives fixed in the centre. Each load is allowed to revolve for twenty-five minutes, and is then discharged through a wooden shoot into bins on the floor beneath. From these it is taken, weighed, and placed in smaller receptacles, holding about 150 lb., and allowed to stand for seven days (or longer) in order that the flavour may assimilate. The bins of tea are then removed to the packing-room, when the process of weighing and packing is performed by machinery with great rapidity.

Tea Storage.—In storing tea the points necessary to observe are that tea is injured by air and by neighbouring odours. A little experience will show—and the knowledge is sometimes purchased too dearly by an assistant's negligence—that tea readily absorbs other flavours. It must therefore not be stored near strong-smelling goods, such as soap, oranges, or cheese. It should be kept in a dry place, fairly warm, as the warmth assists the equal assimilation of the component parts in a blend. As the air should be excluded, air-tight steel bins are frequently used. When tea has acquired a neighbouring flavour by imprudent storage, it should be turned out and exposed to the air for a day or two; otherwise the less air the better. A retailer should not stock tea heavily, his great object being to keep his supply as fresh as possible.

As a hint to give customers as to storing their tea, it may be mentioned that no receptacle is better than a large-mouthed bottle with a glass stopper for the daily use, this being replenished from an air-tight tin kept in the driest store cupboard, unless the tea is bought fresh from the grocer.

A tea-planter offers the following hint to domestic consumers, and it may also have a practical interest for our readers:—

"If you have laid in a stock of tea, and the weather gets damp (as it sometimes does in England), or you live by the sea-side (a fatal atmosphere for keeping tea in) and your tea seems to have become a little dull and flat and loses its crispness, spread it out thinly on a metal tray and give it a good baking in a hot sun, and then 'heat it up' in the oven for three minutes, till it gets crisp. Or (an equally good and safer dodge) get a tin canister that will hold about ten pounds of tea, fill it and set it before the kitchen fire—a foot off or so—and let it remain there for an afternoon, turning it slightly and occasionally so that the heat may get all round it. That will 'pick up' any tea that may have 'gone off'."

Domestic Tea-making.—The grocer should always impress upon customers the importance of making their tea with water that is *quite boiling* and that is *just boiling*—not water that has stood on the hob for hours. If he can circulate amongst them such practical information as the following, he will be doing them and his trade a service:—

"1. To retain the flavour of tea keep it in a can or jar free from moisture and tightly closed by the lid. 2. In making tea use only an earthenware or china teapot, small, dry, and thoroughly clean. 3. Heat your teapot—scald it with hot water before using. 4. The teapot being hot and empty put into it the quantity of tea required—a teaspoonful for every cup. 5. Make the tea in the room where it is served. 6. Use freshly drawn water, boiled as quickly as possible—*quite* boiled but not overboiled.

7. Pour the boiling water on the tea, and let it stand for three minutes, the lid of the teapot being closed. Never boil the tea when made, and be careful it does not steep too long. If more than five cups are wanted have two teapots."

The British method of making tea is an approximation to that above described, and the common way of serving the beverage is with milk or cream and sugar.

Tea à la Russe is served with a slice of lemon instead of milk or cream, sugar being added. Sometimes in Russia the lemon is dispensed with, the tea being served very strong and diluted with boiling water by the drinker.

CHEMISTRY OF TEA

Tea is composed chemically of the following ingredients, the proportions shown being the analysis of representative black and green teas:—

	Congou.	Young Hyson.
Theine	3·2 per cent	2·3 per cent
Albumin	17·9 „	17·6 „
Tannin	16·4 „	27·1 „
Pectin and gum	2·6 „	3·7 „
Nitrogenous extract	6·8 „	7·1 „
Resin and chlorophyll	4·6 „	4·2 „
Cellulose	34·0 „	25·9 „
Moisture	8·2 „	6·0 „
Ash	6·3 „	6·1 „
	100·0	100·0

The amount of ash varies, that, for instance, in Assam orange pekoe being ordinarily 5·9 per cent, and that in Indian pekoe souchong, 6·3 per cent, but it is generally reckoned that the ash of genuine tea should not exceed 8 per cent.

The most important of these chemical constituents are a volatile essential "oil of tea", the alkaloid termed "theine", and the tannin. Physiologically the value of tea depends chiefly on its theine. But its flavour and aroma, which have so much to do with its commercial value, depend chiefly on the volatile oil and the resinous ingredients.

Oil of Tea, which is present in very small quantity, is a yellowish liquid having the peculiar taste and smell of tea, and has powerful stimulant properties. When taken in rather large doses it is said to produce headache and giddiness.

Theine is the alkaloid of tea, and is very rich in nitrogen. It is chiefly to theine that the beneficial and stimulating properties of tea are to be ascribed, although some of the effects are no doubt due to the essential oil. Theine is combined with the tannin in the tea; when separated, and crystallized from water, it forms long needle-like crystals of white colour and silky lustre. It has a feeble bitter taste. Tea contains from 2 to 4 per cent of theine.

Tannin is the most abundant substance dissolved in the infusion of tea. It is an astringent body, and possesses the property of combining with gelatine to form the essential ingredient of leather. For this reason too much tannin conduces to indigestion, since various articles of food may contain more or less gelatine, which with the tannin forms a leathery indigestible compound.

The **albuminoids** of tea are mainly left with the tea leaves when an infusion is made, but a certain proportion is dissolved, and to this extent they influence the character of the beverage.

The **gummy substances** are pectin and pectic acid, which are readily dissolved by water and are consequently found in the tea infusion.

The **mineral matter** (ash) of tea consists largely of phosphate and carbonate of potash; its amount is usually from 6 to 7½ per cent of the tea.

The **cellulose** constitutes a great part of the tea leaves which are left after pouring off the infusion.

Tea Tests.—Colouring matters used for facing tea are best detected by shaking a portion of the sample up with cold water, and pouring off the liquid into another vessel before the detached particles have had time to subside. After these particles have settled down in the second vessel the water can be poured off, the sediment further examined, and, if desired, dried and weighed to determine its amount. If the facing was Prussian blue, its colour will be destroyed on adding a little potash solution to it, and restored again with a little hydrochloric acid.

Used tea leaves employed in adulteration are detected usually by measuring the quantity of ash in the sample analysed; also by the specific gravity. A test for used leaves mentioned by a French journal consists of throwing the suspected sample into a solution of acetate of copper. Fresh tea will in two days give a greenish colour, whereas tea that has been already used will not. This, however, is not quite certain. The colour has been obtained even with tea that has been infused several times.

Chapter II.—COFFEE AND CHICORY

The world's production of coffee has been increasing rapidly for the past eighty years, and is now over a million tons a year, considerably surpassing the consumption. But in the British market coffee is by no means so important an article as tea, the national taste for it being far below the average. The great coffee-consumers are the Americans, the Dutch, and the Belgians, while Germany, France, and Austria-Hungary all likewise consume annually more than 50,000 tons of it. Of all nations the Dutch are the pre-eminent coffee-drinkers, the annual consumption in Holland being no less than 18 lb. for each member of the population, man, woman, or child. Next come the people of the United States, who consume 11 lb. per head; and then the Belgians, 9½ lb. per head. In Great Britain people consume but ¾ lb. per head of coffee.

Brazil by itself has produced in one year more coffee than the world can consume—hence the great efforts made since the twentieth century began to encourage the drinking of coffee by those who at present are tea-drinkers. The crop of Santos (Brazil) coffee in a recent year was estimated at 18,000,000 bags.

The British Board of Trade has published a careful estimate of the **sources of supply** of the eight principal importing countries for a recent year, the countries being the United States, Germany, France, Holland, the United Kingdom, Austria-Hungary, Belgium, and Italy. The coffee imported by these countries was found to come from those named below in the quantities given:—

From Brazil	1,618,000,000 lb.
„ Colombia and Venezuela	211,000,000 „
„ Ecuador, Peru, and Chili	3,000,000 „
„ Central America	158,000,000 „
„ Mexico	35,000,000 „
„ Cuba and Porto Rico	15,000,000 „
„ Hayti and San Domingo	72,000,000 „
„ British West Indies	11,000,000 „
„ British East Indies	62,000,000 „
„ Dutch East Indies	136,000,000 „
Total	2,321,000,000 „

It has been indicated already that but a small proportion of this immense quantity of coffee is consumed by the British nation. However, the United Kingdom imports a good deal —in fact, more than she herself consumes—for re-exportation; and in a recent year the Board of Trade found that the true sources of the supply (not merely sources of importation) drawn upon by the British merchants were as follows:—

COFFEE SENT TO THE UNITED KINGDOM

By Central America	36,516,000 lb.
„ British East Indies	16,317,000 „
„ Brazil	15,621,000 „
„ Colombia and Venezuela	7,649,000 „
„ Mexico	2,509,000 „
„ British West Indies	1,296,000 „
„ Portuguese India	1,220,000 „
„ Ecuador, Peru, and Chili	720,000 „
„ European Countries	420,000 „
„ Portuguese East Africa	395,000 „

In the British East Indies total the chief contributor is Southern India, where coffee is grown in the elevated regions of the south-western coast, the coffee lands of Mysore, Coorg, and the Madras districts of Malabar and the Neilgherries, comprising 87 per cent of the whole of India's coffee area. Ceylon was once a large contributor, three-fourths of the British supplies coming from that island, until in the last quarter of the nineteenth century the trees were destroyed by the fungus known as *Hemeleia vastatrix* or leaf-disease. India produces what is called "plantation" coffee (Neilgherry, Coorg, and Mysore), the bulk of which comes to London, and also "native" coffee (Malabar, Salem, &c.), which goes chiefly to Havre for the French market.

In the British West Indies Jamaica is an important producer of coffee, her "lowlands" coffee being commonly quoted higher than Brazilian Santos, while the limited supply of "Blue Mountain" from the highlands commands very high prices.

From a commercial point of view the **finest coffees for British consumption** come from Central America, India, Java, Ceylon (now picking up again), and Arabia. The term "Central American" here includes the coffees of Costa Rica, Nicaragua, Salvador, Honduras, and Guatemala, Costa Rica occupying the foremost place. The famous "Mocha" of Arabia is but little seen nowadays, however much it be heard of, the Arabians keeping the best of it for themselves. Mocha is raised in the interior of Arabia, Egypt, and Abyssinia, and shipped from Aden or Hodeida, the highest grade being Yemen, grown in the neighbourhood of the Oudien valley. High prices have been fetched on the London market by coffee from Nyasaland in Africa, and Natal, another British colony, has been coming along as a contributor to the breakfast table.

Chicory, used largely in the United Kingdom for admixture with coffee in a legal—and also, doubtless, to some extent in an illegal—way, is obtained chiefly from the Continent, Northern France, Belgium, Holland, and Germany being the principal producers. The plant is also grown to some extent in Yorkshire and the eastern counties of England, and its cultivation is being encouraged somewhat of late. The sale of the mixture of coffee and chicory is allowed by the law on condition that the fact of its being a mixture is declared, and "chicory" may legally consist of the roasted chicory root itself, or of a substitute such as an allied root or other vegetable substance applicable to the uses of chicory, provided a proper excise-duty label is affixed on every package sold.

As a matter of **historical interest** rather than of business, it may be mentioned here that coffee is believed to have been first grown in Abyssinia, the place-name "Kaffa" and the word "gahveh", meaning "wine", being both credited with the origin of its name. It was cultivated in Arabia as early as the fifteenth century, and the use gradually spread to Turkey, Greece, and Egypt. In 1652 an English merchant named Edwards brought it to London from the Levant, a Greek in his employment knowing how to prepare the coffee for use. The Dutch sent the coffee plant to Java in 1652, and its cultivation was begun in 1723 in Martinique, whence it spread to Central and South America.

DESCRIPTION

Coffee beans are obtained from the inside of a "cherry" or fruit which grows on a shrub belonging to the botanical genus *Coffea*. It is of the natural order of plants known as the *Rubiaceæ*, from which we get also quinine and ipecacuanha. There are many species of *Coffea*, but for present purposes it is sufficient to mention two, *Coffea arabica*, the Arabian coffee, and *Coffea liberica*, the coffee-tree of Liberia. By far the greater part of the commercial article is supplied by *Coffea arabica*.

The shrub *Coffea arabica* grows to a height of 15 or 25 ft., and when covered with fruit resembles in general appearance a cherry-tree. Its blossom is a small white flower like a jasmine, these coffee flowers growing in threes and sevens amongst the leaves. The fruit, or "cherry" as it is termed, is first dark-green, then yellowish-red, and finally a deep crimson, although in one variety the mature fruit becomes white. Beneath the outer skin of the cherry is a pulp, then a rather thick and tough membrane or "parchment", and within this, imbedded in soft "silver skin", lie the coffee beans, usually two in number, though sometimes only one.

This plant, *Coffea arabica*, grows best in a moist climate at a temperature from 60° to 80° F. in the shade, on elevated ground—from 1000 ft. to 4000 ft. above sea-level. Brazil has a special variety of the plant called "Café nacional", from which about three-fourths of the Brazil coffee output is grown, while "Bourbon" is another kind.

The Liberian coffee plant, *Coffea liberica*, is larger than the Arabian, being a tree of 30 to 35 ft. in height, flourishing on low ground as well as hillsides, and producing leaves and berries more than twice the size of those of *Coffea arabica*. The berries, which are produced in great profusion, do not fall when ripe, like those of the Arabian plant; and their flavour is decidedly coarser, though it has been much improved by crossing the plant with the other variety.

Coffee plants are reared either from seed or from seedlings. A good deal of attention is required in the way of weeding, manuring, and pruning. The young trees are "topped" to stimulate lateral growth and keep down the height, so as to facilitate plucking. Young plants which are cut down or "stumped" are rendered hardier. In Costa Rica the seed is procured when fully ripe and planted in nurseries; in six months, when the plant has grown to 6 in. or more above the ground, it is removed to the plantation. After four or five years' growth the shrubs produce from 2 to 3 lb. of the "cherries" annually. The blossoming takes place after the heavy rains—in Costa Rica about the middle of April—and the "cherry" ripens some six months later.

Gathering-time varies with the country of growth. In Ramed, in Arabia, it begins towards the end of August; in Brazil the season lasts from May to September; in Ceylon and Java from April to October; in Venezuela it is about the middle of October.

In Arabia the trees are shaken, the ripe berries falling upon spread cloths. In Brazil leaves and fruit are stripped from the branches and afterwards separated, cloths being sometimes used and sometimes not. The Liberian coffee cherry has perforce to be plucked, since it does not fall like the other.

In Costa Rica the pliable branches are held down with one hand, while with the other the pickers gather the fruit into baskets slung round their necks. The fruit next passes to the **pulping machines**, where the deep-red skin and pulp are stripped off. The berries, with more or less pulp adhering, pass into cisterns to "ferment" in water. After twenty-four to forty-eight hours they are passed into "washing" cisterns, where they are turned over with rakes and washed free of pulp. Next they pass into a series of troughs, in which the heavier berries sink, while the lighter float away, and from the troughs they pass to the drying-ground, where they lie for six to fourteen days according to the sunshine. This is known as the "wet" process for "**washed**" **coffee**. There is also a "dry" process. The drying after pulping is an operation which requires care, as it affects the condition of the berry considerably, and insufficient drying is a certain cause of mustiness and bad flavour. The berries after draining are sometimes dried in rotating machines by means of warm air. Where the sun-drying process is used they are spread on terraces or "patios", and have to be constantly turned over either by rakes or by the coolies' feet.

The dried coffee, brittle in its skin, is called "parchment coffee", or simply **parchment**. In this parchment state the berries are commonly sent down from the plantations to the shippers, and are sometimes further cleaned before shipment. But a good deal of parchment coffee is now shipped to importers in London or elsewhere.

The parchment skin has to be removed by means of fluted rollers in a "husker" or "huller". Hence the term **hulled coffee**. When freshly hulled, the coffee is very light in colour; it rapidly changes to horn-green or yellowish-green. A **sorting** machine, having a cylinder with a worm which draws the berries past perforations of different sizes, sorts the berries into "bold", "medium", "pea-berry", and "broken", and the preparation is usually completed by the polishing off of the "silver skin"—which in Indian coffees is usually left on. In the chief European markets, such as London, the importers receive "parchment" and treat it in their own husking or hulling machines. Hence the term "**London cleaned**".

VARIETIES OF COFFEE

Characteristics.—*Brazil*, *Java*, and *Martinique* are examples of coffees the beans of which as a rule are fairly regular in size. *St. Domingo* and *Mocha* are typically irregular.

Costa Rica is a bluish-green berry, large and bold; one of the finest coffees grown. The "London cleaned" has a bluish, "foreign cleaned" a greyish appearance.

Central American sorts resemble Costa Rica. Beans large and medium-sized; more or less oval; colour varies a good deal.

Guatemala is mostly of a pale colour.

Brazil is mainly "Rio" or "Santos", the first from the Rio de Janeiro district. Rio is generally cleaner than the Santos, but not so large or of so good colour. Good Santos is of a pale yellowish colour, immature beans being more or less green. Washed Rio should be of a blue shade. Brazil "pea-berry" is a smaller and more rounded bean than the others, being sifted from the larger and flatter berries.

Jamaica is a smooth, medium-sized bean, rather oblong. Colour ranges from grey and greenish to bluish-green or blue; some kinds are rather large yellow berries tinged with green. Inferior sorts are of mixed colours, often with pale flat berries and mixed with "blacks".

St. Domingo much resembles the commoner, pale-coloured Jamaica.

Porto Rico is a large, well-coloured berry.

Cuba is rather small, sometimes with red streaks.

New Granada is a small bean, grey, greenish, or approaching silvery in colour.

Mocha is of two varieties, "long berry" and "short berry". "Long berry" beans are greyish-yellow in colour; "short berry" beans are small and roundish, and of a pale greenish-yellow. Brazil pea-berry is somewhat like Mocha in appearance, and is sometimes sold for it!

Abyssinian is very similar to Mocha.

Java berries are large, of oblong shape, and vary in colour from whitish to pale yellow, or greenish.

Surinam has the largest of all beans.

Mysore is a good-sized berry, the best kinds being plump and heavy. Colour bluish-grey or greenish, with more or less of a silvery covering.

Naidoobatum is an excellent coffee, for the most part coaty and bold.

Neilgherry is a delicate greenish berry.

Bourbon has very pale yellow beans.

East Indian sorts generally have the "silver skin".

Ceylon is of two sorts, "plantation" and "native", the former a fair-sized berry, pale green or bluish. Plantation "washed" coffee is the best; the "native" is dried in the cherry.

South American coffee is reckoned by the bag of 60 kilograms, about 132 lb.

JUDGING VALUE

The commercial value of coffee, like that of tea, does not depend upon its chemical constituents, except perhaps indirectly to a small extent. The form, size, colour, odour, flavour, age, and uniformity of the beans are the chief factors which determine the value, together with the presence or absence of stones, pieces of stem, and other foreign matters. As an index of quality the country of origin is a good guide in a general sort of way, but it cannot be entirely relied upon. *Shape* varies in the same sample, and consequently is not by itself a sure criterion of the source. There are, however, at least three typical forms: Small and rounded (Mocha short berry); medium-sized, elongated, and pointed (pointed Bourbon); and large, flattened berries (Martinique). *Colour* depends upon local peculiarities of growth and preparation. Speaking broadly, the coffees produced in the Western Hemisphere are of a greenish tinge, those raised in the Eastern are more or less inclined to yellow. Examples of the former are Cape Haytien, Guadeloupe, Gonaives, Martinique, and Porto Rico; and of the latter, Java, Manilla, Wynaad, and some kinds of Mysore. But coffees from the same region often differ greatly in colour. *Odour* is a fairly distinctive test, but requires much practice in its application. The smell of green Mocha suggests that of tea; Jamaica is agreeable; Brazil, strong and varying in Rio and Santos; Java and Sumatra, sharp; and Manilla, very pronounced. *Flavour* is also a good guide as to the origin of a coffee in some cases. Thus Sumatra coffee is slightly bitter; and while Mocha coffee is much extolled, that of Martinique is very agreeable, and Guadeloupe and Porto Rico products are less so. Brazil coffee has a peculiar flavour, readily recognized by experts. *Uniformity* of the berries is another point taken into account in judging.

In estimating the market value of coffee the expert uses several of his faculties. His eye regards the shape, size, colour, and uniformity of the bean; his nose appreciates its odour and that of the roasted and ground sample, as well as that of the beverage made therefrom; and his palate tests the flavour.

Coffee, it must be borne in mind, does not always show the same characteristics. The seasons vary, and the effect of a different season on a particular coffee may be to render its flavour quite unfit for the purpose it has usually served, so that in blending it may have to be discarded.

As a rule, the best quality of coffee is best worth buying, and as far as possible should always be preferred in buying. "Buy your coffee on sample, just as you buy your tea," advises a man of experience; "grind it and draw it and test it as you would tea. Above all, buy it for its drinking quality, not for style or appearance. . . . In selecting Rio coffees in the green, choose a green, flinty, regular bean, free from blacks and quakers. The latter can generally be detected by immersing a small quantity of the coffee in cold water, when the quakers will float on the surface. Reject any beans which are spongy or soft, or which have the appearance of having been dyed or washed."

"Note carefully and select", says an expert, "such coffees as are even and of good colour in the raw, clean and light in the seam, and weighty by comparison with other coffees when tested in the hand. Cut the berry, and note that the structure should be as solid as possible and of even colour. In tasting the roasted and ground sample, expect marked indications of that which, for want of a better word, we call acidity, but not the acidity which is akin to sourness, nor that which comes from a thin and underdone roast. If your sample combines this desirable quality with a considerable amount of fullness—which, however, should not be fruitiness—you cannot go far wrong in selecting it. . . . Don't pay too much for mere size. Often the second size is truly delectable, but not so often the third, for herein will be found a rather large proportion of immature and undesirable berries. One must not think that a few 'lights' will not matter. . . . In judging the raw sample, see that the middle seam is not gaping. A straight, tight seam is a great desideratum. After cutting the berry through, if it appears a nice colour and is tight in the inside, it can hardly be an inferior coffee. Colour, too, is desirable so long as it is not artificial. . . . Grind a bit of a roasted sample and a similar bit of one you want to follow, and wrap them each in a fairly porous paper. The one which most discolours the wrapper is usually the better."

But, like the pudding, the proof of coffee is, above all, in the tasting.

How to make coffee is a point it is necessary to know in judging the value of any coffee whatever. A coffee expert says: "Always use at least 1 oz. to the pint. Put the coffee into an earthenware jug, which should have been previously heated, say in an oven. See that the water used is thoroughly boiling. Half-fill the jug with this boiling water and stir briskly for half a minute or so. Then fill the jug, stir once more, and put it back into the oven for at least five minutes to settle. After this remove the scum carefully, and if the liquor is then poured out carefully, it should be perfectly clear almost to the bottom. Cream or warm milk should be recommended to those making coffee for domestic use. Where chicory is used, the result is improved by straining off the infusion and reboiling it with the milk, as this removes much of the bitter flavour of the chicory."

Note that the character of the water in a district should be studied in regard to coffee.

PREPARATION FOR SALE

The coffee bean or berry, whose growth and treatment up to the point when it reaches the grocer's hands have been already described, has to be prepared for retail sale by **roasting**, and, as everybody knows, the roasted berry has to be **ground** in order to be made into coffee for the household. Grocers often perform both these operations, though some buy their coffee ready roasted, and some buy it even ready ground, while others buy the bean and roast for themselves, leaving their customers to do the grinding. The roasting is a delicate, the grinding a simple operation.

In fact, the **grinding** is so simple, that for the sake of encouraging the consumption of coffee it is perhaps to be regretted that the old-fashioned habit of customers' grinding their own coffee in a hand mill has generally fallen into disuse. The grocer grinds his coffee in a larger sort of mill, and the one point to observe about it is the necessity of keeping the supply as absolutely fresh as possible, so that it is not wise to grind too much at a time and be obliged to stock the ground coffee longer than is necessary. Although the operation of grinding follows, of course, that of roasting, we mention it first to get it out of the way, as the roasting and blending are far more important and technical matters for the grocer's concern.

Roasting.—Coffee-roasting consists in practically cooking the bean in a dry heat, so as to evaporate the acrid oil and develop and retain the valuable principles of the berry in the form required. The beans must not be scorched, yet all of them must get the proper amount of heat and get it gradually and uniformly, while no smoke or fumes must be allowed to contaminate them. After a certain time—which is a matter of observation by the roaster himself—the beans begin to swell and to crackle and to change colour, and when the swelling has taken place and the right shade of colour has been reached the operation is complete.

The **machinery for roasting** varies. The simplest way—common enough in the households of the Continent, United States, and Colonies—is to put the beans in a clean dripping pan over a brisk fire and stir them till browned; when they are a cinnamon colour and begin to crackle, a piece of fresh butter is introduced and the whole well stirred, and finally the pan is taken off the fire and the beans placed in a covered receptacle till wanted. But the grocer needs something more elaborate than that. The point is that there is no inscrutable mystery about coffee-roasting. A roaster can be had which is almost as simple as the homely pan. The old-fashioned way of roasting in an open circular sieve over a hot cinder fire is not recommended. A better roaster consists of a perforated cylinder revolving over jets of gas, which burn a Bunsen flame mixed with air, giving out great heat. Then the coffee is roasted rapidly, and by the rapid roasting the volatile essential oils of the coffee are as far as possible retained in the bean, sealed up, as it were, until the subsequent grinding sets them free. There is a common type of roaster in which a pair of cylinders are used. The coffee having been placed in the drum, the gas is lighted so that the flame will just reach the gauze; the handle is then turned so as to rotate the drum at the rate of about forty or fifty revolutions a minute. In six to nine minutes, according to the quantity, the coffee begins to crackle. Half a minute afterwards the crackling begins to diminish. At this point the gas is lowered to half pressure and the drum handle turned but slowly, so that the beans can be seen through the mica spyhole without stopping the machine. As soon as the operator observes that the desired colour has been reached, he turns off the gas, revolves the drum a few times more, and then suffers the coffee to drop into a "cooler" placed beneath.

Cooling rapidly prevents to some extent the "**sweating**" of the berries, which is a symptom of over-roasting. The roasted berries can be shaken in a wire tray or sieve, or allowed to fall into a trough with a wire-work bottom, through which a blast of air is driven to cool them. There are special plants by the use of which it is claimed that the coffee can be cooled from red heat to stone coldness in two minutes. Common coffee requires to be cooled as rapidly as possible to stone-cold. Fine coffees are dropped quickly to about 120° F. (when they feel still slightly warm) and are then allowed to cool gradually.

The **coffee-roaster** should note that it is always necessary to stop the roast a shade or two under that required, as it will "run up a bit" before the cooling. The operator must always endeavour to keep cool and collected—especially when things go wrong! A total disaster can often be averted by prompt action. Coolness, the essential attribute of a successful roaster, can be acquired by most assistants if they will make it a rule to concentrate their thoughts on the matter in hand. They must bear in mind they will never become experts without it. It is in the last two or three minutes of a roast that the greatest care must be exercised. Where fine coffees are concerned, if they are over-roasted the full acid flavour is to some extent lost; but a medium roast of a rather light chestnut-brown colour brings out the acidity to the fullest extent. If the coffee is under-roasted the berry is hard to break and is of a shrivelled and mottled appearance, and the flavour rather sour. In roasting hard coffees the maximum heat may be continued throughout the process; in roasting the soft and porous kinds the heat should be gradually applied, and reduced sooner. Soft coffees develop quickly when nearing completion. As a general rule, the time taken for roasting should not exceed ten to twelve minutes, or be less than seven to eight minutes. Common coffees should be taken rather higher than fine. The first roast of a new parcel of coffee should always be carefully tasted to learn whether the proper degree of roasting has been reached; when this is so, keep a standard sample.

Coffee, once roasted, should be exposed to the air as little as possible. It should be immediately enclosed in closely lidded canisters. As the aromatic oils are more freely given off from hot coffee, the beans should not be ground whilst in that condition.

Electric coffee-roasters have been introduced, and the makers have claimed that they produce a "more delicate and aromatic flavour" than can be got by the old process. Apparently there is no ground for such a belief. As an American consul who looked up the matter wrote, "The taste of coffee does not depend upon the fuel used in roasting it, but on the quality of the bean itself, as well as on the degree of roasting. If coffee when not quite ripe is over-roasted, even though it be of the finest quality, it loses its delicious aroma and assumes a bitter or burnt taste. The **loss by shrinkage** in roasting depends upon the quality of the bean and the degree and duration of roasting. In fact, the best or 'fleshy' bean shrinks less while being roasted than a porous bean does, and the loss in weight is greater when the bean is darkly roasted than when lightly roasted. One of the largest coffee-roasting firms in Germany informs me that if the machines for roasting are so constructed that they burn evenly, empty quickly, and cool quickly so that the bean does not require a further roasting, the results are always satisfactory, both as to loss by shrinkage, cost of roasting, and quality of aroma, irrespective of the kind of fuel used."

Glazed coffee is produced by coating the hot beans with a mixture of egg and sugar, the idea being to prevent absorption and evaporation. A solution of isinglass or gelatine is sometimes added. Syrup is also used for the same purpose. The French sometimes use sugar during the roasting to "caramelize" the coffee, or coat the beans with a dark-brown varnish of burnt sugar.

Roasting in a small way for a retail grocery trade has its advocates and its opponents; the question will be decided by the grocer's own circumstances. Whilst some of the most successful retailers have built up a good trade owing largely, as they assert, to their "own roasting" and personal attention to the quality of their coffee, there are others who advance plausible reasons to the contrary. One writes to *The Grocer* as follows:—

"I believe that, as a matter of fact, the grocer can get his coffee roasted better by the house of whom he buys it than he can roast it himself. The grocer will have a small machine, he will proceed by rule of thumb, the roasting will be done by a man who has many other things to do, and the roast will be cooled in an open tray, and take half an hour to get cool. If he has it roasted for him, it will be roasted in a large machine, which does it better than a small one, and more quickly (which is a great point). It will be roasted by a man who does nothing else, and who consequently turns out every roast done 'to a turn'. Finally, the roast will be cooled in three minutes, and quick cooling greatly preserves the flavour. In saying this I am relating my own experience. For fifteen years or more we (the writer's firm) roasted our own coffee. Rather more than a year ago we gave up the practice, and I now have our coffee roasted for us. My coffee trade has increased owing to the change, because by it we get better coffee, and I have no intention of going back to 'coffee roasted on the premises'. In these days of 'experts' the individual grocer cannot roast his coffee well enough."

Blending is an art not so generally practised with coffee as with tea, but is, nevertheless, of great importance in some classes of trade. The berries may be mixed before roasting, if suitable, or subsequently. On this subject a coffee expert writes:—

"Coffees differing widely in roasting characteristics should not be blended before roasting. Soft and light-weight coffees develop more quickly than do the hard and heavy kinds, but coffees of similar grades may be blended with safety before roasting. Those coffees which possess many immature berries (pales) are best avoided. None of the difficulties, real or imagined, are insuperable, and it is astonishing how soon those who take an interest in coffee become experts in valuing, blending, and roasting. When commencing to roast his own coffee, it is well for the grocer to find a good wholesale house who will supply a coffee that will roast easily. There is no better than a well-harvested Costa Rica for the purpose. Good Costa Rica is a capital foundation for almost all blends, and is easy to roast. Vera Paz, Mexican, Guatemala, Nicaragua, Colombian, are all most useful coffees, and in many respects somewhat similar to Costa Rica. East Indians, Mysore, Coorg, and Naidoobatum are very useful in blends to give strength and colour, but as they are of a very hard nature it is advisable to roast them separately. For a 1*s.* blend use, say, one of a good washed Santos and one of a fairly thick liquoring Colombian. For a 1*s.* 2*d.* blend use two of Colombian and one of Santos. For the 1*s.* 4*d.* blend, two of good Costa Rica and one of Colombian. For 1*s.* 6*d.* the blend might consist of one of Costa Rica and one of Mysore. For 1*s.* 8*d.* a very fine Mysore or Naidoobatum and fine Costa Rica or Mexican, &c., might be offered, and, if liked, say 1½ oz. of Mocha to the pound. For 1*s.* 10*d.* and 2*s.* I come into coffees of the pea-berry type, and a fairly good business is to be done even at this price, which shows a splendid profit. As to the coffees mentioned above, the Costa Rica, Vera Paz, and pea-berry are easy to roast, but Jamaica is rather delicate and requires a little more care. For Mocha the same method of roasting may be adopted as suggested for the softer kinds."

For blending it is necessary to select grades fairly similar to one another, not, for instance, to put a low-class Jamaica with a high-class Costa Rica. It is well, also, to roast a sample before using it, and to experiment with different combinations, using always the water which will be used in the district for making the coffee for domestic consumption.

Storing Coffee.—It has already been mentioned that when once roasted coffee must be kept as much as possible in the condition of being hermetically sealed, or the air will quickly remove its most valuable qualities. Coffee readily absorbs odours; thus it may be spoilt by proximity to fruit, vegetables, &c. It is a mistake to store it near tea, as in that case its odour will spoil the tea. Whilst avoiding damp, the place should not be too dry or airy, and it should be moderately cool. Properly stored, coffee improves.

Chicory is the root of the wild endive, *Cichorium Intybus*, a plant which blossoms in August, bearing bright-blue flowers. The white fleshy roots are washed, sliced, kiln-dried, and roasted. Chicory in the raw state contains chemically about one-fourth its weight of sugar. Chicories vary in quality, and are not all equally suitable for the purpose of admixture with coffee. It is necessary, for instance, to see that the chicory employed for this purpose has not a strong acrid flavour, as this would much impair the flavour of the coffee. In fact, in judging and buying chicory, unlike coffee, the buyer usually desires absence of flavour rather than the contrary. In buying chicory select a good heavy-weight article, uniform in colour and grain. Before making your choice carefully draw a teaspoonful in a cup of boiling water. The liquor should be sweet and faintly pungent, with no disagreeable flavour, and having all the necessary body.

Opinions differ as to the expediency of mixing chicory with coffee. Whilst some traders think it spoils a good coffee trade, others argue that when a question of price arises the admixture is necessary to avoid giving a much inferior quality of coffee. "A much finer drink", says one, "is made by, say, three parts of finest coffee and one part of chicory than by one part of chicory and nine parts of inferior coffee." There is no question as to the legality of adding chicory to coffee in the United Kingdom. The only thing insisted upon is that the mixture shall be sold *as* a mixture. The question sometimes arises, however, as to whether a mixture containing, say, 90 per cent of chicory can properly be sold as "coffee mixture". In such a case the more proper designation would obviously be a "chicory mixture".

The question "Is chicory injurious?" was discussed in 1907 by *The Lancet*, which concluded an article by remarking that though the subject might call for investigation, "most dietetic authorities seem to agree that there is no reason for believing that chicory is in any way injurious to health".

"**French coffee**", so-called, is usually a mixture of coffee, chicory, and burnt sugar. The flavour of the sugar masks the earthy taste of the chicory. Chicory and "caramel", as this burnt sugar is termed, readily absorb moisture from the air and clog together, unless shut up in air-tight tins.

Coffee essences and extracts are sometimes prepared from coffee alone, but commonly consist of an infusion of coffee and chicory with caramel (or burnt sugar) added, the infusion being evaporated down to the approved consistency. The essences and extracts lack the fine aroma of freshly prepared coffee infusion, and are said to be frequently deficient in caffeine. Nevertheless they are a convenient form in which to have the beverage when required for ready use.

CHEMISTRY

Chemically speaking, **coffee** is composed of the following ingredients: an alkaloid called *caffeine;* sugar; caffeic acid; fat and oil; albumen and other nitrogenous bodies; cellulose, and mineral matter; with a certain quantity of moisture. A little dextrin and more or less colouring matter are also present.

Caffeine is the substance to which the chief physiological effects of coffee are due—namely, the stimulant and refreshing action. It is identical with the theine of tea. About 1·2 per cent of caffeine was found as the average quantity present in the analysis of fourteen different kinds of coffee, representing most of the chief commercial varieties. Although this is only about one-third of the amount of theine found in the leaf of tea, yet, on account of the greater weight of coffee used, a cup of coffee as ordinarily prepared contains quite as much alkaloid as a cup of tea does. Caffeine, when separated from coffee and purified, is a mass of long, white, silky, needle-like crystals.

Sugar is contained in the raw berries to the extent of about 9 or 10 per cent. During roasting, however, nearly all this sugar becomes converted into caramel. It is not the same substance as ordinary cane- or beet-sugar.

Caffeic acid is a yellowish solid, occurring in coffee to the extent of from 3 to 5 per cent. When heated it emits the peculiar odour of coffee, and from this it is thought that this acid plays an important part in developing the flavour found in the roasted beans.

Fat and oil exist in coffee to the extent of about 12 per cent or more. They become altered to some extent in the process of roasting, and about 1 per cent is lost in the operation, or more if the coffee is over-roasted.

Caffeone is the chief aromatic principle of roasted coffee. It is an oil which has the characteristic aroma of coffee, and is produced, during the roasting, by the action of the heat upon the fat, oil, and other constituents of the raw coffee. A portion of the nitrogenous matter of coffee is present in a soluble or readily digestible form; this constitutes the *albumen* or *legumin*. The albumen imparts a certain amount of nutritive value to coffee, over and above the purely stimulant effect of the alkaloid common to both tea and coffee.

Cellulose is the substance to which coffee berries owe their hard and horny character. It constitutes about one-third to one-half of the whole berry.

The **moisture** (water) in ordinary unroasted coffee generally ranges from 6 to 10 per cent. In the roasted berries this is reduced to 1 per cent or less, the total loss of weight which a medium-roasted coffee suffers in roasting being about 15 to 20 per cent.

Dietetically, the ingredients of chief physiological importance in coffee are the alkaloid caffeine and the food-stuffs—namely, the saccharine matters, fat, and legumin or soluble albumen. It is in the presence of these last three nutritive substances, and in the practical absence of tannin, that coffee differs from tea as an article of diet.

Testing for Adulterants.—The large quantity of caramel produced in chicory during roasting furnishes the means of applying a simple and convenient preliminary test for detecting the presence of chicory in coffee. When a few grains of coffee containing chicory are placed on the surface of water in a test-tube or wine-glass, each particle of chicory becomes surrounded by a yellowish-brown cloud of colour, which rapidly diffuses itself in streaks through the water till the whole liquid acquires a brownish colour. Pure coffee under similar conditions gives no sensible colour to the water until after the lapse of about a quarter of an hour.

Other sweet roots (parsnip, beet, turnip, &c.) when present will produce under like conditions the same effect as chicory, but not, as a rule, so strongly or so rapidly as the latter. The colour produced in all these cases is mainly due to the burnt sugar, which also imparts to the infusion the taste of caramel bitter that is one of the chief inducements to the use of chicory.

The *quantity* of chicory which has been mixed with the coffee is determined usually by making a 10-per-cent infusion of the mixture—say, 1 oz. in exactly ½ pt. of water, and then taking the specific gravity of this infusion. (The "specific gravity" means the weight of any definite volume of the infusion, divided by the weight of the same volume of pure water at the same temperature.) Chicory infusion is much denser or heavier than that from coffee.

If other roots, cereals, &c., are used as adulterants instead of chicory, their presence is first ascertained by means of the microscope, and then the amount can in many cases be determined from the specific gravity of the infusion.

Chapter III.—COCOA

Cocoa, it may be well to begin by explaining, has nothing whatever to do with the coco-nut, or, as it is sometimes spelt, the cocoa-nut, or again, coker-nut. As the "cocoa-nut" is a product of the palm *Cocos nucifera*, its name is properly spelt "coco-nut". Cocoa, on the other hand, derives its popular name from its botanical name *cacao*, and therefore the "a" should be retained. The terms "cocoa" and "chocolate" are both Mexican. Linnæus, the great botanist, who was fond of chocolate, gave to the cocoa-tree the generic name *Theobroma*, meaning "food of the gods". Cocoa is prepared from the seeds of this *Theobroma Cacao* and kindred trees, the family being allied to the Limes, and some ten or more varieties of the cocoa-tree are recognized, all of which are natives of South America.

Historical.—Discovered by the Spaniards in their early travels and expeditions in Mexico, cocoa was introduced to Europe chiefly by the efforts of the Jesuit missionaries in the seventeenth century. The Spaniards in the New World were familiar with it more than a century earlier. They found that amongst the Aztecs and Central American Indians the cacao beans were used as currency. Joseph Acosta (Portuguese) writes in 1604 that "the Indians used no gold nor silver to trafficke in or buy withall, . . . and unto this day the custom continues amongst the Indians, as in the province of Mexico, instede of money they use cacao". When the Spaniards ransacked the storehouses of Montezuma, the Mexican chief or king, they found 40,000 loads of cacao in wicker baskets. Acosta further writes:—

"The cocoa is a fruite little less than almonds, yet more fatte, the which being roasted hath no ill taste. It is so much esteemed among the Indians (yea, among the Spaniards) that it is one of the richest and the greatest traffickes of New Spain. The chief use of this cocoa is in a drincke which they call *chocholaté*, whereof they make great account." Acosta thought them foolish, for he did not like the "skumme or frothe"; but he granted that the Indians esteemed the "drincke" very much, and feasted with it "noble men as they passe through their country", and that "the Spaniards, both men and women, that are accustomed to the country, are very greedy of this chocholaté".

A British explorer, John Ogilby, who wrote in 1671, speaks of "the cacao, with which Fruit New Spain drives a great Trade; nay, serves for Coin'd Money. When they deliver a Parcel of Cacao (beans) they tell them by five, thirty, and a hundred. Their Charity to the Poor never exceeds above one Cacao-nut. The chief reason for which this Fruit is so highly esteem'd is for the Chocolate, which is made of the same, without which the Inhabitants (being so us'd to it) are not able to live. Before the Spaniards made themselves masters of Mexico, no other drink was esteem'd but that of the Cacao; none caring for Wine, notwithstanding the Soil produces Vines everywhere in great Abundance of itself."

In the seventeenth century there was a great controversy amongst ecclesiastics as to whether cocoa was a food or drink, and therefore whether it could be lawfully drunk in Lent; and according to a recapitulation published in Venice, "Father Diana found reason for acquitting the consciences of those who, in time of fasting, should *drink* chocolate", although "all agree that he will break his fast who *eats* any portion".

It was in the seventeenth century that cocoa began to be known in England. The *Public Advertiser* published in 1657 a notice that

> "In Bishopsgate Street, in Queen's Head Alley, at a Frenchman's house, is an excellent West India drink called chocolate to be sold, where you may have it ready at any time, and also unmade, at reasonable rates".

These rates, we are told, were at that time from 10*s.* to 15*s.* a pound! The author of *The Food of the Gods* quotes a later advertisement of the "Indian Nectar" being sold at 6*s.* 8*d.* a lb. by "an honest though poor man" in East Smithfield, and later still:

> "*N.B.*—The curious may be supplied with this superfine chocolate, that exceeds the finest sold by other makers, plain at 6*s.*, with vanillos at 7*s.* To be sold for ready money only at Mr. Churchman's Chocolate Warehouse, at Mr. John Young's, in St. Paul's Churchyard, London, A.D. 1732."

One of the London chocolate-houses, the "Cocoa Tree", became the Jacobite headquarters. Cassell's *Old and New London* says: "At No. 64, St. James's Street is the 'Cocoa Tree Club'. In the reign of Queen Anne there was a famous chocolate-house known as the 'Cocoa Tree', a favourite sign to mark that new and fashionable beverage. Its frequenters were Tories of the strictest school. Defoe tells us in his *Journey Through England* that 'a Whig will no more go to the 'Cocoa Tree' . . . than a Tory will be seen at the coffee-house of St. James's'."

Production.—Cocoa is now produced largely in Africa and Asia as well as America, and has become a large item among the imports of the United Kingdom, over 50,000,000 lb. being cleared for British home consumption every year. A published statement of the sources of supply places Guayaquil, in the Ecuador Republic, on the west coast of South America, as the largest cocoa-producing country in the world, her output being nearly 50,000,000 lb. a year. The world's cocoa crop in a recent year was estimated at about 147,000 tons, the chief countries producing being, in order, Ecuador, Brazil, St. Thomas, Trinidad, San Domingo, Venezuela, Grenada, Gold Coast. Of the British supply some two-fifths comes from British possessions, the largest individual source being the British West Indies (14,000,000 lb. and over per annum). The St. Thomas supply reaches us via Portugal. In a recent year Great Britain imported from Portugal 13,000,000 lb. of raw cocoa. London's bonded stocks of cocoa in a recent year included 19,850 bags of Trinidad, 11,750 Grenada, 12,800 Ceylon, 29,150 Guayaquil, 5500 Bahia, 3800 African, and 9400 other sorts; total, 92,250 bags. Guayaquil, where the famous "Ariba" cocoa forms the bulk, produces on an average about 400,000 bags a year. Trinidad cocoa has made such an excellent name that it is much sought after, and the island now exports cocoa to the value of over £1,000,000 a year. But Caracas cocoa is commonly considered the best.

The cocoa-tree, which grows wild in the Central American forests, does not thrive more than fifteen degrees north or south of the equator, and within this zone it is not successfully grown to any large extent at more than 600 feet above the sea.

DESCRIPTION

Cocoa is made from the ground bean or "nib" (seed) of the cocoa-tree. **Chocolate** is a mixture of cocoa paste and sugar, with some flavouring essence such as vanilla, and sometimes starch.

The **cocoa-tree** is in shape not unlike an ordinary orchard tree, resembling when pruned a cherry- or apple-tree with very large leaves. It is ordinarily some 15 to 20 ft. high; the leaves, which grow chiefly at the top, are some 7 or 8 in. long and 3 in. broad. The trees are reared either from beans planted "at stake" (three beans around each stake), or by seedlings "from nursery", when the young plants are grown in baskets of bamboo or palm-leaf and transplanted into the clearing when some months old. In one of his *Vailima Letters*, Robert Louis Stevenson, the famous literary man, gives an interesting little description of this work at his own home in Samoa: "You should have seen us; the veranda was like an Irish bog, our hands and faces were bedaubed with soil. . . . The cacao, you must understand, has to be planted at first in baskets of coco-leaf. From four to ten natives were plaiting these in the wood shed. Four boys were digging up soil and bringing it by the boxful to the veranda. Lloyd and I and Belle, and sometimes S. (who came to bear a hand), were filling the baskets, removing stones and lumps of clay; Austin and Faauma carried them when full to Fanny, who planted a seed in each, and then set them, packed close, in the corners of the veranda. From 12 on Friday till 5 P.M. on Saturday we planted the first 1500, and more than 700 of a second lot. You cannot dream how filthy we were, and we were all properly tired."

In Trinidad a **plantation** is generally formed from trees about one year old taken from the nurseries or pépinières. These young trees are very tender. They have to be protected from the blazing sun during the first two or three years, and this is done by planting around them ground vegetables as temporary shade. The trees are planted 12 or 14 ft. apart, according to the richness of the soil; and at 25 to 30 ft. intervals is planted the large tree "Bois Immortelle", the permanent protector or shade of the cocoa, hence called in the Spanish "Madre del Cacao". In Grenada and some other parts of the British West Indies the trees are planted more closely together and the shade trees are dispensed with.

Tiny pink and yellow blossoms appear on the tree in the third year, growing in tufts directly out of the trunk and branches. In the fifth year about one in every four of these blossoms becomes a pod, which in a few months' time will grow to a length of from 7 in. to 1 ft. The pods in appearance are somewhat like cucumbers, with furrowed sides. First they are green, but as it ripens the pod changes to a bluish-red, almost purple, with pink veins, or, in some of the varieties, a delicate yellow or lemon colour. Each of these pods contains embedded in its pulp from twenty to forty-two **cocoa beans**, somewhat like almonds in shape and size. The tree bears in its fifth or sixth year, but is not at its best till the sixteenth in Trinidad.

Gathering, "Sweating", and Drying.—When ripe, the pods are cut down from the trees with sharp knives ("goleta") affixed to poles which can be lengthened as required—fatiguing work, as the twigs are very tough. The pods are heaped in piles by one set of labourers, while another cuts open their hard rinds and extracts the contents. The seeds or beans, with much of the acid pulp adhering, are extracted and taken to the "sweating-box". Here they are left for three days or more to undergo a kind of fermentation, the mucous pulp turning to a thick vinegary liquid, which flows away and can be converted into vinegar or alcohol. "Experience", writes Mr. H. Caraciolo, F.E.S., in *The Book of Trinidad*, "is required in this matter of fermentation, as on it depends to a great extent the flavour of the cocoa, whilst it is a means of suppressing the bitter principles so especially marked in the Calabacillo varieties. The heat in the sweating-box, which is made of wood or concrete, is generally 115° to 120° F. while the beans are sweating; if the temperature rises, it can be regulated by the admission of cold air through bamboo tubes, which are arranged in the tanks for that purpose. When sufficiently sweated the beans are taken out of the boxes and spread out to dry or cure (on the majority of Trinidad estates by the action of the sun, which is certainly the best) in the drying-house, which consists of a strongly built span-roof, with wheels running on iron rails laid along a strong framework supporting a platform underneath. There the beans are spread and manipulated in the sun. By a strange anomaly, however, this manipulation as it is called, is principally done by the feet, which is commonly known as

dancing." Upon the same point Señor Bazo, Secretary of the Guayaquil Chamber of Commerce, writes: "The **drying** is done on open platforms made of split bamboo and palms, where the cacao is exposed to the sun during three or four days, and in order that it may dry uniformly and well, labourers are employed to tread it out with bare feet. If not well dried the bean is apt to ferment, and if excessively dried it shrinks and finally turns black. When dried in this primitive fashion, considerable pulp yet adhering to the grain, the cacao is sacked and sent to Guayaquil to be sold in its natural state."

Cleaning for Export.—At the port of exportation, such as Guayaquil, the cocoa is subjected to a cleaning process, splinters, dirt, and defective beans being removed, and adhering clusters of beans broken apart and dried. The sacks for foreign shipment contain from 60 to 70 kg., or 132 to 150 lb. net.

JUDGING VALUE

Retailers are hardly likely to buy cocoa in the raw state with which we have been dealing, but a little information as to varieties and values may be of interest.

The cocoa bean, which in the raw state is covered with a skin more or less delicate, in Ecuador varies in colour from dark coffee to violet, the latter indicating an inferior grade. This is the case with the Guayaquil cocoa, but of some beans, such as the Caracas, the colour is very much lighter. The highest-priced cocoa is the "Criollo" (see below), the seeds of which are almost white in colour, whilst others are pink, and others dark purple.

There are many **varieties** of cocoa, and they are now divided into three main classes of cultivated kinds: (1) The *Criollo* ("native" or "creole"); (2) the *Forastero* ("foreign"); and (3) the *Calabacilla* ("little calabash"). The *Criollo* fruit or pod is of average size, having a "pinched" neck and a curving point, yellow or red in colour, and with a bean light-coloured and of delicate flavour. It is largely planted in Venezuela (the home, of course, of the "Caracas" cocoa), Colombia, and Ceylon, and is regarded as the best kind, though not the most productive. The *Forastero* has a long and regular-shaped pod, deeply furrowed, generally rough surface, red or reddish-yellow, and gives pink seeds. The *Calabacilla* in the pod is smooth and roundish like the calabash after which it is named, and the cocoa beans which it yields are commonly of a dark-purple colour.

"In Venezuela", we read, "an old Spanish custom still prevails of sprinkling a fine red earth over the beans in the process of drying; this plan has little to recommend it, unless it be for the purpose of long storage in the tropics, when the 'claying' may protect the bean from mildew and preserve the aroma. In Ceylon it is usual to wash the beans thoroughly after the process of fermentation, thus removing all remains of the pulp, and rendering the shell more tender and brittle. Such beans arrive on the market in a more or less broken state, and it seems probable that they are more subject to contamination owing to the thinness of the shell. The best 'estate' cocoa from Ceylon has a very light, clear appearance, and commands a high price on the London market; this cocoa is of the pure *Criollo* strain, light brown (pale burnt sienna) in colour."

On the point referred to above, of "claying" the beans, the Guayaquil Secretary, whom we have quoted, observes: "Some merchants attempt to deceive the buyer by washing an inferior bean in achiote, which gives the skin the appearance of first-class cacao; but this practice is severely condemned by honest merchants, and is seldom followed; nor is reddish earth used here, as it is elsewhere, for the purpose of preserving the grain from decomposition and of increasing its weight".

The cocoa beans, shipped in bags of from 1 cwt. to 1½ cwt., are disposed of by the London brokers on Tuesdays in the Commercial Sale Rooms at Mincing Lane.

The **purest form** of cocoa which a retailer can buy is "**nibs**", of which we shall presently speak. But it does not follow that nibs are the most advantageous or suitable form of cocoa for general consumption

PREPARATION FOR SALE

The cocoa bean has to be prepared for sale and consumption by various manufacturing processes before it, or rather its valuable contents, can be described as ready for the retailer's handling.

The dried beans are first sifted and picked over to get rid of unsound seeds and foreign material. In an up-to-date manufactory this is done by a **sorting** and winnowing machine, which removes dust, &c., and grades the beans according to size, delivering them by separate shoots as cleaned.

Next comes the **roasting**. The beans are conveyed to hoppers, which admit them to steam-heated drums of huge size, slowly rotating. Under the eyes of experienced workmen they are roasted to the point necessary for perfect aroma and flavour. They then pass to a cooling chamber.

Breaking down, or cracking the shells of the beans, is the next process. The cracking-machine is at a considerable height, and as the beans are cracked they fall before a powerful blast of air, or winnower. This blows away the broken pieces of husk, while the cocoa contents of the beans fall in a heap to be sorted according to size. These, the fragments of the cocoa bean freed from the husk or shell, are the **cocoa nibs**.

Whole nibs are simply the whole kernels, from which the husks have been removed without the kernels being broken.

Nearly one-half of the constituents of the nibs consists of "cocoa butter". If the cocoa is to be digestible a good deal of this "butter" has to be removed, or else means must be adopted to dilute it by adding other ingredients. For the process of removal the nibs are subjected to what is called **grinding**, between horizontal mill-stones, which crush and melt out the "butter", and grind down the whole mass till it flows. The thick, treacly fluid from the grinding-mill is poured into round metal pots, which, when full, are put under a powerful hydraulic press. Under this pressure the oil or butter is squeezed out—much or little as desired, and according to the pressure applied. At the end of the process a firm, dry cake is left in the press. This, taken out to cool and then ground again to flour, is the familiar **cocoa essence.**

Flake cocoa is usually made by grinding the entire roasted beans in a steel mill, and afterwards reducing it to a coarse paste, which is then dried.

Rock cocoa is prepared from the nibs by grinding them in a warm mill, the fat being thus softened and a smooth plastic paste produced; a quantity of sugar, or of sugar and starch, is then added to the soft paste, and thoroughly incorporated with it.

Other cocoa preparations, including the so-called "soluble cocoa", are either essentially similar to rock cocoa, but with different proportions, or consist of ground nibs only, deprived of a portion of the "butter".

Cocoa butter, which is expressed from the cocoa nibs as above explained, is caught in moulds as it leaves the steam-heated hydraulic presses, and then hardens into a white or slightly yellow substance resembling tallow in appearance—either inodorous or with a faint smell of chocolate—and at ordinary temperatures solid or semi-solid. It is used in making bon-bons, ointments, and high-class toilet soaps, and is now a very important commercial article.

Starch, in the form of arrowroot, sago, corn-flour, tous-les-mois (canna), or potato starch, is frequently added to cocoa, which it renders more miscible with hot water. The addition of starch is a well-recognized practice. Less defensible is the addition of ground cocoa husk or cereals.

Dutch cocoas are said to be usually treated with alkaline salts to soften the cocoa fibre and make it more digestible. The Dutch method of chocolate manufacture is to roast and grind the beans between rollers, then powder in a hot mortar, adding sugar, when the whole mass is rolled and worked on flat stone slabs, and vanilla added. The dough is made into loaves and kept in a dry place for half a year, and then moulded into smaller cakes. Large quantities of cocoa powder without sugar are used in Russia and Poland.

Epps's cocoa, according to analysts' evidence in the case of Gibson *v.* Leafer, consists of cocoa, 40 per cent; sugar, 44 per cent; starch, 16 per cent.

Maravilla cocoa contains sugar and sago flour.

Granulated cocoa is a mixture of nibs, sugar, and arrowroot.

Homœopathic cocoa is similar, with the sugar omitted.

Chocolate and cocoa differ somewhat in their manufacture. The little book we have mentioned before, *The Food of the Gods*, describing the processes of one of the largest and best-reputed houses in the trade, says: "Both are made from the cocoa nib, but whereas in cocoa the nibs are ground separately and the butter extracted, in chocolate sugar and flavourings are added to the nib, and all are ground together into a paste, the sugar absorbing all the superfluous butter. If good quality cocoa is used, the butter contained in the nib is all that is needful to incorporate sugar and nib into one soft chocolate paste for grinding and moulding. But in the commoner chocolates extra cocoa butter has to be added. It is a regrettable fact that some unprincipled makers are tempted to use cheaper vegetable fats as substitutes for the natural butter; but none of these is really palatable or satisfactory in use, and none of the leading British firms is guilty of using such adulterants, or of the still more objectionable practice of grinding cocoa shells and mixing them with their common chocolates. Flavouring is introduced according to the object in view; vanilla is largely employed in this country, though in France and Spain cinnamon is used, and elsewhere various spices. . . . When the chocolate is sufficiently ground it is put into a stove to attain the correct temperature, and is then passed on to a moulding table, where it is pressed into tin moulds and shaken till it settles. After passing through a refrigerating chamber, the contents of these moulds are ready as cakes of hard chocolate for putting up" in packets.

CHEMISTRY OF COCOA

Pure cocoa contains about 4 or 5 per cent of starch natural to the bean. Its other constituents may be classed as fat, albuminoids, alkaloids, tannin, dextrin, colouring matter ("cocoa red"), and mineral matter. The alkaloids impart a stimulant character to the cocoa; they are termed *theobromine* and *caffeine*, and are closely allied to the alkaloids of tea. The "non-fatty cocoa" of the Trinidad nibs contains about one-third of its weight of albuminoids, the other two-thirds consisting mainly of gum, tannin, cellulose, colouring, and other organic matter.

When it is suspected that cocoa has been adulterated with an alkali it may be detected by using red litmus paper. A small book of this paper can be bought from a chemist for a few pence. When the red slip is placed in a solution of the cocoa, the presence of alkali will turn the paper purplish or blue.

Cocoa has more of the character of a food than either tea or coffee has, its heat-producing and flesh-forming ingredients being present in greater quantity and in better relative proportions. At the same time the popular idea of its value as a food is rather an exaggerated one, since the whole of the nitrogenous or flesh-forming constituents of cocoa are not present in a nutritive form. It is better to regard it as essentially a stimulating and refreshing beverage rather than a food.

To make Cocoa.—The method recommended by experts is as follows. For three breakfast cups mix $1\frac{1}{2}$ dessert spoonful ($\frac{3}{4}$ oz.) of cocoa essence with an equal bulk of powdered white sugar, using a quart jug with rounded bottom and narrower neck; stir to a thin paste with a little boiling water. In an enamelled saucepan mix one breakfast cup of milk with $1\frac{1}{2}$ cupful of water and boil with care. When on the boil, pour this over the contents of the jug, whisk vigorously for a few seconds, and serve. For a richer drink use equal parts of milk and water. It is desirable to warm the jug before putting in the cocoa.

CHAPTER IV.—SUGAR

Sugar is one of the world's important foods and one of the grocer's important commodities. The recognized sugar "campaign" in Europe is from September 1 to August 31. In a recent campaign the world's total sugar crop was no less than 12,144,000 tons. There are no trustworthy estimates of the total production of sugar in such countries as India, China, and certain of the West India Islands, but judging by the export figures in those countries, and statistical estimates in others, the crop (*vide* an answer by the President of the Board of Trade in the British House of Commons) was thus divided:

Beet sugar: European crop, 6,954,000 tons; United States, 284,000; total 7,238,000 tons.

Cane sugar: total crop, 4,906,000 tons.

It will be seen from these figures that there is now far more beet sugar than cane sugar produced, and that these are the two great classes of the sugar with which we have to deal. Respecting the kinds of sugar we shall have something to say farther on.

There is again a mode of classifying sugars which distinguishes between **raw** and **refined**, the meanings of which will also fall to be explained later. The British excise authorities apply the term "raw sugar" to both unrefined cane sugar and unrefined beet sugar, "crystallized" and "soft" descriptions also being included. The technical term "refined sugar" simply means all sugars made in, and that have passed through, refineries.

We are now in a position to understand the meaning of some further statistics regarding the production and sources of trade supply of sugar.

Whilst the production of sugar of one kind or another is carried on in most parts of the world—forty-three countries being named in a British parliamentary return as engaged in its production in "any considerable quantity"—the largest producers of *cane sugar* are the West and East Indies, and the largest producers of *beet sugar* are Germany, France, Austria, and Russia. Of beet sugar Germany alone produces some 2,000,000 tons, while France and Austria produce over 1,000,000 tons each, and Russia nearly 1,000,000. In some years Cuba produces nearly 1,000,000 tons of cane sugar.

British supplies are officially distinguished as (1) refined, (2) raw, as above explained. Of the *refined sugar* the United Kingdom imports about 930,000 tons, of which seven-ninths come from Germany, while Holland, France, Austria-Hungary, Belgium, and Russia send the remainder. The *raw sugar* imported by the United Kingdom is about 630,000 tons, of which amount 440,000 tons are beet and 190,000 tons cane, one-third of the raw cane coming from British tropical possessions, while Germany and Austria send most of the raw beet sugar. Of the whole British import of cane sugar Java sends about one-seventh, namely 27,000 tons, and Cuba more than one-ninth, or 22,500 tons. The British West Indies send 25,000 tons, British Guiana, 15,000 tons, the British East Indies, 15,000 tons, and Mauritius and its dependencies about as much. Every year the United Kingdom imports about £20,000,000 worth of sugar.

The United Kingdom also imports no less than 180,000,000 lb. of **molasses**, one of the products which, as will be explained, accompany the making of sugar. The molasses from beet sugar being alkaline, the product made from the cane is much preferred, and the major part of the supply reaches the United Kingdom from the United States.

The competition between beet sugar and cane sugar has become very severe of recent years, the cane-sugar producers having lagged behind in the race owing partly to their adherence to old-fashioned methods of manufacture and partly to fiscal handicapping, while the beet-sugar producers have been encouraged by State bounties and other aids to carry the scientific manufacture of their product to a high pitch of development. In 1903 a united effort was made by the chief European nations, including the United Kingdom, to put an end to the growing evils of the "bounty" system, the Brussels Convention which came into force in that year laying down certain procedure to be adopted by the producing nations to cease giving the bounties, and by the importing nations to neutralize their effect where given.

The supply of **other products** which are more or less dealt with in this chapter includes *honey*, *glucose*, and *grape sugar*. **Honey**, which largely grows in the United Kingdom itself, reaches the British importing markets chiefly from California, some also arriving from South America, France, Australasia, and elsewhere. California is the great honey-producer, the annual crop there being about 4,500,000 lb. Chili is placed next as a honey-producer. Palestine has always been famous for its honey. French honey enjoys a high name, but is mostly consumed in France itself, being seldom seen in Mincing Lane; the crop averages about 6,000,000 kg.

Glucose and *grape sugar* reach the British market mainly from the United States, though Germany and other European nations contribute.

DESCRIPTION

Sugar used for domestic purposes is the kind with which we are here exclusively concerned. There are, however, two great classes of commercial sugars:

(1) The *cane sugar* and sugars corresponding to it, including *beet sugar*, *maple sugar*, *jaggery*, and *sorghum*—what are chemically called the "sucroses".

(2) *Glucose* or *grape sugar* and sugars corresponding. These are used chiefly in manufactures and are not the grocer's concern.

Cane sugar is the product of the sugar cane, *Saccharum officinarum*, a grass which grows commonly ten feet high, but varies from six feet to sometimes sixteen or eighteen feet; a native of Asia, brought from India to Europe by the Venetians in the twelfth century, and carried by the Portuguese and Spaniards to America. The outer surface of the stem of this grass is extremely hard owing to the flint in it. The stem is not hollow but full of juicy pith. The stem of the cane is $1\frac{1}{2}$ in. or 2 in. thick, and is jointed at short intervals, with leaves springing from the joints. The cane rarely flowers; when it does, the flowers, often 2 ft. long, are used for stuffing pillows. The conditions required for successful cultivation are plenty of moisture, alternating with dry weather, and a strong sun. The plant is propagated from cuttings 6 to 12 in. long, which attain maturity in from 12 to 14 months. In the early stages of growth the sugar cane is not unlike Indian corn. In about 6 to 8 months it shows the fully developed cane like a bamboo, which throws its "arrow", turning the field from green to silver grey. The soft pith inside the canes contains the sweet juice from which the sugar is extracted. When the plant is ripe the skin of the cane becomes dry and brittle, the colour of the pith turns from grey to brown, and the juice is found to be sweet and sticky. At this point the canes are cut off close to the ground by the use of a sharp knife called a cutlass; they are then stripped of their leaves and sent to the mill for manufacture into sugar as explained below.

Beet sugar is the product of a kind of beet developed by careful cultivation from the plant found on the sea-shore, *Beta maritima*, from which also come many different sorts of mangolds and the edible beet root of our gardens. The sugar beet, which in appearance and habit resembles the mangold, is white-fleshed, shaped like a "long red" mangold but smaller. As long ago as 1745 the French chemist Margraf showed that the common beet, *Beta vulgaris*, contained sugar identical with that of the sugar cane; and it was Napoleon's policy of making France as far as possible independent of foreign supplies which led to the great development of the beet for sugar-making.

The process of continually selecting sugar beets from seed on the basis of their richness in sugar has produced a beet which contains as much as 18 per cent of sugar and 20 per cent of dry matter, while the mangold contains about 12 per cent of dry matter and 8 per cent of sugar. The beet averages perhaps 10 to 12 per cent of sugar. As the extraction processes are only economical when the roots contain a high proportion of crystallizable sugar, most beet-sugar factories pay for their roots on a scale varying with the proportion of sugar they contain, and reject consignments of roots which fall below a certain standard. Sugar beets can be grown wherever mangolds are grown, though on the whole they are more suited to lighter and warmer soils than the mangold prefers. Mr. Sigmund Stein, a great advocate for sugar-beet growing in Great Britain, pointed out to the Society of Arts that it is grown in all countries of Europe, even as far north as Sweden, and as far south as Spain, Italy, and Greece—also in Persia, Siberia, Canada, United States, Chili, Natal, the Cape, and the East Indies.

Maple sugar is the product of the sugar maple, *Acer saccharinum,* which abounds in North American forests. It is well known and largely used in Canada and the United States, but comparatively little seen in Great Britain or Europe generally. The sugar is obtained from the sap of the tree, which is very plentiful in the spring and summer. The tree is tapped to the depth of about ½ in. and a tube inserted, through which the sap flows. The collected sap is boiled down to the crystallizing point and strained, after which it is poured into moulds to solidify: it is then ready for use. A good maple-tree will yield each season about 4 to 6 lb. of sugar, which contains on an average 83 per cent of saccharine matter.

Sorghum is the product of *Andropogon Sorghum,* var. *saccharatus,* the Chinese sugar grass or cane, a kind of barley; it is a native of India, but largely grown in China, where the sugar is chiefly used.

Jaggery, also called **palm sugar,** is a sugar of low quality produced from various species of palms, such as *Phœnix, Arenga,* and *Borassus,* grown in India, where it is largely consumed. Before the great development of the beet-sugar industry, jaggery was a factor of some economic importance in the sugar trade of the world, because in times of scarcity it exercised an influence in keeping down the rising price of raw sugar. But as it contains a large proportion of uncrystallizable "invert sugar" (a term to be explained), it fetches only a low price for refining, and the quantity now imported into Great Britain is but small.

Glucose, one of the second group of sugars mentioned above, is also called **grape sugar**, **starch sugar**, **corn sugar**, and **dextrose**. In America immense quantities of this sugar are made from yellow maize, and "corn sugar" is its American name. In Great Britain also its manufacture is an extensive industry, but the raw material is more varied, potato starch and grain being used. It is in two forms, solid and liquid, and in England both are called "glucose"; but in America only the liquid is termed glucose, the solid varieties being sold as "grape sugar". Glucose is not so sweet as either cane or beet sugar. If the sweetening power of cane sugar be taken as a hundred, that of glucose is only about thirty or forty. Large quantities, chiefly of the solid form, are used by brewers; and the liquid is much employed for jams, marmalades, jellies, syrups, and sweetmeats. It is a frequent adulterant of honey, golden syrup, and treacle. Tanners use glucose for "weighting" leather, and vinegar-makers for the production of vinegar. A small quantity of cane sugar is sometimes mixed with glucose syrup to improve its flavour. Glucose sugar is present in ripe grapes and many other fruits; hence its names "grape sugar" and "fruit sugar".

Invert sugar, the principal constituent of honey, and one which enters largely into the composition of treacle, is an uncrystallizable syrup, sweeter in taste than cane sugar, made by heating cane or beet sugar with acids. It is made largely for the use of brewers, being sold as **invert**, **saccharum**, &c.

Saccharine, which is technically not a sugar at all, is about three hundred times as sweet as sugar, while **sucramine**, prepared from it, is about five hundred times as sweet as sugar. Saccharine is prepared from toluene, a liquid obtained from coal tar, and closely resembling benzene. Large quantities of it are imported for sweetening purposes, the manufacturers of aerated beverages preferring it for one reason, because it does not ferment and form alcohol as sugar does.

It is also used largely in medical preparations, and diabetic patients take it instead of sugar.

Honey is the saccharine substance collected by the bee, *Apis mellifica*. **Virgin honey** is the product of the activity of the younger bees before they have swarmed, and is of better flavour and quality than that produced by the old bees. **Artificial honey** is made from glucose syrup, flavouring materials to imitate the genuine honey, and a minute quantity of formic acid. The English or Scottish heather honey is that most esteemed. Narbonne honey is a light-coloured kind, very granular and highly aromatic.

Molasses, golden syrup, treacle, &c., will be described after the processes of sugar manufacture have been explained; and this also applies to the various descriptions of manufactured sugar, such as "granulated", "caster", and so on.

MANUFACTURE

Cane-sugar Manufacture.—In a representative sugar mill of the modern type the cut canes are received from the plantation by a private railway, and are unloaded alongside a travelling carrier, which slowly feeds the great revolving crushing rollers. The cane juice squeezed out of the canes by these rollers runs down through strainers, and is next pumped up to various clarifiers and "subsiders". The juice is heated, and its fermentation is prevented by the addition of lime or sulphite of lime, which also causes a quantity of impurities to come to the surface as a scum that can be skimmed off. The partly clarified juice then flows on to the open coppers or vacuum-pan for the process of evaporation. The vacuum-pan is a vessel heated by steam, and which can be closed so that the air and vapour can be exhausted, enabling the water in the syrup to be boiled off at a lower temperature. When sufficiently concentrated, the syrup begins to deposit crystals of sugar, which are either large or small grained according to the way the process is conducted. From the pan the "massecuite" (as the mixture of crystals and syrup is called) passes into coolers, and thence to the centrifugals—a machine where very rapid whirling frees the sugar from the syrup and dries the crystals. Sugars dried in the centrifugal are much drier than those drained in the hogshead, like the old-fashioned muscovadoes.

Muscovado Sugar Manufacture.—In this, the old-fashioned process, the canes when ripe are cut as close to the ground as possible, into junks about 4 ft. long, and tied in bundles of about one dozen, the cane top being used as a band, and afterwards as fodder for the stock. They are then taken to the sugar mills and crushed by heavy rollers to extract the juice, which goes to the boiling house (the pith called "megass" being dried in the sun and used for fuel). Here the juice, of an opaque greyish colour, is strained and put into "clarifiers", where temper lime is added, and it is heated to about 180°, which brings all the impurities to the top, when they are removed by skimmers. The juice, now of a sherry colour, is run down to the evaporating battery, of usually five iron or copper pans, the largest holding about 500 gal., and the last and smallest tache, which is nearest the fire, about 100 (but if steam is used in the last stage of boiling it is larger). In these "coppers" the juice is boiled and skimmed till it forms a syrup, great care being here required to see that it does not burn. It is then struck into large wooden trays (or coolers), where it is turned with an oar-like pole every fifteen or twenty minutes till it "sets", when more syrup is then "struck" on to it and treated in a similar manner, until the cooler becomes full of a dark-brown mass of crystalline sugar and sweet uncrystallized molasses, which, after remaining about thirty-six hours to cool, is dug out and put into casks with holes through the bottom, through which the molasses run and leave the sugar dry and ready for shipment, as "muscovado"

Yellow Crystals (Centrifugal).—Most of the West Indian sugar is now made into "centrifugals" or "yellow crystals" by what is called the "triple effect" and vacuum-pan. The process is more economical, and the megass fresh from the mills supplies all the fuel. The "triple effect" consists of three large cylinders or bodies for boiling the juice in vacuum.

so arranged that the heat from the exhaust steam from the mills can be used three times over. When the syrup has been boiled sufficiently in the third body, it is passed to the vacuum-pan, where it is reduced to the consistency of "masse-cuite" (mixture of crystals and molasses), and then on to the centrifugals. These, revolving at 1200 to 1500 revolutions per minute, eliminate the molasses from the crystals, which are forthwith sent to the packing floor. The scum, refuse juice, and fermented molasses, &c., are distilled and made into "rum". The first sugars from the vacuum-pan are called the "centrifugals" or "crystals". The syrup from these, being reboiled later on, makes what are called **syrup sugars** or **molasses sugars**, "many of which", says Mr. J. R. Murray, British Commissioner to the West Indies, "are admirable grocery sugars". Again, molasses is obtained in the drying of these, and is once more boiled to make a third sugar, the molasses from this being used finally for rum making or stock feeding.

Hinton-Naudet Process.—This recent development applies to cane-sugar manufacture the "diffusion" process for obtaining sugar from beet. The advantages claimed are briefly:

1. Single crushing of the cane. 2. Defecation of the juice and its filtration, after defecation, in its own "megass" (or cane waste) in diffusers. 3. Recovery of all sugar in juice and megass, with a loss of from ·36 to ·4 per cent. 4. The megass, after being passed through a mill to extract the waste, is used as fuel in the ordinary way. 5. Total abolition of all skimmings, filter presses, and of the acidity resulting from their use. 6. A defecated juice unaffected in purity and perfectly brilliant. 7. A much higher yield in sugar, entailing less expense and less fuel, as the defecation of the juice is made in special heaters with the use of exhaust steam.

Beet-sugar Manufacture.—The old method of extracting the sweet juice from the beet by pressure has been superseded by what is called the "diffusion" process. The beet roots are brought by the farmers to the factory's weighing-machines in the farming districts, and have thence to be transported to the factory's yards and taken into the sugar works as economically and regularly as possible to feed the machinery, which works day and night. In the older factories this was all done with barrows, but recent improvements have inaugurated a system of an open drain, with a constant flow of water some few inches deep (worked by pumps and gravitation), into which the beet roots are pushed by men from the heaps at the side of this artificial water-course. On arrival at the factory the roots are washed in a vast tank, from which they are taken up by a screw elevator on to a shaking grid, where any worthless bits are removed, and the clean roots pass at once on to the official weighing-machine. The roots pass from the weighing-machine to the cutters, which rapidly cut the solid root into strips, somewhat similar to vermicelli, but the section is half-moon shape instead of round. The shredded beet roots now pass into the diffusers, into which powerful jets of hot water are injected, and practically the whole of the sugar present in the shreds is dissolved out, and leaves the diffuser in the form of a dirty brown liquid, while the swollen shreds are used as cattle food. The juice of the roots passes then into a lime purifier to remove the chemical impurities, whence it passes through a long series of filters to extract any vestige of lime and clarify the liquid. The juice, which has now become fairly transparent, passes through three series of boilings to drive off the surplus water and effect concentration. We now come to the vacuum-pan, where the liquid is boiled for a considerable time, and the formation of the crystals takes place. The concentrated mass in which the crystals are floating is drawn off from the vacuum-pan into a large open tank, in which revolve slowly but continuously a series of long arms, which impart to the floating crystals a slow movement and prevent them forming into blocks. From this tank the sugar is drawn off into turbines, a powerful jet of steam plays upon the sticky mass, the adherent syrup called molasses is drawn off by the centrifugal force combined with the steam, and in about five minutes the turbine is stopped and the crystals are visible. The sugar is rapidly removed from the turbines, and then passes into an upper room, as the turbines are generally in the basement. The transport is effected in the big factories by an archimedean screw. On arrival on the upper floor the factories of choice grocery crystals arrange for the sugar to fall from the roof on to an immense slanting riddle, which the perfect crystals traverse, while the lumps pass on one side and are remelted. The huge pile of sugar sufficient to fill 100 bags is then carefully mixed. A sample is drawn by the Excise for their own analysis, and the sugar then passes by gravity down a filling tube into the lower story, when it is weighed and sealed under the supervision of the Excise authorities.

Beet Crystals.—The first crop of sugar from the centrifugal is called "1st jet" sugar. Its odour and taste are usually such that it is not fitted for consumption in its present form, but by washing it in the centrifugal it is rendered nearly pure, and it is thus marketed as "beet crystals". The syrup left from this, when again boiled down and machined, yields "2nd jet" sugar, and this again "3rd jet", or even "4th jet".

Sugar-refining.—This industry, formerly of considerable importance in Great Britain, is practised separately from the manufacture of sugar, though, owing to the improved processes now used by the manufacturers, it is sometimes difficult to say where raw sugar ends and "refined" begins. The refiners use both cane and beet sugars of different qualities, such as "75 per cent" to "88 per cent" raw beet (these terms refer to the strength or "degree of polarization" of sugar, as later explained), yellow crystals, "syrup" sugars, muscovado, and so on. Beet sugar had to be refined owing to the bad taste of the vegetable matter in it, and the superior appearance imparted by the refining created a necessity for refining cane sugar also to meet the demands of competition. Raw sugars contain, in varying proportions, such matters as (1) syrup; (2) impurities insoluble in water (fibre, sand, mud, fluff from bags, &c.); (3) colouring matter; (4) impurities soluble in water (glucose, salts of potash, salt, lime, &c.). The refiner's object is to remove the insoluble impurities and to separate as much as possible of the sugar from the soluble impurities in a white crystalline form, and make the remainder of the sugar mixed with the soluble impurities into golden syrup. The removal of the insoluble impurities is effected by mechanical filtration through cloth or sand, the raw sugar having been first dissolved in roughly an equal weight of water. Cloth is generally used, and the mud, &c., is deposited on the surface of the cloth, while a clear liquid containing the sugar and the soluble impurities falls through. This liquid is, however, not colourless—in fact, when certain kinds of cane sugar are used, it is a very dark brown, and it is, of course, impossible to make white sugars from it until the colour is removed. This is effected by a chemical process, depending on the affinity which animal charcoal (made by heating bones red-hot in closed retorts) has for colouring matter. Refineries use for this purpose huge cylinders, more than 20 ft. high and 8 ft. in diameter, filled with animal charcoal. The clear but coloured solution of raw sugar is run slowly on at the top and comes out at the bottom practically colourless, the colour remaining in the charcoal and everything else passing through. The power of the charcoal soon fails; after a few hours of work it has to be revivified by reheating in closed retorts—the care of the charcoal is one of the largest expenses a refiner has to face.

The solution which comes from the charcoal—bright, clear, and colourless, but still containing the soluble impurities—is boiled down in order that the water may be driven off in the form of steam, and the sugar left in a more concentrated form. If a solution of sugar is boiled in an open pan at atmospheric pressure the result is not white crystals, but sugar candy. To avoid this refiners evaporate "in vacuo"; that is, boil down the liquid which comes from the animal charcoal at a pressure much lower than the pressure of the atmosphere. In these circumstances the solution boils at a very low temperature, little heat is used, the sugar is not burned or browned, and sugar candy is not produced. Great closed copper vessels are used, each connected with a vacuum pump, and provided with steam coils for heating. As the water is removed the sugar separates itself in the form of crystals floating in their mother liquor, because sugar needs about half its own weight of water to dissolve it, and if you take away more than this quantity a corresponding amount of sugar, having been deprived of its solvent, is obliged to become solid. Ultimately a mixture of solid crystals and liquid—"mother liquor"—results, which cannot be boiled down further without becoming a solid block, and the next part of the process consists in separating the solid part from the liquid part of the mixture.

This is effected by the application of centrifugal force. The mixture of solid and liquid is placed in cylinders which revolve with extreme rapidity. The sides of the cylinders, instead of being made of solid sheet metal, are made of fine copper or brass sieve, and the centrifugal force drives the liquid part of the mixture, called *green syrup*, through the meshes, while the solid sugar is retained within the cylinder. The green syrup is evaporated again and again, new crops of crystals being obtained each time until no more can be extracted. When this condition of exhaustion arrives the syrup is **golden syrup**, and contains the soluble impurities which were originally present in the raw sugar with a quantity of pure sugar which these impurities prevent from crystallizing. It only remains to dry the sugar which is left in the cylinders. This is done either by spreading in an airy place or by passing through a dryer heated artificially. The sugar is then ready for packing and consumption.

Loaf and Cubes.—In making *cubes* the sugar, before removal from the centrifugals, is purified by means of an extra syrup, and is then taken to presses, when sugar plates are obtained. After being dried they are put on the cutting machines and are then ready for packing. In the manufacture of *loaves* the mixture of solid and liquid is taken from the vacuum-pans, filled into conical loaf forms and then placed on loaf beds, and also purified by an extra refined syrup during five days in order to remove all impurities. The loaves are then dried in stoves, packed in paper. In the Hersey cube machine, which is largely used for making hard sugar, white moist sugar is fed into a hopper, mixed with a small quantity of liquor just sufficient to bind the grains together, and then delivered from the hopper on to a revolving drum. Round the periphery of this drum are rows of moulds, each of the size of the cubes required. As it passes from the hopper the sugar is pressed into these moulds, and it is afterwards, as the drum revolves, forced out on to plates ready for drying in stoves.

Granulated Sugar.—For drying and granulating sugar by Hersey's process a large sheet-iron cylinder, about 8 yd. long and 2 in diameter, is placed in a slightly sloping position and kept in rotation. A closed steel cylinder of half the diameter and nearly the same length is placed inside the first one and turns with it on the same axis. The inner cylinder being kept hot with internal steam, the wet sugar is fed continuously on to the top of it at the upper end. As the apparatus revolves, this sugar falls off into the outer cylinder, to be again carried up and once more to fall on the hot inner cylinder, and so on. The slope of the machine causes the sugar to work gradually down to the lower end and so out. Meanwhile a current of cold air is entering by this lower end and passing out at the upper; it meets the hot, moist, spread-out sugar on its way, and carries off the moisture from it. As the sugar gets gradually dried it granulates, and passes out clear, white, dry, and cool enough to be immediately barrelled. The granulated sugar is in crystals of very fine grain, and is largely used for all purposes.

Pieces, or soft sugar, are made by introducing into the vacuum-pan a larger quantity of syrup than is used for large crystals, and this syrup being boiled down to the crystallizing point in less time and under smaller pressure, yields crystals of greater number and smaller size, the massecuite being smaller in grain. Pieces may be brown, yellow, or white in West Indian sugars; the name "dabs" is also given to sugar made in imitation of the raw muscovado.

Syrups, or **molasses sugar**, is a raw cane sugar, very soft and yellow, and is made from the runnings or molasses after the yellow crystals are made, as already explained.

Foots derive their name from the fact that they are the little wet pieces at the foot or bottom of the hogsheads in which the old-fashioned raw muscovado sugar is packed; they are usually damp and moist.

White crystals are small, medium, large, and extra large, and are small sparkling crystals made by refining the raw sugar. A very small quantity of indigo or ultramarine "bluing" is sometimes used in the refining process to improve the colour.

Lump sugar is the name given to the pieces of refined white sugar cut into small sizes about $\frac{3}{4}$ of an inch square.

Rainbow cubes are (in West Indian usage) the same as lumps, but tinted with "various pretty and harmless colours", according to the leading price lists.

Lump dust is the soft sugar from the bottom of cases of lump.

Preserving crushed is refined sugar about the size of medium crystals, but less sparkling in appearance. Used for jams, syrups, &c.

Caster sugar, sometimes called **sifted sugar**, is finer than granulated, and less fine than icing sugar. It may be either cane or beet sugar, and may be merely the sifted dust from loaf sugar, or specially ground. **Fine caster** is a finer quality.

Icing sugar is highly refined sugar pulverized like flour, to be used for cakes, &c. Cane sugar is generally preferred for this, as it is stated that beet sugar is liable to change colour when strongly heated, and the goods "iced" with it are not so white as when cane sugar is used.

Coloured sugars used in confectionery are coloured by adding a harmless liquid colouring matter, such as decoction of cochineal, to the gently melted sugar.

Molasses is defined as the runnings from raw sugar while awaiting shipment. It is generally darker than treacle and contains more impurities.

Green treacle is the residue left from raw sugar in the process of refining.

Golden syrup is defined by West Indian authorities as "the residual product of white cane-sugar refining". It is lighter in colour than treacle, and generally contains more cane sugar and less invert sugar.

Green syrup, which drains from the conical moulds during the making of loaf sugar, is said to be the purest kind of syrup, analytically speaking, but it is less sweet than some other forms of treacle and syrup.

JUDGING VALUES—CHEMISTRY

In judging sugars for value, as for taxation, &c., the great point is the amount of "pure sugar" they contain, to ascertain which both chemistry and optics are drawn upon. The Customs duty is paid according to the "polarization" of the sugar imported, sugar of a polarization exceeding 98° paying per cwt. more than twice as much as that does whose polarization does not exceed 76°. The meaning of this "polarization" phrase is the degree or extent to which a solution of the sugar "rotates the plane of polarization" by acting upon polarized light in an instrument called variously a *polariscope*, *polarimeter*, and *saccharimeter* — the last-named meaning a *sugar-measurer*. Within certain limits the degree at which a sugar polarizes measures the amount of true saccharine matter which it contains.

The **saccharimeter** or **polariscope**, which in appearance resembles a small telescope, may be described as follows:—

When ordinary light — daylight or lamplight — is passed through a certain kind of prism ("polarizer") with which the instrument is fitted, its properties are altered in a way which we need not here particularize except by calling the light "polarized light". And when this light is passed through a solution of sugar its characters are still further altered. As applied in the saccharimeter, the nature of the change is as follows. If we look through the instrument before putting in the sugar solution, we see a disc of lavender-coloured light.

Looking again after the sugar has been placed in, we see one-half of the disc *red*, the other *violet.* And the more sugar there is, the greater is the change of colour. By turning certain screws a compensating arrangement is brought into play, the effect of the sugar is neutralized, and we can reproduce the original uniform lavender tint. The more turning required, the greater is the colour to be "compensated", and therefore the more sugar is there present. The instrument is fitted with scales showing the amount of movement and the corresponding quantity of sugar. After a sample of sugar has been dissolved in the proper volume of water, the finding of its "degree of polarization" or "strength" is done in a few seconds by means of the saccharimeter. One important property of the saccharimeter should be mentioned, since it distinguishes between different kinds of sugars. In order to get the required "compensation" of colour, the screw arrangement must be turned to the *right* for some sugars, but to the *left* for others. Cane sugar and invert sugar, for instance, have what are called opposite "rotations"; the former right-handed, the latter left-handed.

Beet *v.* **Cane.**—With a little practice it is not difficult to distinguish the *lower qualities* of beet sugar from the cane product. For example, in Demerara sugar the colour is a bright yellow or straw tint, whereas beet has a much lighter tone, inclining to white. Not infrequently, however, the beet crystals are, as indicated above, dyed with an aniline dye to match the colour of Demerara, and it is then difficult or impossible to tell them with certainty by mere inspection. The method adopted by analysts in such cases is as follows. A small quantity of the suspected sugar ("yellow crystals") is stirred up with alcohol. The latter dissolves the yellow dye from the crystals; it is decanted off into a small porcelain basin and the alcohol is evaporated away. The residual colouring matter is dissolved in a little distilled water with a drop or two of hydrochloric acid, and a few inches of Berlin wool immersed in the solution for an hour or so. The wool is then removed, well rinsed in pure water, and dried. If the wool becomes dyed yellow under these conditions, it is due to the presence of coal-tar dye, and not to the natural colouring matter of the sugar. There are also differences of odour and flavour in some cases which enable one to distinguish beet sugar from cane. But for the most part this applies only to the raw sugars, or to those which have not been well refined. The best method of detecting the odour is to rub up some of the sugar between the palms of the hands before smelling it. Sometimes one sees statements to the effect that cane sugar has greater sweetness and a richer flavour than that from beet; but it should be understood that the most highly refined sugars in the two classes approximate very closely to each other, and the reader should not be disappointed if, in comparing sugars of such character, he finds that his palate is not sensitive enough to detect much difference. One recommendation frequently given for telling whether a sugar is beet or cane is to put the sugar into a cup of tea without milk: beet sugar, it is said, will turn the tea dark, cane sugar will not. This is due to the presence of a little iron, which is sometimes found as an impurity in low-class beet sugars. The iron combines with the tannin of the tea to form a kind of ink. But that such a general test is misleading in the case of purer sugars may easily be seen by trying the experiment with, say, some Paris cubes and some English-refined cane-sugar cubes, side by side. Even a trained eye will be unable to distinguish between the results shown by the two. Hence it should be borne in mind that the differences of flavour, &c., are most noticeable in the raw and less highly refined sugars, and to one who is not an expert they are of little use for the purer kinds. Such statements as that "beet sugar contains very little real saccharine matter" can only be characterized as absurd. Whatever political, patriotic, or business reasons may exist for wishing success to the cane-sugar industry, there is nothing to be gained by such gross exaggerations as the above; and it is better to recognize the beet as what it really is—a dangerous but a worthy rival to the cane.

Dyed Sugar.—Put a teaspoonful of the sugar in a small white basin or tea-cup, and pour on it enough pure, colourless, dilute hydrochloric acid to cover it. Mix the substances by gently shaking. If the sugar is dyed with any of the ordinary dyes, the acid will become tinged with pink, red, yellow, or even blue, according to the kind of dye which has been used. With undyed sugar the acid remains practically colourless.

To Test Demerara.—Mr. Brierley, Borough Analyst of Southampton, in a reported address said: "If they had any suspected articles before them let them taste, touch, smell, and observe them, and by those means in numerous cases they would be able to satisfy themselves as to whether adulteration had taken place or not. Take, for instance, the case of common yellow sugar, known as yellow crystals. There were really no chemical differences between those crystals and Demerara or Trinidad sugar, which was produced from the cane. It was in the manufacture that the difference existed. Yellow crystals were made from beet root, and with the sugar derived from the beet was associated several materials which it was absolutely necessary to remove before the sugar could be put upon the market. In order to effect this removal the sugar had to be very highly refined, and could only be turned out in that condition colourless, and they knew that a colourless substance could not possibly be sold as Demerara sugar. Between the yellow crystals and the ordinary sugar there were several differences. In the first place, as he had mentioned, the yellow crystals were highly refined, and consequently free from syrup, whilst the Demerara sugar was always associated with the syrup from which it was made; therefore the syrup in the cane sugars was absent from the crystals. If they took up a quantity of Demerara sugar in the hand and pressed it in the same manner as when making a snowball, they would find that the particles became more or less cohesive, and would adhere to each other. In the crystals the syrup was not present, and therefore they would not stick together, and consequently one indication of a distinction between yellow crystals and the other sugar was obtained simply by ascertaining whether the syrup was or was not present. Another distinction would be found if they placed samples of both in water and warmed them afterwards, noting the difference in the odours. A smart grocer, by similar means, would not only be able to tell what were yellow crystals and what was Demerara, but he would also be able to tell if he had a mixture of the two. He wished to impress upon them the necessity for using their powers of observation not only with regard to sugar, but also with regard to starches."

BUYING AND SALE

Sugar Weights.—Sugars are sold wholesale at "original" or refiners' weights, not delivery weights, and are therefore liable to be found lighter when received from a distance, owing to loss on the voyage. The "marks" of sugars are the initials of refiners stencilled on the cases; lists of "first marks", indicating that these sugars are classed as first quality, are published from time to time. When sugar is bought "open first marks", any of these equivalent marks may be supplied, so that in the course of an order running over six months as many different "marks" may be received. Practical buyers usually recommend the grocer to order the particular sugar which suits his trade and specify the mark, in order to defeat speculation.

Preparation for sale, as regards sugar, is now a very different operation from what it used to be, and far less onerous. The improved methods of manufacture have done away with the labour of emptying hogsheads and chopping up "titlers", and incidentally, it may be remarked, the temptation offered by the old-fashioned sugars for adulterating them by adding sand—according to a well-known slanderous story—is now entirely removed and "sanding" out of date, if for no other reason than that it is impracticable. Weighing up sugar in bags for retail customers is now the chief "preparation for sale", so far as the grocer's shop is concerned.

Sugar mites, scientifically called the *Acarus sacchari*, are found in raw sugar—the purification process eliminates them from the refined goods. When raw sugar is handled these small animals, which form colonies in the sugar, are sometimes troublesome.

The mite, which resembles an itch insect, burrows under the skin, producing an irritating pustular disease called **Grocer's Itch.** If a sample of the sugar containing these mites is dissolved in warm water in a glass, the insects adhere to the glass either at the sides or top or bottom of the liquid, and if a suspected particle is drawn out with a glass tube and examined under a low-power microscope, the acarus may be easily identified. For the "Grocer's Itch" disease the following remedy has been published in *The Grocer*:—

"In the first stage, when there are heat and swelling, cold water dressing will greatly relieve. When the eruption has appeared it should be dusted with finely powdered starch, white oxide of zinc powder, or chalk. If there be scabs they can be easily removed by softening with oil or bread and water, or poultices of mashed turnips; after which use a simple ointment such as vaseline, or an ointment made of yellow oxide of mercury 1 drachm, oil of sweet almonds 1 drachm, and lard 6 drachms. It is best to take the advice of a medical man, as tonics are necessary in some cases, and if possible, change of air."

Sustaining Power of Cane Sugar.—The following is quoted from the *West Indian Committee Circular*:—We have often had occasion to refer to the remarkable sustaining powers of cane sugar, and it may be remarked that Sir Martin Conway, in his book, *The Ascent of Aconcagua*, states that he found Demerara sugar 'the finest heat-producing, muscle-nourishing food in the world'. For men taking violent exercises, such as soldiers on active service or athletes in training, a plentiful supply of sugar was, he said, far better than large meat rations. A quarter of a pound per day per man was his allowance on the mountain-side, and he was inclined to think that this might be increased to nearly half a pound with advantage, cane sugar, of course, being selected for this purpose. This testimony as to the alimentary value of sugar finds striking confirmation in the account of the first crossing of Mount Cook, contributed by Mr. Malcolm Ross to the *Alpine Journal*. On this expedition, which proved a wonderful feat of endurance, brown sugar formed an important part of the rations. Indeed, Mr. Ross says that upon it he 'existed almost entirely on all our climbs'."

Chapter V.—CEREAL GOODS, ETC.

Cereal goods treated of in this chapter as being dealt in more or less by grocers include wheat flour, semolina, macaroni, pearl barley, barley meal, oatmeal, groats, Indian corn or maize, rice, and millet. For convenience, although they are not scientifically classed as cereals, we also treat here of arrowroot, sago, tapioca, corn flour, and one or two other goods.

Correctly speaking, a **cereal** is a grain plant. The word comes from Ceres, the name of the Roman goddess of corn, and it appertains to edible grain, such as wheat, rye, barley, oats, maize, rice, millet, and durra. These are the chief varieties of cereal grains used for human food.

Cereal plants belong to the natural order *Gramineæ*, or grasses, having hollow stems, alternate sheathing leaves and flowers arranged in either spikes or panicles. Maize is accounted the most productive of all the cereals and wheat the second. According to Sir William Crookes, President of the British Association in 1898, it may become at no distant date a very serious question which of these important cereals is to be grown, and how, in order to keep the human race alive. He calculated that by 1931 the demand for wheat would be such that the arable areas of the temperate zone in which wheat could be grown would have to be completely used for that purpose to yield the necessary supply. And then, he asked, "Where can be grown the additional 330,000,000 bus. of wheat required ten years later by a hungry world? If bread fails—not only us, but all the bread-eaters of the world—what are we to do? We are born wheat-eaters. Other races, vastly superior to us in numbers, but differing widely in material and intellectual progress, are eaters of Indian corn, rice, millet, and other grains; but none of these grains has the food value, the concentrated health-sustaining power of wheat, and it is on this account that the accumulated experience of civilized mankind has set wheat apart as the fit and proper food for the development of muscle and brains."

Leaving this serious topic for the future, it may be mentioned here that rice is another cereal which is reckoned to be the staple food of one-half the human race, being the mainstay of the people of China, Japan, Burma, and Siam. To the swarming millions of India it is somewhat less essential, millet being the cereal they most largely consume, though rice comes next. Maize or Indian corn is very largely consumed in America, where it is used mainly also for the feeding of hogs and horses; it is the chief food also of the native tribes of South Africa.

Chemistry of Cereals.—As it will be convenient to take the cereals separately in describing them and their manufacture, we may observe here that chemically the substance of the cereal grain consists to a large extent—50 to 70 per cent—of starch. The granules of starch have different sizes and shapes characteristic of the respective cereals, and the various kinds are readily distinguishable from one another under the microscope. So also the husk surrounding the grain of one cereal has a structure different from that of other cereals. Hence it is possible, by means of the microscope, to distinguish the cereals in a mixture even when ground into flour—as, for example, wheat flour and corn flour; and this is the method which is usually employed to detect adulterations of one cereal with another.

The constituents of all cereals are of the same kind in the main, but the proportions differ more or less considerably. Fat, starch, sugar, albuminous and other nitrogenous bodies, cellulose, mineral matter, and water, make up the substance of the grain in all cases. *Oats* are comparatively rich in fat and nitrogenous compounds, but poor in starch; *rice* is poor in the two former and rich in the latter; and *wheat* is intermediate in all three respects. This, at least, is shown by the results of certain analyses that have been made; but it must be remembered that rather considerable variations occur in different specimens of the same cereal.

Wheat is estimated to be produced by the world to the extent of 3,030,000,000 bus. a year, the worth being about

£555,000,000 sterling. The largest growers are the United States and Russia. The United Kingdom is the largest importer, and the United States, Argentina, Russia, India, and Canada the principal sources of her foreign supply. Her home production accounts for about a quarter of her total consumption. Roumania and Australia are also worthy of mention as exporters of wheat to Britain. The United States supply has been the dominant factor in the wheat market for many years, and will probably be the largest contributor for some years, until her population overtakes the production to a greater extent. Canada and Argentina are the sources from which most is expected, and India, as irrigation extends there.

Wheat as a **plant** belongs to the genus *Triticum*. There are many varieties; in Great Britain those chiefly known are the "bearded" or awned wheat, which are winter wheats usually sown in autumn, and the unbearded wheat, or wheat without awns, which are spring wheats. Another division is into red and white, the red being suitable for poorer soils, while the white yields better quality. "Spelt" is a hardy kind grown in the Alps. Polish has very long ears and grains. A kind with loosely formed ears is called "mummy" wheat, from the supposition—now said to be erroneous—that it has all grown from grains found in Egyptian tombs. Lincolnshire is the county growing most wheat in the United Kingdom, Yorkshire, Norfolk, and Essex following. The yield of wheat is highest in the highly cultivated fields of England and Belgium (30 bus. to the acre in England and 34 in Belgium). The American wheats are hard, and rich in starch, with little bran, but deficient in albuminoids. The hard wheats are particularly used for macaroni and various fancy foods.

Wheat flour is yielded by the milling of wheat in varying degrees, dependent upon the quality of the wheat, the better grain yielding 80 per cent or more, while the inferior gives as little as 54 per cent. The threshed grain is sifted to remove impurities, then ground and dressed. The new system of milling has done away with the old trades of the thresher and the stone-dresser; the necessary operations are effected by steam mills, by which are produced qualities of flour much finer than were formerly seen. The ground wheat is divided into a number of different products, the proportions depending upon the fineness of the flour and the proportion of bran present.

Thus a qr. of wheat of 63 lb. per bushel, or 504 lb. in all, will yield as follows:—

Fine Flour	333 lb.
Seconds	53 „
Fine Sharps or Middlings	16 „
Coarse Sharps	18 „
Fine Pollard	25 „
Coarse Pollard	26 „
Bran	26 „
Waste	7 „
	504 „

and the average obtained by Mr. A. H. Allen from a large number of results from 100 lb. of meal was as follows:—

1st, 2nd, 3rd Fine Flour	70·2 lb.
Tails	5·3 „
Fine Sharps or Middlings	8·8 „
Coarse Sharps	3·4 „
Fine Pollard	2·4 „
Coarse Pollard	6·5 „
Long Bran	3·0 „
	99·6 „

"Fine" flour is sold as "households", "whites", "superfine", "extra superfine", "patents", &c. In Hungarian flour milled in Budapest and district eight grades are recognized, culminating with "No. 0", which contains only 5 per cent of the wheat. American and Canadian spring wheat flour is regarded as the most generally suitable for bread, while the winter-wheat flour gives a grocer's flour particularly useful for scones, biscuits, and general domestic purposes. The finest Lincolnshire and other English and Scottish flour is much used for biscuit-making.

Judging Flour.—The chief criteria in flour-judging are the flavour of the product baked from it, the "strength", and the colour. The common method of judging the **colour** of flour is what is known as Pékar's test. In consists in compressing a small quantity of the flour into a thin cake or slab, which is wetted and allowed to dry: the depth and character of the colour are then observed. A rough-and-ready method of comparing two flours is to get even surfaces on them by pressing them with some object such as the smooth back of a watch, and then noting the colour of the surfaces. The **strength** or bread-making capacity of a sample may be ascertained by finding out how much water has to be mixed with a given weight of the flour to make a dough of standard consistency. An ounce of flour is a convenient weight to take, and the water is carefully measured out from a graduated vessel. It is thoroughly mixed with the flour by means of a glass rod, but some practice is required in order to judge of the proper consistency. The quantity of water used is then calculated into quarts per sack of flour. A flour which requires 68 qt. of water per sack of 252 lb. is regarded as of standard quality. One sack of such flour would make 95 4-lb. loaves, or 380 lb. of bread. For a grocer the best plan in judging of flour is probably that recommended by a gentleman in the trade, who says: "Don't depend entirely on your own judgment. Get a reasonably good sample from a miller of reputation, and have it baked by two or three of your customers in whom you have confidence, and who will give you a fair report." The results will afford guidance, and the reports of confidential customers should be listened to before repeating orders.

Semolina.—A granular form of wheat, or very coarse flour, being the central part of the grain left when the wheat is ground by millstones furrowed and placed so far apart as not to crush it completely to flour. Some of the wheats grown in

Italy, Spain, and Southern France are hard and rich in gluten, and these yield the best semolina, France supplying usually the superior grade. As semolina contains more of the nitrogenous part of the wheat and less of the starch, it is more valuable for soups or puddings than sago or arrowroot.

Macaroni, Vermicelli, Italian Paste, Spaghetti.—These are dried pastes made from flour and water, the flour used being that of the hard red wheat of the Black Sea district and Southern Italy. After being prepared as semolina (see above) the wheat is freed from bran and husks and the coarse flour is kneaded in hot water till it resembles dough. This dough is placed in a vertical brass cylinder 8 or 9 in. in diameter, the bottom of which is a plate like the rose of a watering-pot, which is fine or thick according to the macaroni required. Thus, for making **vermicelli** and all kinds of solid macaroni the holes are very small, while for making the **tube macaroni** the holes are much larger. In the latter case also a conical blade is fixed in the middle of the hole to form the tube. The dough being placed at the top of the cylinder, it is driven down by hydraulic pressure through the perforated plate and cut off by hand in lengths of about 3 ft. It is then hung on canes in the sun to dry. In the case of solid macaroni there is no difficulty in grasping the process. In the case of the tubular macaroni the conical blade and its attachment cut through the dough and the macaroni issues with a slit all along it. This, however, shrinks together at once, and forms a perfect tube, the join being practically invisible. No macaroni is now made by the laborious hand process.

The British Consul at Naples says the best macaroni is made at Gragnano and Torre dell' Annunziata. A little, also of the best quality, is made at Amalfi. The etymology of the name is not certain, but some derive it from an Italian word meaning *to bruise*. Naples macaroni is sold in boxes of about 28 lb., invoiced at nominal weight.

Barley, which supplies the brewer with malt, supplies the grocer with **pearl barley** and **barley meal**. Barley has a thick spike; the calyx, husk, awn, and flour are like those of wheat, but the awns are rough. There are common long-eared barley, square or "bigg" barley, and "sprat" or "battledoor" barley—all sown in the spring in a dry time. The "bigg" is chiefly cultivated in the bleaker parts of Scotland, where barley is much used for broths.

Pearl barley and **French barley** or **Scotch barley** are barley grain freed from the husk by milling, the distinction between the two kinds being that pearl barley is reduced to the size of small shot, all but the heart of the grain being ground away. The "Scotch" or "French" is therefore larger and less rounded. The pearl is sometimes whitened by being dusted over with powdered chalk. German and Dutch pearl barley is now a good deal seen in the United Kingdom.

Barley meal, the flour from barley ground, is used for feeding pigs and poultry; also, occasionally, for adulterating oatmeal and wheat flour. Particles of the husk in an adulterated sample may usually be discovered by the microscope.

Oats yield the grocer his **groats** and **oatmeal** and some well-known breakfast foods. At one time they were more consumed than wheat in the British Islands—so it is said. Certainly oatmeal was in much more general use up till the end of the seventeenth century. The oat has been cultivated immemorially in Scotland, Ireland, and the north and west of England; but the native country of the common oat is entirely unknown—some authorities suppose it to have been Mesopotamia and Persia. Scottish oats, including those of the north of England and north of Ireland, have the reputation of superiority, but of late years Canada contests the palm.

Scottish oatmeal is coarsely ground; Derbyshire very finely so. Whiteness of the meal is no great criterion of quality, the freshly made oatmeal being rather grey than white. Adulteration of oatmeal with barley meal or maize flour is readily detected by the microscope, owing to the octagonal shape and small size of the starch granules in oats.

In storing oatmeal it has to be remembered that the best character of its flavour departs if the meal is exposed to the air, and is liable to be spoilt by the proximity of strong-smelling goods. When stored in a bin the meal should be inspected periodically, that the bin may be kept free from insects, &c.

Maize or **Indian corn**, called in South Africa **Mealies**, the product of the plant *Zea Mays*, is grown in most parts of America north and south, also in large parts of Asia, Africa, and Europe. America, the largest maize-growing country, does not export now so much as formerly, owing to the increase of her own home requirements. The Argentine is now an important source of supply. Maize is now a good deal used for feeding purposes, especially where fat is required, though not found so suitable for pigs as barley. The Americans use it for cakes, puddings, and other domestic purposes, for feeding horses and cattle, in making starch, and for distillation. The dried seed of the maize contains about 55 to 60 per cent of starch, 9 to 12 of albuminoids, and 5 to 8 of fat or oil. The starch in a more or less purified condition constitutes one variety of corn flour. The oil can be extracted from the seed by pressure, and is sold commercially as "Maize Oil". The whole grain is used as human food in various forms: the American "Johnny-cakes" and the Mexican "tortilla" are cakes of maize meal; the "polenta" of the Italians is a kind of maize pudding; and the "hominy" of the United States is also a preparation made from crushed and sifted maize. In England this last form of maize is sold as "Corn Grits". "Pop-corn" consists of the unripe grains baked.

Corn flour is usually the purified starch of the maize plant, but is also made from rice. British corn flour is generally a preparation of rice starch. Corn flour is essentially a starchy food, and is not a "flour" in quite the same sense as wheat flour, though it contains more of the valuable nitrogenous substances than do sago or tapioca. "Oswego flour" and "maizena" are brands of the maize or corn flour.

Rice is the grain of the graceful plant *Oryza sativa*, largely grown in China, India, Burma, Java, Japan, tropical America, and the West Indies. Two chief kinds are recognized, upland rice and low or sea-level rice; but as a rule rice is grown in warm, damp regions, or in those which can be frequently irrigated. Rice is harvested much as wheat is. The threshed and winnowed grain, still covered with the yellow husk, is called "*paddy*" in India and "rough rice" in America. This rough rice is then husked and sifted, giving chaff, broken rice, middlings, and prime, the last being considered the best grain. New rice is said to be less digestible than old. There are also certain differences between different kinds of rice when boiled: thus some varieties grown in India and used for curry have the grains remaining quite distinct after boiling, whereas in Carolina rice the grains break up and give a soft, mucilaginous food. Rice is consumed by more human beings than is any other grain, but is nevertheless not the best of grains in nutritive qualities, being more starchy and less nitrogenous than wheat.

Most of the British supply of rice comes from Patna and elsewhere in the East Indies, Burma contributing 54 per cent and India $17\frac{3}{4}$ per cent, while Java through Holland sends 10 per cent of the rice bought by the United Kingdom.

Rice-milling is conducted with great attention to grading to secure uniformity; and, as in the polishing process, to prepare the grain for market, there is a considerable percentage of broken, this is separated, whole grains being used for the higher-priced qualities, and the rest graded down to smalls.

The **varieties of rice** most abundant are known as "common rice", "early rice", "mountain rice", and "clammy rice". *Rangoon*, *Aracan*, and *Bassein* are good useful rices for general purposes at popular prices. *Native-cleaned rice*, such as "No. 2 native-dressed Rangoon", is graded and exported under marks. *Patna* is a small variety of a slender white hard grain, esteemed for boiling and for curries. *Siam* is somewhat similar. *Japan* is round-bodied and soft in grain, and commonly very good rice. *Java* is one of the finest table rices seen in the United Kingdom, and is sometimes called "Carolina kind". *Carolina* is larger, sweeter, and better coloured than most other kinds, but is comparatively little seen in England. Many different varieties of rice are cultivated in India; the seeds vary in colour from white to red, brown, mottled, and even black. *Indian* rice is exported in the three classes of "Table rice", "Ballam", and "Moonghy", the last inferior. The harvesting of rice extends over nearly the whole year.

Ground rice, if ground from Patna or Java, is brighter in appearance but not of such a chalky white as that made from the cheaper kinds.

Rice arrives on the importing markets in bags, those of rough rice weighing 1½ cwt., and those of cleaned 2 cwt. Note that rice should not be stored on a stone floor or in a damp place, and that it is necessary to watch against weevils in the warehouse.

Millet, very largely grown in India, China, Egypt, and elsewhere, where it is a staple food, is a very small grain the size of an ordinary pin-head. **White millet** is sold as a bird-seed.

Durra or **Dari** (also spelt **Dhurra**), a cereal largely grown in warm countries, and used as an article of food by Arabs and others, is sold as poultry food in Great Britain. The meal closely resembles that of maize.

Sago, a native of the East Indies, is called *sagu* in Malay and *sagu-dana* or *sagu-chawul* in Hindostani. The grocer's article is prepared from the pith of various palms belonging to two genera *Metroxylon* and *Cycas*, the first or sago palm being common in certain districts of India, Ceylon, and islands of the Indian Ocean, while the cycads are indigenous in the Moluccas, China, and Japan. The sago palm, a low thick-set tree, flourishes in low marshy places. It is ready for yielding when about fifteen years old, the whole interior of the stem being then full of spongy matter surrounded by a rind of hard wood. Before the tree flowers (if not it is too late) it is cut down, the stem sawn into 6-ft. lengths, split up, and the pith scooped out and grated to powder. The grated pith is kneaded with water and strained, the sago passing through the strainer while the woody fibre is strained out. The starchy fluid being floated into troughs, the sago settles at the bottom, and all that remains is to wash it once or twice and dry it, when it is ready for use as **sago flour** or **sago meal.** For their own domestic use the East Indians make the sago into biscuit, which, if in a dry place, will keep a long time. They eat the sago with beans, pease, ground-nut, &c.

Pearl sago is made by mixing the sago flour with water to form a paste, and then granulating it with sieves and roasting it. The paste sago is shaken in a bag to granulate it, and the granules then passed through a bamboo sieve. Those selected are then roasted for three minutes or so and again sieved. The roasting makes them translucent and glutinous, and a second roasting, which greatly reduces their size, renders them hard and tough as when imported. Most of the pearl sago imported by the United Kingdom comes from sago in pearls varying in size from a pin's head to a pea; the grain is hard, translucent, and varying in colour from whitish to whitish-brown and pink. Usually, however, pearl sago is buff-coloured, and may thus be distinguished from pearl tapioca, which is commonly white. Commercially, sago is classified as small, medium, and large.

A cycadaceous plant gives nuts or seeds which yield farina, from which **Australian sago** is prepared; and the root of *Zamia integrifolia* is largely used in the same manner in Florida and the West Indies.

A **brown sago** is made in Borneo from an indigenous plant. The so-called **Portland sago** is made from the starchy matter in the roots of the arum lily. In South Africa *Encephalartus caffer* is a cycadaceous plant which yields pith from which the natives make a kind of edible sago cake.

Arrowroot, which like sago consists almost entirely of starch and water from the chemical point of view, is obtained from the underground stem or rhizome of plants belonging to the genus *Maranta*, the most important being *Maranta arundinacea* of the West Indies. The plant is now cultivated in Africa, Ceylon, and elsewhere, as well as in its original home, and there is an East Indian as well as a West Indian variety. The rhizomes, a foot or so in length and about three-quarters of an inch in thickness, have outer layers which have to be carefully peeled off; otherwise their resinous flavour would spoil the arrowroot. They are then rasped or crushed to a pulp, and the pulp is washed with water over a sieve which permits starchy liquid to pass through its meshes, while the fibrous matter is kept out. The contents of the tank beneath are further purified, and finally the starch is drained and dried.

Bermuda arrowroot, having the best-established reputation, usually commands the highest price, but excellent arrowroot comes now from Natal, which, with St. Vincent, is the chief source of supply of the United Kingdom.

Imitation arrowroots and substances sometimes mixed with the true article include "English arrowroot" (chiefly potato starch or from maize), "Portland arrowroot", made from tubers of "lords and ladies", the common arum; "Curcuma starch", largely made in India; and "Brazilian arrowroot", which is merely tapioca flour.

Tous-les-mois is sometimes termed a kind of arrowroot, but is really a starchy preparation from the plant *Canna edulis.* It is made in the Lesser Antilles, more particularly St. Kitts.

Tapioca is prepared from the starchy contents of the tubers or roots of a plant (*Manihot utilissima*) called "Mandioca" in Brazil, "Cassava" in the West Indies and some parts of Africa, "Mangyokka" in Ceylon, "Mohogo" in East Africa, and "Yucca" in Peru and Hayti. There are many varieties, the bitter cassava being the chief, although the sweet cassava (*Manihot Aipi*) is also cultivated for tapioca. The tuberous roots are found in clusters of three to eight, weighing sometimes as much as 20 lb. The manioc is a large half-shrubby plant, with large leaves at the end of the branches. In South America the roots are taken up in from nine to twelve months. They are well washed and the skin scraped off. They are then grated or rasped, and the pulp pressed to get the juice out. The pulp is then dried on hot metal plates and pounded into meal, being then called "farinha". Well dried, it will keep for a year. In Jamaica it is made into "bammy cake", first being cooked on an iron plate and then dried in the sun. The pulp-pressing and the heating mentioned are resorted to for driving off the poisonous principle contained in the juice of the bitter cassava, which poison is no other than prussic acid. Being very soluble in water and very volatile, this deadly stuff is readily got rid of, and the starchy matter left is perfectly edible when its preparation has been completed. When the starch has been separated, properly washed and dried in the sun, its more familiar name is **Tapioca flour** or "Brazilian arrowroot". **Tapioca** as the grocer sees it is prepared by heating the cassava starch, when partly dried, on a hot plate, stirring it meanwhile with an iron rod. The starch granules burst, and their gelatinous contents form into the larger or smaller grains seen in the grocer's shop.

"Seed Pearl", "Medium Pearl", "Bullet", and "Flake" are classes of tapioca. The pearls are sometimes re-manufactured by softening, rolling, and re-drying, when they form the "flake tapioca" or "tapioca flakes".

As tapioca is often sold as sago and believed by the public to be so—the two articles having become confused in ignorance—the retailer is recommended to label drawers and packages with the proper description, and to state to purchasers what it is they are buying. In this way trouble may be avoided and the public educated.

Chemically tapioca is almost identical with arrowroot and sago, so far as its chief proximate constituents are concerned. It consists of about 85 per cent of starch and 15 of water, with small amounts of mineral and albuminous matters. But the starches of the three foods differ in the form of the granules, and are readily distinguished from one another under the microscope.

Beans and **Peas** and **Pea meal** are handled by grocers. Haricot beans, and the special kind of them called the "Butter bean", may be particularized. These butter beans at one time were imported by the United Kingdom almost entirely from America, but interference with the price caused resort to a similar bean from Madagascar, which is now a good deal sold.

Lentils, a most nutritious seed about half as large as ordinary peas, are sometimes called "Red" and "Egyptian", but are exported largely from India, Arabia, and Palestine as well as Egypt. The French and German variety, smaller and of a yellowish or brown colour, is considered superior.

Lentil flour, which is very rich in albuminoids or nitrogenous flesh-forming substances, is the basis of several proprietary articles such as "Revalenta", in one make barley meal and sugar being mixed with it to improve the flavour, which, being strong, is found by some persons objectionable.

Farinaceous foods include a number of articles sold as specially nutritive products, prepared infants' foods, and similar substances. Their composition is varied, but many contain lentil flour as the basis, mixed with wheat flour, corn flour, rice meal, or barley meal, and flavoured with salt, sugar, celery seed, &c. Others consist of wheat flour, slightly baked or otherwise treated, and with or without sugar. Some are preparations of barley meal, some of groats, and some of potato flour; others are mixtures of pea flour and arrowroot; and others again comprise one or more of the foregoing ingredients mixed with a proportion of malt or of malt diastase. The idea is that the malt or diastase, when the food is mixed with warm water, sweetens the starchy matter of the food, and so renders it easier of digestion.

Chapter VI.—SPICES AND CONDIMENTS

Pepper, mustard, salt, ginger, cloves, nutmegs, allspice, capers, and mixed, are the spices and condiments mainly sold by grocers, but a few others are briefly dealt with also in this chapter. The United Kingdom imports every year about

£850,000 worth of spices, of which by far the greater part are supplied by the British Empire itself.

Of pepper, for instance, the British import 20,000,000 lb. every year, four-fifths of which come from Imperial sources, Singapore alone sending more than half of it. A good deal of pepper is also exported by French Indo-China, and of this Havre is the principal market.

Before passing to the details of spices a brief reference to the important part these commodities have played in history may not be uninteresting.

In mediæval times, when very few vegetables were known and modern condiments not yet invented, the spices of the East yielded the choicest flavours men had knowledge of; consequently they were objects of great desire. "We cannot in our day quite understand", writes the late Professor Thorold Rogers, "how eagerly our forefathers desired to procure Eastern spices. Cinnamon, ginger, pepper, mace, nutmegs, and most especially cloves, were in universal demand. The profit on the trade was enormous, for in the home of their origin they were cheap enough. They were to be obtained nowhere else, and some of them were found in only a few islands. A pound of these spices was often, before the Cape Passage was discovered, worth as much as a quarter of wheat, and at feasts a seat near the spice box was more coveted than one above the salt." The same historian elsewhere remarks: "The Dutch sought to secure a monopoly of the spice islands, and particularly of those where the clove grew. Now such a policy included a good deal of costly fighting, and the Dutch merchant vessels were as much men-of-war as traders. *There have been few objects on which more blood has been shed than on the exclusive right to sell cloves.*"

Pepper is largely responsible for the presence of British Imperial power in India to-day. In Queen Elizabeth's day the Dutch had practically obtained a monopoly in North-west Europe of the produce of the East, and of all Eastern produce at that time the most generally in demand was pepper. The historian tells us that the ordinary price of pepper had been about 2*s.* 9*d.* a lb.; the Dutch raised it to 4*s.*, and even 8*s.* Queen Elizabeth therefore determined to set up an East India Company of her own people, and on December 31, 1600, issued the charter of that trading association, which in course of time established the British Indian Empire. To encourage the trade the queen conferred a monopoly on the company, and exempted traders under it from all Customs duties for four years. From that time forth the price of pepper to the English consumer was very rarely above 2*s.* the lb., and was frequently less.

Spices here touched upon are arranged for convenience in an approximate alphabetical order.

Allspice, also called **Pimento**, is the dried berry of the pimento tree (*Pimenta officinalis*), a West Indian myrtle. Being chiefly cultivated in Jamaica, it is sometimes called **Jamaica pepper**; but it is not strictly a pepper. The tree is an evergreen with fragrant white flowers, shining green leaves, and berries that grow in small branching clusters. The berries, which are a small round fruit very much like an ordinary black currant, have to be picked before they are quite ripe, or they lose much of their characteristic flavour. The berries, stripped of their stalks by women and children, are dried in the sun and become a bright brown—this colour being a point to which much attention is paid by purchasers. The name "allspice" originates in the fact that the pimento flavour is supposed to combine that of cinnamon, nutmegs, and cloves. This flavour arises from an essential oil in the shell of the berry, and which is most abundant when the fruit is unripe. The smaller berries are therefore preferred to the larger and riper ones. Larger berries of the "bayberry tree" and "Mexican spice" are sometimes mixed with those of the true pimento. Allspice is used not only in cookery but in medicine as an agreeable aromatic, and it forms the basis of a cordial and a water.

Capers are the pickled flower-buds of the caper-bush (*Capparis spinosa*), a shrub common in Southern France, Spain, and Italy. The buds are picked daily as they develop during the summer and autumn months, and placed in strong white vinegar. Later on they are passed through sieves to sort them out according to their different sizes. Several grades are recognized: the smallest, being also the youngest, are deemed the best; these in France are classed as "superfines" and "nonpareils", whilst the largest or *Communes* are the cheapest, selling at about one-fourth the price of the superfines. Intermediate grades having values between these are known as "fine" or "medium fine", *capotes* and *capuchines*. The best reputed are the French capers from Marseilles and Provence. Considerable quantities come from Spain and Italy—sometimes via France!

Copper is sometimes found in the liquor of capers. It is in most cases probably derived by the action of the vinegar upon the copper wire of the sieves used for sorting; but it is also alleged to be sometimes purposely used for improving the colour of the capers. To test for the presence of copper, immerse one end of a bright knitting-needle in the liquor for a night, and examine it the next day to see if there is a red film of deposited copper on the submerged part.

Capsicums, Chillies, and **Cayenne pepper** are all relatives, being forms of the same plant, the *Capsicum*, a genus of *Solanaceæ*, the order which furnishes also the tomato and potato. Cayenne pepper, therefore, has nothing to do with real pepper, although sometimes known as "Red pepper", "Guinea pepper", "Spanish pepper", &c. The capsicum plants have a greenish-white flower. On ripening, the ovary of the plant becomes a leathery pod, within which are about a dozen kidney-shaped seeds in a kind of spongy pulp. These pods of the larger sorts of the plant, either dried in the sun or packed in brine, are the capsicums known to the grocer, *C. grossum*, yielding the best and tenderest kind. They are eaten green in Southern India, where they grow wild. **Chillies** are the dried ripe or unripe fruit of a small variety of the capsicum plant called *C. frutescens*, grown largely in Guiana and the West Indies, Zanzibar, and other warm countries. The pods are deep orange colour and barely an inch in length.

They are hotter and have more aroma than other capsicums. "Bird's-eye chillies" are a very small red kind of superior quality.

Caraways are the seeds of a biennial plant with white or pinkish flowers, chiefly grown now in Holland, though formerly a crop frequently following coriander on the clays of Kent and Essex. The seed is used for cakes, &c., and from it a carminative oil is extracted and a cordial distilled.

Cardamoms are the small dark-brown seeds or fruits of an East Indian plant like a tall sedge, botanically termed *Elettaria Cardamomum*. The fruit is picked and spread on mats in the sun; the scapes are stripped off, and the drying is completed by a gentle fire heat. Among the Indians this is esteemed the most valuable of condiments, and is much used for flavouring sweetmeats and curries. It is used in Europe for spicing cakes, cordials, sauces, and curries. The **East African cardamom** is a product of a different plant called *Amomum*, of the same botanical order as the ginger plants. In trade several varieties of cardamoms are often found mixed together.

Cassareep is the inspissated juice of bitter cassava. It is a flavouring material used in West Indian "pepper pot" and in the composition of some of the best sauces in the European market.

Cassia lignea is the bark and **Cassia buds** are the unexpanded flower-heads of *Cinnamomum Cassia* and other varieties of the cassia tree, a lofty laurel flourishing in China and the East Indies. The bark is somewhat similar to cinnamon, but thicker, and the flavour is not the same, though the thinner kinds are nearer. The buds have a rich flavour of cinnamon.

Cayenne pepper is prepared from capsicums (which see) by pounding the dried pods fine in a mortar. Sometimes the powder is mixed with wheat flour and made into a cake with yeast; the cakes are baked hard like biscuit, then ground and sifted. The flavour of cayenne deteriorates if the pepper is exposed to the sun or is stored in a damp place.

Chillies. See **Capsicums.**

Chinese cinnamon is wholly prepared from cassia bark (which see under *Cassia liguea*).

Cinnamon is the inner bark of shoots from the cinnamon tree, *Cinnamomum zeylanicum*, an aromatic plant allied to the laurels, and grown in Ceylon, Borneo, Java, Jamaica, Brazil, and elsewhere. It is a native of the mountain forest districts of Ceylon up to 3000 feet. Under cultivation the young bushes are pruned to cause them to produce stalks from which four or five shoots are allowed to grow. In eighteen months or two years these shoots begin to turn brown, and having reached perfection are cut off and the leaves stripped away. The bark of the shoot is cut round at distances of a foot, and a longitudinal cut is then made on each side. These quills of bark are then removed by a peeling-knife, and after standing in bundles for a day are taken separately, and the two outside layers of the bark removed carefully by scraping. The bark after this scraping is dried, first in the shade and then in the sun, and the rolls or "quills" are done up in bundles.

The finest cinnamon is light yellow, smooth and pliable, not thicker than good drawing-paper, and has a sweetish aromatic taste, mildly pungent, not biting or hot, and leaving no after taste. Genuine but inferior qualities are darker and thicker, acrid in flavour, and do not become soft when chewed. Cassia bark, often substituted, is thicker, coarser, less quilled, and of a hotter and more biting taste.

Cinnamon chips are small pieces and cuttings, "Strips" and "Bark" inferior fragments, of cinnamon.

White cinnamon or **Wild cinnamon** is the dried bark of *Canella alba*, a tree native to tropical America, and which flourishes in the West Indies, Florida, and the Bahamas. The flavour is aromatic, but more pungent and bitter than that of true cinnamon. The name "white" is due to the light colour of the silvery outer skin or cortex, which is often not completely removed from the inner bark.

Cubebs are the dried berries, usually with stalk attached, of the climbing shrub *Cubeba*, allied to the peppers. They are round and rather smaller than white peppercorns; the outer covering is wrinkled, and brownish or black. They have a pleasant aromatic odour and a pungent and rather bitter taste. **African cubebs**, which have a smoother berry, are sometimes called **West African black pepper**.

Curry powder contains green ginger, dried chillies, stick cinnamon, cloves, nutmeg, mace, turmeric, cardamom, lemon grass, with lime juice, tamarind, mango, and salt. (Macknight: *Food for the Tropics.*)

Cloves are the dried flower buds of a kind of myrtle, *Eugenia caryophyllata* (or *Caryophyllus aromaticus*), a tall slender tree, which sometimes reaches a height of 30 or 40 feet, brought from the Moluccas to Zanzibar and other tropical districts. The buds, which grow in clusters somewhat after the manner of the honeysuckle, are nearly white when young, but later become green, and then bright red, at which stage they are gathered. If left too long, the buds unfold into flower, and the resulting cloves are of inferior quality. The crop is harvested mostly by hand picking, but in the Moluccas the branches of the trees are sometimes beaten with long bamboos, the buds being collected on cloths placed beneath the trees to receive them. Since the buds are liable to lose some of their aroma during drying, the process is carried out as rapidly as possible—generally in the shade, but sometimes in the sun or with wood fires. When dried, the clove is of a dark-brown or reddish colour, and consists of a wrinkled calyx tube, partially enclosing at one end the folded, knobby bud. Their colour varies somewhat, but should be fairly uniform in each kind. Brown is the general colour, and a reddish or red tint is more esteemed than black; but Amboyna cloves are classed among the best, although blacker and smaller than other varieties. Of the many kinds of cloves met with in trade, those from Penang have the best reputation, those from Amboyna ranking next, followed by those from Zanzibar and Pemba, which are often mixed.

Cloves of good quality have a strong aromatic odour, a hot spice-like taste, and leave traces of oily moisture on the fingers when rubbed in the hand. Of the volatile essential oil cloves contain no less than 18 to 22 per cent. A clove should not float horizontally when placed in water; this shows that the essential oil has been distilled out of it. Examine a sample for excessive stalk and also for admixture of cloves from which the oil has been extracted—sometimes shown by the clove being light-coloured, shrunken, and lacking the knob. Cloves well dried in the tropics sometimes absorb moisture in a damp climate, while, if they have been shipped rather damp, they may lose weight instead of gaining it.

"Mother of Cloves" is the unripened fruit of the clove-tree preserved. "Oil of Cloves" is distilled from the young flower buds; it has a faint yellow or brownish colour and the characteristic odour. "Essence of Cloves", used as a flavouring in cookery, is a solution of oil of cloves in alcohol—about 10 per cent of oil and 90 of spirit.

Elephant pepper is a large variety of long pepper (which see).

Ginger is a rhizome or underground stem of a plant like a reed, *Zingiber officinale*, about 3 or 4 ft. high, and which has its flowers on a stem separate from the leaves. In Jamaica, whence the finest comes, it is grown by small settlers in certain central districts. The time of planting is April to June, and the crop is ready for picking between December and March following, when the rhizomes—or roots as they may be popularly called—are dug up and cut off. After being well washed and dried, they are stored away as **black ginger** (or "coated"). Sometimes the roots are dried in the sun, washed, and scraped, when it is called **white ginger** (or "uncoated"). The roots are often subjected to a process of bleaching, either by immersing them for a short time in a solution of bleaching powder, or by exposing them to the fumes of burning sulphur. An artificial white coating is also sometimes applied by dipping the ginger in a wash of chalk and water, or of calcium sulphate and water. Although this whitewashing may improve the appearance, it may also serve as a disguise for inferior qualities of ginger; and it is well to know that these coverings may be readily detected by the ease with which they can be rubbed off, and by their usually leaving a white powdery deposit in the vessel in which the ginger has been stored. When not thus whitened, uncoated ginger has a pale-buff colour. In texture it is rather fibrous, and breaks with a short mealy fracture showing many short fibres. As met with in trade it varies in size from single joints 1 in. or so in length to irregular branching "hands" of several joints and 3 or 4 in. long. The uncoated ginger is usually of a superior quality to the coated kinds; but there are, of course, several grades of each country's products, such as "finest", "fine", "good", "medium", "low", and "common". Jamaica and Cochin are the two best-esteemed varieties, the most valuable pieces being the largest and finest, of a pale-buff colour throughout, and cutting softly and evenly.

Ground ginger is sometimes adulterated by the addition of foreign ingredients.

Goat pepper is the name given in India to the commonest and largest species of Capsicum (see *Capsicums*), and is an indispensable ingredient in curry. The pod is bright red when ripe. When picked the pods are laid out on mats in the sun to dry if required whole; or they are dried on hot plates or in an oven, pounded in a mortar, passed through a hand mill till finely powdered, then well sifted and bottled. **Chilli vinegar** is prepared by pouring hot vinegar on the pods.

Jamaica pepper is Allspice (which see).

Long pepper is obtained from the plant *Piper officinarum* (or *Chavica roxburghii*), a native of the East Indies. The pepper does not consist merely of the berries analogous to the peppercorns of the true pepper plant. It is a dense spike of small berries closely packed round the central stalk, the spike being about 1½ in. long and ¼ in. thick. These fruit spikes are gathered shortly before the fruit reaches maturity, and when dried are ready for the market. Much of the long pepper is, however, derived from wild plants. As met with in commerce the spikes with their berries appear as compact masses, which look as though they have been limed.

The pepper is always contaminated with from 3 to 7 per cent of clay and sand, embedded in the crevices of the fruit. It is therefore almost impossible to clean the long pepper properly before grinding it, as is readily done with true pepper. Long pepper contains piperine, resin, albuminoids, starch, and volatile oil; and yields from 8 to 10 per cent of ash. The quantity of piperine is smaller than in ordinary pepper, and the volatile oil has a strong and disagreeable smell. On account of this smell the article can hardly be used by itself, and its chief application is in the making of pickling spice. In the ground, unmixed state it can scarcely be said to be a recognized trade article; it is used as an adulterant of ordinary pepper, being usually lower in price.

Mace is what the botanists call an "aril" or "arillus" or "foliaceous investment", a fibrous network surrounding the shell of the nutmeg, and lying between it and the fleshy tough external covering of the nutmeg fruit (see *Nutmegs*). When the fruits are gathered, the outer part splits like the shell of a ripe horse-chestnut. The bright-red mace is then stripped off the seed, pressed flat between blocks of wood, and dried in the sun. It then becomes yellow or brownish yellow. Sometimes mace is cured by steeping it in brine or sea-water. The Moluccas, Sumatra, Banda, and the West Indies chiefly furnish mace, the British supply being drawn chiefly from the East Indies. East Indian mace is usually classed for sale purposes as fine, good, medium, and ordinary; and in the manufacture various kinds are distinguished, such as Finest Pickled Flake, Fine, and Ground Mace. Good mace should have a fresh appearance and bright colour, be rather tough than brittle, and possess the pleasant aromatic odour characteristic of the spice. The flavour is essentially that of the nutmeg, but is considered to be somewhat more delicate. The smaller pieces are looked upon as the better mace. "Malabar Mace" and "Bombay Mace" are sometimes mixed with the genuine article, and another form of sophistication is extracting the essential oil. "Malabar" has a resinous taste; "Bombay" is larger than genuine mace.

Melegueta pepper, also called **Alligator pepper, Guinea grains**, and **Grains of Paradise**, is not a true pepper, but is esteemed as a most wholesome spice, and largely used to season food in West Africa. It is obtained from *Amomum Melegueta*, a plant of the Ginger family, the seeds of which are extremely pungent.

Mustard is a preparation of the yellow flour obtained by grinding mustard seed and removing the husk. The plants which furnish mustard seed are of the genus *Brassica*, and there are three principal species: (1) Black or brown (*Brassica* or *Sinapis nigra*), (2) white (*Brassica alba*), (3) sarepta (*Brassica juncea*). The eastern counties of England produce the finest black and white mustard; the sarepta mustard is chiefly grown in Russia and the East Indies. Black mustard, the most valuable, has brownish-purple seeds, which are smaller than those of the white—a gram of Cambridge white was found to contain 172 seeds, whereas the same quantity of Cambridge brown contained 944 seeds.

Table mustard is a condiment made by mixing the mustard flour (which would be too strong for use by itself) with the flour of wheat or other "farina", turmeric being added to impart the customary colour. Table mustard, therefore, must not be sold in the United Kingdom as pure mustard, but as a mixture. Under the British Sale of Food and Drugs Act it is an offence to sell without disclosure mustard diluted with wheat flour or other substance; but the sale is legal if the addition is duly announced by the label. Several grades of pure mustard are made containing nothing but the farina of mustard seed, the lower qualities having larger amounts of the cheaper white mustard. The various kinds are distinguished as "pure genuine", "extra quality genuine", "superfine" "double superfine", and so on.

In mustard manufacture the mixed seeds of black and white are crushed between rollers and pounded in mortars. The pounded seeds are then sifted through a coarse sieve. The residue left on the sieve is termed "dressings" or "siftings", that which passes through is "impure flour of mustard". This latter then undergoes a second sifting through a finer sieve, yielding thereby a second quality of "dressings", and "pure flour of mustard" which constitutes the ordinary mustard farina of the shops. By means of pressure a quantity of "fixed oil of mustard" is extracted from the dressings and is used for various purposes, such as mixing with rape, colza, and other oils. A mixture of both black and white mustard is better than either kind separately, for the reason that the peculiar pungency and odour to which mustard owes much of its value are due to an essential oil developed by the action of water upon two chemical substances in the mustard, called *sinigrin* and *myrosin* respectively. The former is contained in black mustard, but not in white.

Note that in making mustard the water used ought not to be boiling, otherwise there is hindrance to a chemical reaction which brings out the strength.

The analyst has discovered that cayenne pepper has often been used to make diluted mustard more pungent. A simple method of detecting this is to boil a little of the mustard —about half a teaspoonful—with about a tablespoonful of methylated spirit for a minute or two. The liquid is then filtered from the mustard by pouring it through a small filter of blotting paper, received in a small basin or teacup, and evaporated to dryness on a steam bath. (A tea kettle does very well for this, the basin being placed on it instead of the lid; but care must be taken not to let the spirit ignite.) On tasting the residue the pungent, biting flavour of cayenne will readily be detected, if that adulterant was originally present in the mustard. Wheat flour and rice flour, with turmeric to heighten the colour, are the most usual additions to mustard in this country. As already explained, they are not adulterants if the mustard is sold as a mixture. Even in this case, however, excessive amounts have been objected to, though there is no actual standard. Charlock seeds and rapeseed have been used instead of true mustard seed: these additions are detected by microscopical tests. Mr.

A. H. Allen, the Public Analyst for Sheffield, mentions one or two interesting cases of mustard adulteration. In one instance it was asserted that calcium sulphate (plaster of Paris) had been used with so free a hand as to cause the mustard to "set" when mixed with water. In another case a firm of mustard makers who were in financial difficulties, and unable to obtain mustard seed on credit, are said to have carried on their business for months by manufacturing "mustard" from a mixture of rapeseed, wheat flour, turmeric, and cayenne pepper.

Nepaul pepper is a superior kind of cayenne prepared from a variety of capsicum, the best quality being ground in Nepaul. (See *Cayenne pepper* and *Capsicums*).

Nutmegs are the seeds or kernels of fruit yielded by the nutmeg-tree (*Myristica*), a tropical plant indigenous to the Moluccas and growing also in the Banda Islands, East and West Indies, Hainan, and Madagascar. The trees, which are about the size and appearance of pear-trees, bear a fruit resembling a peach-coloured walnut. The outer tough, fleshy rind being removed discloses the *aril* or mace (see *Mace*), and this being taken off, shows the shell of the nutmeg. The whole fruit is sometimes collected unripe and preserved as a sweetmeat. For the nutmeg trade the rind and mace are stripped off, and the seeds in their shells are slowly dried for a few weeks, until the kernel has shrunk away from the shell, and the shell itself has become brittle enough to crack easily when struck. Freed at length from this shell, the seeds or nutmegs are sorted out according to size. The largest, averaging up to 160 to the pound, are shipped for the market; the smaller ones and defectives are ground up for spice and for the extraction of the oil. The larger and more compact the nutmegs the greater their value. Round ones are considered the best.

For the English trade East Indian nutmegs are usually classified in four grades—(1) those of which 60 to 70 weigh a pound; (2) those 80 to 110; (3) those averaging 120 to 160 to the pound; (4) wormy, shrivelled, and defective.

"Wormy" nutmegs are those which have been attacked by certain maggots and larvæ of a kind of beetle. As a protection the dried nutmeg kernels are put through a liming process, being dipped several times into a thick cream made of powdered calcined shells and brine.

Mixed spice, sometimes called **Pudding spice**, is a mixture of several ground spices, such as cinnamon, cloves, nutmeg, mace, and caraway, together with either rice flour or sugar, or both, the cheaper components preponderating in the lower qualities. *The Practical Grocer* gives the following as recipes, with the note subjoined:—

	(1)	(2)	(3)
Rice flour	30 per cent	51 per cent	28 per cent
Sugar	19 ,,	15 ,,	—
Caraway	15 ,,	3 ,	28 ,,
Cassia	—	14	—
Cinnamon	—	6	28
Cloves	6 ,,	5	—
Coriander	30 ,,	1 ,,	—
Ginger	—	1	—
Mace	—	4 ,,	11
Nutmeg	—	—	5
	100	100	100

[Though the rice flour and sugar mentioned in the recipes are frequent ingredients of mixed spice, it would be well to remember that objection might be raised to them on the ground that, strictly speaking, neither substance is a spice. Nevertheless each has its use in modifying the flavour of the mixture.]

Paprika, or "Hungarian Red Pepper", is a non-pungent condiment made from a kind of capsicum.

Pepper is the dried fruit of a climbing shrub, *Piper nigrum*, indigenous to the forests of Travancore and Malabar, and thence introduced into the East Indies, the Philippines, and the West Indies. In the East, Singapore is the great emporium. In South-western India, where the pepper plant grows wild, the natives merely tie up the climbers or vines to adjacent trees and manure the roots with leaves. In Sumatra cuttings are planted with saplings to serve as supports, and two crops are gathered every year. The pepper vine grows to a height of 8 or 12 ft., and the fruit is a small round berry which grows in loose clusters, each cluster consisting of twenty or thirty berries attached to a stalk. Both black pepper and white pepper are the same berries. The difference is due simply to the time of plucking and the treatment of the berries themselves.

Black pepper is made from berries picked before they become ripe; if suffered to become mature they lose in pungency. As soon as one or two on a cluster begin to turn red the berries are gathered, the spikes being collected in baskets and the berries then stripped from them. The berries next undergo drying, either on the ground in the sun, or near a fire. Those dried on the ground are often earthy. Others, dried by the heat of fires, are sometimes found smoky. In Johore pepper and gambier plantations are often worked together, and in boiling down gambier mats are suspended near or over the kettles, pepper being placed on the mats. The furnace dries the pepper, but at the same time blackens and smokes it, giving the smoky odour frequently observable in the Singapore product. Malabar, Tellicherry, and Penang are usually considered the best varieties of black pepper. Tellicherry and Aleppy peppers are light brown and similar; they are sun-dried. Trang pepper is shipped from Penang and grown in either Java or Sumatra. Lampong peppercorns are less uniform than those named, and lighter. Mangalore peppercorns are very large and deep black.

White pepper is prepared by rubbing off the outer shell or pericarp of the berries after soaking them in water. This is certainly "decortication" or peeling, to some extent; but the process is sometimes carried to the extent of not simply rubbing but grinding off the outer layers of the seed, leaving only the white kernel. "Such pepper", says Mr. A. H. Allen, "contains a large proportion of starch, but is deficient in flavour and pungency." It is generally understood that berries that have been allowed to ripen before picking are used for making white pepper, as they are more easily skinned. But not all white pepper is made from fully ripened berries, nor is the decorticating necessarily done on the plantations; it is frequently done by manufacturers at a distance, who buy such pepper as they deem suitable for their purpose. The corns are sometimes bleached to improve their appearance. For these various reasons white pepper is milder than black.

Ground pepper is usually a blend, a common mixture being equal parts of Malabar, Penang, and Sumatra—the first for weight, the second for strength, and the third for colour.

The commercial value of different samples of peppercorns depends very much on their weight. The corns readily sink when thrown into water. Malabar pepper is usually the heaviest, though Penang sometimes outweighs them. As a rule the weight of 100 berries lies between $3\frac{1}{2}$ g. and 6 g.; the lower figure was found by Mr. W. Johnstone for a sample of Lampong pepper, and the higher by Dr. A. W. Blyth for specimens of Malabar and Penang. The corns of good black pepper should be firm and round, with a skin not too much furrowed. When rubbed between the palms the berries should not readily crumble. Pepper is sometimes adulterated with chalk, clay, sand, and barium sulphate. Black pepper coated with white clay has been sold as white pepper. Rice starch is also used, and ground rice is frequently found. The following are rough tests for artificial colouring matter in pepper: (1) Steep the suspected pepper in water for several days, and notice if the water becomes coloured or turbid. (2) Stir up a little of the sample with a little pure dilute hydrochloric acid, and note whether the liquid acquires a red or yellow tinge. (3) Notice whether the colour of the pepper fades after being kept in stock for a time. When any considerable quantity is mixed with ordinary ground pepper the mixture has a peculiar slaty colour, and the characteristic odour of the long pepper can be readily recognized after a little experience.

Pepperette or **Poivrette**, extensively used at one time as an adulterant of pepper, is ground olive stones. It is a buff-coloured powder. An easy method of detecting it is to mix the sample of pepper into a paste with weak caustic soda, dilute the paste with a considerable quantity of water, and decant off the liquid. After washing the residue in the same way with a further volume of water, the particles of poivrette in the residue will appear of a bright-yellow colour, and can be picked out and tested to see if they are hard, as they should be if poivrette.

Pimento.—See *Allspice*. St. Ann is the principal pimento-growing parish in Jamaica, and the average product of the whole island is about 55,000 bags of 150 lb. each The highest price is fetched by "Plantation", the "Settlers'" being often carelessly cured.

Pudding spice.—See *Mixed Spice.*

Ravintsara (*Agathophyllum aromaticum*) is a native of Madagascar and Mauritius. Its leaves are used as a condiment, and the aromatic oil from them is greatly valued by Indian cooks. The spice is sometimes called **Clove nutmeg**.

Salt, in chemistry known as *Sodium chloride*, has in all ages been one of the most important of substances used in food, and more especially so in times when there were neither winter vegetables nor canned provisions. It is estimated that about 12,000,000 tons is manufactured in the world every year. It occurs in the form of rock salt or brine springs in many countries, and in others is obtained as bay salt by evaporating sea water. The largest rock-salt mines in the world are those of the Austrian Government in Galicia. In England well-known centres, where salt is made from brine, are Northwich, Middlewich, Winsford, and Sandbach in Cheshire; Weston-on-Trent in Staffordshire; Stoke Prior and Droitwich in Worcestershire; and Middlesbrough in Yorkshire. There is at Northwich a bed of rock-salt 35 yd. thick, and on top of the salt beds a layer of saturated brine, which is pumped up to make white salt. In the United Kingdom four principal kinds of salt are manufactured: (1) Fine-grained or lump; (2) Common, for manufacturing purposes; (3) Fishing salt, for fish-curing; (4) Bay salt, the coarsest-grained. The lump salt is made in the smallest-sized pans, about 30 ft. long, 20 wide, and $1\frac{1}{2}$ deep. The brine is boiled till a temperature of $107\frac{1}{2}°$ C. is reached. As the salt forms it is raked to the side of the pan, and is drawn out two or three times in twenty-four hours by means of a perforated shovel or "skimmer". The salt, with some adherent hot brine, is placed in wooden boxes as it is ladled out, and as it cools in the boxes the hot brine crystallizes, cementing the whole into a solid mass. The lump salt thus formed is dried, crushed, and ground to form the fine table salts. The exact grain of salt required can be obtained by what is technically known as "poisoning" the pan, instead of graduating the evaporation. Thus fine crystals are caused to form if a little gelatine, glue, or grease is added to the brine, whereas larger grains are given by the addition of alum.

It should be observed that many substances are called "salts" by chemists. Sodium chloride (or chloride of sodium) is the one known to the grocer, and is specifically called in science *common salt.*

Turmeric, which is a spice and an ingredient of curry powder as well as a yellow dye, is made from the rhizome of a plant of the ginger family, *Curcuma longa*, grown in the East Indies, China, and elsewhere. The roots are boiled and then sun-dried.

Vanilla is made from a plant which is found growing wild in tropical America, a kind of orchid. This is *Vanilla planifolia*, which gives the best vanilla of commerce; but vanilla is also obtained from *V. aromatica* of Guadeloupe and Brazil, and the French possessions in Oceania export a good deal every year. The plants are cultivated by placing the roots on trees which have a soft bark, to which they cling and from which they absorb nourishment. The fruit is a long pod, which is dried in sun and shade and rubbed over with oil. A few ounces will flavour a cwt. of chocolate.

West African pepper, sometimes called **Ashantee pepper**, is the fruit of the plant *Piper clusii*, called "Irrei" in Yoruba and also "Tara". It is largely used in West Africa for flavouring soups and other dishes. The plant, which is found as a climber on forest trees in mountainous parts, has bright-red berries, which are dried for use. This pepper has a pungent taste like ordinary pepper, and contains the chemical principle piperine. It differs from ordinary black pepper chiefly in being somewhat smaller and less wrinkled, and it is attenuated into a stalk like cubebs.

Zedoary is an aromatic and tonic root serving the same purposes as ginger, and may therefore be mentioned here, although few grocers are likely to handle it. It consists of the roots of *Curcuma Zedoaria* or zerumbet, a plant found in India and the Far East.

Chapter VII.—DRIED FRUITS

The fruits here dealt with, and the order of their description, are as follows:—

1. Currants.
2. Raisins
3. Plums and prunes.
4. Figs.
5. Dates.
6. Preserved fruits.
7. Almonds.

The **sources of supply** of these commodities may be briefly summarized from the point of view of the British market, the largest exchanging market in the world, and for some articles the largest consumer also. It is hardly necessary to say that currants, of which the United Kingdom imports about 150,000,000 lb. a year, come almost exclusively from Greece, which country has always monopolized their production. Many attempts have been made to transplant the currant vine. It has been carried merely across the Ægean Sea to Turkey; it has been carried to the other side of the world to California and Australia; but none of the experiments has yet proved successful. "No matter how carefully chosen the soil and the climate," remarks an authority, "this daintiest of all the grapes, when subjected to these experiments, has always changed its soft and velvety skin to a hard thin one, has developed one or more large pips, has lost its exquisite flavour, bloom, or texture, or has in some way or another gone altogether to pieces." Greece, therefore, is still the monopoly home of the currant. Of raisins the United Kingdom imports every year about 80,000,000 lb. Of these about two-fifths are Muscatels and Malagas from Spain, and more than half are Sultanas from Asiatic Turkey. Dried or preserved plums, including dried apricots, are supplied to the extent of more than a half by California, and the remainder by France and Austria mainly, with a few from Germany, Servia, and Turkey. Prunes also come mainly from California, but also largely from France; French plums and prunelloes almost exclusively from France. Asiatic Turkey supplies most of the 20,000,000 lb. of figs and fig cake; Portugal, Spain, and Greece also contributing. The dates reach Great Britain mainly from Asiatic Turkey and Persia, smaller quantities being obtained from France (Algerian produce), India, and Egypt. Asiatic Turkey, again, is a large supplier of miscellaneous dried fruits. Canned and bottled fruit is obtained chiefly from the United States (California), Spain, Canada, France, and Australia; while fruit preserved without sugar is a trade chiefly with Italy and Spain, and fruit and vegetables preserved in sugar are received mostly from the United States and the Straits Settlements. Of the almonds, nearly one-half of the total supply is drawn from Spain, and Morocco another quarter, Italy, France, Portugal, and the Canaries sending most of the remainder. The British market takes about 7000 tons of almonds yearly. Besides these it imports about 40,000 tons of other nuts used as fruit, very large quantities being contributed by France, Spain, the British West Indies, Ceylon, and Brazil.

Currants—the kind dealt in by the grocer—have nothing to do botanically with the red, white, and black currants that grow on bushes in the gardens. The grocer's currant is a small kind of grape, being the dried fruit of the Corinthian seedless variety of the ordinary grape vine, *Vitis vinifera.* It is largely cultivated in Zante, Cephalonia, and Ithaca, of which Greek islands it is the staple produce; also in the Morea, in the vicinity of Patras, this town being the chief emporium for the fruit. The currant vines, which are generally planted some 3 or 4 ft. apart, are found to grow best in calcareous marl soil, in the lowlands or near the sea-coast. The plant is delicate, and as the crop is particularly liable to injury from rains in the harvest, it is precarious, whilst considerable capital is needed, owing to the fact that a plantation must be six or seven years old before it can produce.

The **exportation of currants** from Greece is regulated by law according to the crop and other considerations. Thus in a recent "campaign" the total quantity exported was 238,000,000 lb. (Venetian), while some 86,000,000 lb. were retained in Greece under the "Retention Law" to be made into alcohol, which is sold for use in cooking, lighting, and heating, and also for making wine. Of the export mentioned more than half went to Britain and a third of the remainder to America. In 1905 the Greek Government granted a monopoly contract to a company whereby the currant trade was to be controlled for twenty years.

The **currant grape** is small and round, with a thin skin, and ripens about the end of July, the principal vintage month being August. When the berries are rather over-ripe and nearly black they are picked by hand. The curing is merely drying, and is effected by the aid of the sun simply, no "chemicals" being used. The bunches of currants are spread upon sheets or upon wicker trays and dried by the sun's heat. Of late years a new process has been adopted whereby they are dried in the shade, being placed in a long, narrow shed, the sides of which consist of jalousies or sliding shutters, adjustable to suit the time of day, the weather conditions, and the needs of the fruit to be dried. When the drying is finished the currants fall from their stalks, or are detached by gentle switching, and the fruit is graded into sizes by means of grading machines, consisting of graded sieves usually worked by gas engines, the dust and fragments of leaves, &c., being winnowed away by fans. This sorting and grading is done in some instances by the farmers, but more usually by the dealers in the shipping ports.

The Vostizza currant, recognizable by a soft velvety appearance, is esteemed the best, its quality being due apparently to some special suitability of the soil, since it is not produced elsewhere in the same excellence. The Panariti is the best kind of *Gulf* currant. *Gulf* (not specially described), *Zante*, and *Patras* are good medium; then come *Amalias* and *Pyrgos* (now much improved, it is said), and lastly *Provincials.* The dried fruit is packed in casks and cases, and now to some extent in bags—a cheaper mode, dependent for its success on the season being dry at the time of packing.

In **buying currants** note the condition of the fruit and their colour, size, and flavour. They should be dry and "free" in handling in order to keep well, the colour should be black and even, without many "soldiers" or red currants, and the flavour of the berry when chewed should be sweet and pleasant, slightly subacid, but not acid. Size is of less importance; if a currant is extra "bold" a small stone may sometimes be found, whereas currants should be seedless. The process of cleaning the fruit is now sometimes performed in Greece or by the merchant before it reaches the grocer, and this is no doubt an economical method. It is held, however, that washing should only take place when the fruit is wanted for use; otherwise mould and fermentation may develop. Being packed usually at a dry season and in a warm climate, currants may gain a little in weight through the absorption of moisture in a damp climate. On the other hand, if they happen already to have nearly as much moisture as they can take, they are liable to lose weight when exposed in small quantities for weighing out, particularly if the air happens to be dry, or if they are stored afterwards in a very dry place.

Since, in cooking currants, the water originally dried out of them is replaced, it has been calculated that 1 lb. of currants really represents, when eaten, as much as 4 lb. of the most delicate fresh grapes in the world—a fact which, as grocers may remind their customers, renders them extremely cheap food.

Raisins are dried grapes produced from many different kinds of grapes, but all varieties of the common grape vine, *Vitis vinifera*, the requirements being plenty of pulpy tissue and grape sugar In the Old World the principal raisin-producing regions are the south of Spain, Greece, Turkey, Italy, Southern France, and Persia; large quantities of the fruit are also produced in California, and the industry is carried on also to some extent in Australia and Cape Colony. Among the best are the large *Malaga*, *Valencia*, and *Alicante* raisins of Spain, and the seedless *Sultana* raisins and *Elémé* raisins of Asia Minor. The Valencia variety is grown chiefly in the district around Cape San Antonio, Denia being the chief port of shipment, the Muscatels about 14 miles on either side of the town of Malaga, and the Almerias in the vicinity of the town of that name.

Muscatels are produced by drying the grapes on the vines themselves under the warm Andalusian sun of Malaga—said to be the warmest part of Europe. When the grapes are ripe most of the leaves are pulled off the vine to allow of the full heat of the sun reaching the fruit. The stem of each bunch is then cut half through, or partly broken by wrenching, so as to check the flow of sap to the grapes; the latter are then allowed to dry in the sun—an operation which requires some two or three weeks, and which can only be effected, of course, where the weather and sun can be depended on for the time necessary. The Malaga Muscatels are the pick of the raisin world, the first qualities being fine sound raisins of large size and splendid flavour. Any small and damaged fruit is trimmed off the bunches before packing. Formerly Muscatels were packed in bulk in layers; they are now to a large extent put up in clusters carefully protected from being too much squeezed. Dehesa qualities are esteemed. Denia Muscatels are less valued. The real Muscatels are quite a short season trade.

Seedless Muscatels are a special variety of which a considerable quantity is exported for the use of confectioners, who use them as a substitute for Sultanas.

Malaga raisins other than Muscatels are *Bloom* or *Sun* raisins and *Lexias.* The former are prepared like Muscatels, but from a different grape, and have a bluish bloom on the surface. The Lexias are cured in the same manner as the Valencias described below.

Valencias are cured by a quicker method than the Muscatels, which enables the Denia raisins to be put on the market a little earlier than those of the Malaga district. The process also has the advantage of being useful when the weather is not to be depended on to be warm and dry. When the grapes on the gooseberry-bush-shaped vines are ripe, the stem of the bunch is twisted or cut and the leaves thinned from the vine, as with the Muscatels; and after a time the bunches are cut off and spread on wicker trays to be dried in the sun for a day. They are then dipped into a boiling lye of wood ashes and salt, containing a little lavender or rosemary, on the top of which floats a thin layer of olive oil. The dipping slightly wrinkles the grapes, and as the fruit is withdrawn from the lye a thin film of oil adheres to the surface and gives it a bright glossy appearance. The dipped grapes are then spread on wicker trays and exposed in the sun for three or four days, and when thoroughly dried in this way they are ready for packing, being either dealt with by the growers or sold in the bunches to dealers to be packed at the port of exportation. Each year the old wood of the vines is pruned away and burned to ashes to produce the lye mentioned. The raisins are sometimes subjected to sulphur fumes, with the notion of improving the colour by rendering it lighter and brighter; but this is a doubtful practice, and, though probably harmless enough, is not generally approved in the British trade.

Turkey raisins include *Red Chesmé* and *Elémé*, the latter a light-brown raisin of long shape, and hand-picked, as the name signifies. These raisins, shipped from Smyrna, are often of very good quality, though not equal to Valencias.

California raisins are a growing trade, as the quality improves. In a recent year over 7,000,000 lb. of them were exported, Canada being much the best customer and British Australasia the next; but they are also sent to Germany and Northern Europe, and a few to Great Britain.

Sultanas are seedless raisins from a vine supposed to be of Persian origin, but grown mainly in the Smyrna district of Turkey—a small, sweet, golden-yellow raisin with a delicate skin. A small quantity of Sultanas is imported to the United Kingdom from Greece, and is in favour with grocers, the fruit being rather smaller than the choicest Smyrna, but brighter and yellower. The size of the fruit is not really material, though large sometimes commands a slightly higher price owing to its better appearance. The best fruit is free from admixture of "blacks". Commercially, Sultanas are classed as Greek, Smyrna or Turkey, and Persian. They are generally cured in the same way as the Valencias, as described above; and, like them, they are sometimes "sulphured" with the mistaken object of improving their appearance, and others are "oiled" to prevent cracking of the skins. New growths reach the United Kingdom usually about the third week in August.

In **buying raisins** condition is the point to which merchants pay first attention A parcel should not show dampness or "bleeding" at the top. Colour is a criterion to some extent, but a light, bright hue is not necessarily a recommendation in Sultanas; a medium colour, without dark stuff, is probably better quality than a very light one. Some grocers pay special attention to the size of raisins, and even count them—50 to the ¼ lb. being deemed satisfactory, while much fruit ranges 70 or 80 to the same weight. In **preparing raisins** for retail sale it is not necessary to damp them, though some grocers think they are improved by a dry rub to fetch off the grit and brighten them up a little. For Christmas trade in particular raisins are sometimes stoned by the use of a raisin-seeder and thus sold; but the fruit soon candies after being seeded. **Store raisins** where they will not be exposed to heat or damp.

Plums and **prunes**, dried and put up in various ways, are now a very large trade. The United States—which is tantamount in this case to saying California—alone exports 55,000,000 lb. of prunes, sending over 20,000,000 lb. of them to Germany and rather more than half that quantity to the United Kingdom, besides nearly 10,000,000 lb. to the Netherlands. France also is a great producer still of her famous *Imperials* and other sorts, and is an important contributor to the British market, though far outdistanced by her American competitor.

French Imperials are grown mainly in the Loire district and shipped from Bordeaux. One of the chief varieties is the St. Catherine or Bricette, a cling-stone (flesh fast to the stone) oval plum, medium to large size, tapering towards the stalk, yellow-fleshed. The fruit ripens towards the middle of September, and can be dried to a prune on the tree if against a wall. Large-sized dark-skinned varieties of other sorts are also included in the class of French plums. The *Imperials* are a favourite fruit for dessert; the bottle trade has almost died out, those packed in wood being preferred.

French prunes are sometimes left on the tree till the plum is dried to a prune, but the usual method is to dry them after gathering. In the old French process the gathered plums are first spread out on beds of straw or rushes and are exposed to the sun for a day or two, being turned several times meanwhile. They are then steamed—in a special apparatus by the larger growers, or in the local baker's oven by the smaller farmers. This baking or steaming is repeated thrice, the temperature of the first being up to 113° to 140° F.; the second, 149° to 158° F.; and the third, 176° to 194° F. These temperatures must not be exceeded or the skins break. Each baking lasts six hours. In the first two no air is admitted to the oven; in the third air is not excluded. After each baking the plums are exposed to the air and are turned over. The fruit is considered good when it is firm and shining and the flesh elastic.

French plums are classed according to the weight. The largest go 40–44 to the French lb., and fetch the highest price; the sizes then following go 50–64, 60–64, and so on up to 120–124 to the lb. The most famous French prune plum is the *Prune d'Agen*, or *du Roi*, grown in the Agen district of the Lot and Garonne Department, a plum also called *Prune d'ente*, in allusion to the method used for grafting it. This is a free-stone plum, medium-sized, obovate, somewhat flattened on one side, with a skin of deep purple, almost black, and covered with blue bloom.

Californian prunes are prepared (from any suitable plum) by a system much more rapid than the original French method. Being quicker it is less costly, yet is held to produce an equally good prune. The plums are placed on wicker trays in a current of hot air—the temperature is carefully kept below 212° F. to prevent the taste being spoiled by the boiling of the plum. They remain in the evaporator from twelve to fifteen hours, and are then taken out, cooled, and piled up in lofty chambers, where they remain ten to fourteen days. This process is intended to level them up as regards moisture, as some of the plums contain more than others. Although some 80 per cent of its water is driven out by the evaporation, the prune retains enough to be soft and elastic to the touch if good.

With regard to American prunes (or plums, as they are more commonly termed in the trade), it has been alleged that old season's goods are sometimes sent out at the beginning of the new season. But it is quite possible for the new season's plums to be shipped from California in time to reach Liverpool in the middle of October, given an early crop and favourable drying weather.

German prunes are, in the best kind, usually of the Quetsche plum, a free-stone like the D'Agen.

Italian prunes are rather round in shape, and of rich flavour.

Porcal plums are a large-sized kind grown in Spain and Portugal.

Bosnian plums, exported from Servia and Herzegovina as well as Bosnia, are grown largely in the valley of the Save, the chief emporium being Breka. The plums are dried in ovens in the French way, and are sorted by sieves into sizes. The prunes are exported from Servia in large boxes and, the inferior qualities, in sacks. The foreign merchants importing them are accustomed to repack them in smaller boxes for retail sale.

Figs are the so-called "fruit" of a tree, *Ficus Carica*, which is allied to the mulberry, and which grows to a height of 15 to 30 ft., with dark-green leaves. It bears its flowers inside the hollow, pear-shaped receptacle which constitutes the edible "fig", and which is commonly referred to as the "fruit". Strictly, however, the fig which we eat is only a fleshy enlargement of the stalk: the true "fruits" are inside this, and enclose the seeds. In warm climates two crops of figs per annum are obtained—*summer figs* or *firsts*, and *autumn figs* or *seconds*. Occasionally a third and much poorer crop is yielded towards the end of the year; but the autumn gathering is the one which, in warm climates, gives the most figs, and the best suited for drying. The summer fruit is more watery and not so sweet as the autumn kinds, and is generally eaten fresh. Where the climate is colder only summer figs are usually obtained. In gathering the crops the figs are either hand-picked (Turkish *eléme*) or shaken from the trees into sheets. Since figs contain a large quantity of sugar, they can be preserved by simply drying them in the sun. This is done by spreading them on wicker trays and exposing them during the daytime; at night, if the climate is dry, they are simply covered over with a cloth; otherwise they are removed to a dry room. In Southern Europe figs are commonly cured by sulphuring—*i.e.* by exposing them to the fumes of burning sulphur—as well as by being sun-dried. When they can be flattened without splitting they are sufficiently dry, and this point is reached when the figs have lost about two-thirds of their original weight. In other districts the fruit, when gathered, is dipped for a minute or two into a hot lye of wood ashes (potashes), then in water to wash off the alkali, after which they are drained and dried, either in the sun or in ovens. The sulphuring and the dipping in the hot lye are for the purpose of sterilizing the outside of the fruit—*i.e.* destroying spores of moulds and larvæ of insects, which might otherwise develop and spoil the fruit. When sufficiently dry the figs are gently flattened and packed in boxes with laurel leaves, or in casks, or are strung on threads or fibres: the best figs are packed in the first way. Figs are also preserved in syrup and as glacé fruit or *gold figs.*

The broad trade division of figs is into *dessert figs* and *cooking figs*, the dessert including the higher-priced varieties of pulled or hand-picked figs and layers. Turkish figs are of three classes: (1) *Elémé*, (2) *Erbeli*, (3) *Aidin;* but traders are accustomed to speak of only the first by the Turkish name, Elémés being the choicest imported. *Layered figs* are a staple article, and *Naturals* are the cheaper figs which have been allowed to dry in their own shape. The Elémés reach England from Smyrna about the end of August. Spanish figs are often packed in mats. Greek figs, smaller than the Turkish, are threaded on strings and packed in baskets or barrels. *Comadras* and *Faro-taps* are low-priced sorts. Figs are largely grown in Southern Italy, but in size and quality are inferior to those of Smyrna. The exported table figs are packed in 15-lb. drums; one of the best kinds is the *Fico Trojano*, or *Trojan fig.*

"Marrying the figs" is the interesting process of **caprification**, practised from time immemorial in South Italy and some other fig-growing countries. Many kinds of figs do not require it, while to other kinds it is absolutely essential. The caprifig is the wild fig and is not edible, and caprification is attained by suspending the fruit of the caprifig upon the trees of the edible fig. The fruit of the caprifig contains special fig wasps called *Blastophaga grossorum*, which hatch in the wild fig, cut their way out with their antennæ, which have teeth like a saw, and search for other caprifigs to lay their eggs in. Not finding any they enter the edible fig blossom. The effect of this visit is the pollination of the edible fig flowers with the caprifig pollen brought by the wasps, which causes the edible fig to mature, seed, and set its fruit. Hence a supply of these wasps is essential to the fig-grower, and, if spring frosts or an unfavourable season has destroyed his supply of wasps, he must obtain some caprifigs from a more favoured locality to fertilize his trees. Thus, when caprifigs fail in Asia Minor, shiploads are imported from Greece, and in every fig-growing country they may be purchased in their season in the open market.

Dates are the fruit of a palm called by the botanists *Phœnix dactylifera*, which flourishes in the hot, dry climate of North Africa, Arabia, and Persia. Most of the dates consumed by the British public and others come from that old, old part of the world where Nebuchadnezzar once reigned, and where the Caliph Haroun al Raschid reigned after him, the land of the Thousand and One Nights, of ancient Babylon and modern Bagdad. The date palm not only supplies their chief food to millions of people—who maintain a splendid physique on their dates—but is also useful in a variety of ways which do not concern us here, save that amongst them are the yield of sugar, honey, spirits, wine, and vinegar. For the best kinds of dates the fruit is gathered before it is quite ripe and dried or cured in the sun, the fresh dates containing a sweet juice which soon begins to ferment unless the fruit is thus treated. For the bulk dates, or "squashed", the fruit is allowed to become perfectly ripe, when it is gathered and pressed into baskets. The natives in the date-eating districts commonly prefer the smaller and drier kinds, not over-sweet (and thus not thirst-provoking), but very nourishing and sustaining. Arab travellers carry dates so closely pressed as to be something like sea biscuit.

Tafilat dates are accounted the finest grown. They are produced in that part of the Morocco hinterland which lies south and east of the great Atlas Mountains, and are therefore carried mainly to Tunis, while other Morocco dates are carried by mule caravans to Fez. In either case the dates figure in the British import returns as coming from France! The chief North African export date is the *Majhol*, which is large and luscious, sweet, and with a fairly large stone; when quite ripe it is of a greenish-brown colour. The *Degla* are reckoned the best Tunis dates. Egyptian dates are sometimes larger than the Tafilat, though not such good keepers; and there is a small Egyptian date about the size of an acorn, so light-coloured that it is called the *White date.*

Siar or *Sayer*, *Hallowie, and Khadrawie* are names of Arabian and Persian dates, exported partly via Turkey (and counted therefore as from Turkey in Asia) and to a much smaller extent from Basrah and other ports on the Persian Gulf. These dates were known in bygone years as *Golden Babylonian* dates, and it may be interesting to mention that according to historical inscriptions dates were sold in the seventh year of Nebuchadnezzar at about a halfpenny a quart, and in his thirty-eighth year a quart could be had for only a twenty-fifth of a penny. In Arabistan the price at Basrah rules the market, and in an average year Bahrein dates are sold locally as low as 1*s.* 8*d.* for a bag of 70 lb. According to recent Consular reports, Arabistan exported some 52,000 cwt. of dates mainly to India. The principal variety is *Sayer*, and others are *Gantar* and *Khadrawie*, the last the best and highest-priced. Gantars are never packed in boxes, being too full of syrup. On the Persian Gulf *Kharak* is a name for dried dates obtainable in two qualities, *Sayer* and *Hallow*, of which Sayer is the better, while the *Khalas* variety at Bahrein fetches the highest price of all. But inasmuch as native opinion does not coincide with European as to the relative merits of dates, it is not surprising to find another authority stating that Hallowie is the best. The Hallowie is a golden-yellow, the Khadrawie reddish-brown, and the Sayer dark-coloured.

Speaking generally, the Arabian, Persian, and Turkish dates fetch lower prices in the British market than either the Egyptian or the Tafilat. In buying, attention is given to size, colour, flavour, sweetness, and general condition—plump, fleshy fruit being preferred to the harder and drier.

Preserved fruits (apart from jams) include two main classes: (1) Evaporated fruits; (2) Fancy fruits.

Among **evaporated fruits** are apples, pears, plums, peaches, apricots, &c. Normandy pippins are sun-dried largely in France, and these small spotted apples are well known in the grocery trade, for which they are put up in baskets and bags. When dried they are brownish in colour. The United States and Canada are large exporters of dried apples, Ontario supplying most of the Canadian. The best fruit is of a natural-looking light colour; the brown is frequently old or inferior. Apricots dried are packed in "extra", "choice", and "fancy" grades. The Australian apricots, which are sun-dried without sulphuring, are not quite the same colour as the Californian, but are preferred by some judges for flavour. Dried pears in baskets of about $5\frac{1}{2}$ lb. net are a favourite article imported from France, but also supplied by California, whence come also peaches. Dried silver prunes are a large fruit, sometimes running only 20 to the lb.

The usual process of evaporating fruit is to pare and core it and spread it on trays of galvanized wire, which are placed in the evaporating chamber, through which is passed a current of air heated to about 240° F. The trays rest on endless chains, so that they can be moved upwards every few minutes, and thus expose the fruit equally to the operation of the hot air. Another system is to place the fruit in a vacuum-pan, into which warmed air dried by passage over chloride of lime is alternately let in and exhausted, carrying away the moisture of the fruit very quickly. Very often fruit to be preserved is, after being washed, passed through a sulphur bath to preserve the colour.

Fancy fruits which are termed *crystallized* or *glacé*, though prepared by various methods, are essentially fruit which has been treated with sugar. *Metz fruits* have a superior reputation, and Portugal has a special trade in sugared fruits, such as apricots, peaches, plums, and figs. The district around the French town of Apt is famous for its glacé apricots and other fruits. The chief varieties of fruits thus treated are Angelica (from the umbelliferous plant *Archangelica officinalis*), apricots, cherries, chinois (gold and green), figs, ginger, greengages, mirabelles, peaches, pears, pineapples, raspberries, and strawberries.

The fruit, usually gathered unripe, and in the case of plums and gages sometimes before the stone has become hard, is boiled until it is tender, and is then suspended in strong syrup. In this it is allowed to hang until it has become practically transparent, the syrup being maintained at its full strength during the process by occasional evaporation to keep it saturated with sugar. When the fruit has become sufficiently permeated with the syrup it is removed, and either dried in a current of warm air or placed in a stove at a temperature not exceeding 120° F. until the syrup has crystallized. The process of the manufacture of sugared fruits in Portugal consists essentially in repeatedly boiling the unripe fruit in syrup. When the operation is finished the excess of syrup is allowed to drain off, and the fruit is then dried on trays in the open air. For exportation it is put up in round, tastefully decorated boxes of various sizes. When crystallized and glacé fruits are packed and weighed before the contained syrup is dry, they are liable to lose weight through the evaporation of moisture. Retailers, however, are usually charged on the actual net weight of the fruit at the time of delivery; and the London wholesalers have of late years united to secure the abandonment of the ancient custom of weighing in the paper with the fruits.

Italian cherries are packed in spirits in bottles, and are also preserved or candied. The cherries to be packed in spirits are brought to the factories to be cleaned by women. They are then subjected to the sulphur bath to preserve their colour, and are afterwards passed through three alcohol baths, in which the strength of the fluid is increased from the thirty to the sixty grade. The entire processes of preparation occupy nearly forty days. Male labour is employed throughout after the cleaning process at wages approximately 1*s.* 8*d.* per day. When bottled for shipment the cherries sell at about 1*s.* 2*d.* per lb. Preserved or candied cherries take the sulphur bath, are then stoned, cooked in sugared water, to which sweetening is gradually added, and are then left for two or three days in the basins until the sugar slightly ferments. They are then boiled again in water, in which the proportion of sugar is increased, and on finishing are either sold for candied cherries or are bottled in a heavy syrup. Women do the cleaning and pick the cherries; men do the rest. These cherries sell at about 1*s.* 6*d.* per lb. The best cherries are produced in Salerno, the second quality are produced in great numbers in the provinces of Brescia and Bergamo.

Candied peel includes *citron*, *lemon*, *orange*, and *mixed*, the citron being the most valuable. At Leghorn, the chief seat of the industry, the citrons, after being halved, are placed in brine for a time, and the fruit is then removed from the rinds by hand. The rinds are next placed in water for two or three days to get rid of the salt, and are then boiled to make them tender. For the next eight days the rinds are treated with syrup, being placed first in a weak sugar solution and then in syrups increasingly stronger. The peel is next boiled in a concentrated sugar syrup over a slow fire and drained on wire netting. The saturated peel is finally candied by being immersed in a solution of crystallized sugar and boiled once more, when, on being again placed on the wire netting, the peel assumes a candied appearance, owing to the crystallizing of the excess of sugar as it cools. At Syracuse is practised the industry of **salting peel**, both that of the bitter orange and the lemon.

Almonds are the drupe or fruit of a tree some 15 or 25 ft. high, the *Amygdalus communis*, a native of Persia and North Africa, which now flourishes in Southern Europe, Syria, the Canary Islands, China, and California. The fruit consists of four portions: first a downy covering, then a layer of fibrous tissue; inside this a shell, and inside the shell the kernel. When the fruit is ripe it is knocked off the trees with light rods or reeds, collected, and prepared for market by removing the outer covering. There are two kinds, *Sweet* and *Bitter*, produced by different varieties of the tree. The well-known *Jordan* almond is what is known as "tender-shelled". Other classes are the *Large Sweet*, ½ in. longer than the Jordan, the *Common Sweet*, and the *Pisoche*, the latter a small blunt-ended fruit much grown in the south of France.

The sweet almonds include *Jordan*, *Valencia*, *Sicily* or *Italian*, and *Barbary*, priced usually in that order. The Jordan almonds from Malaga are esteemed for their superior flavour. One kind is flat, about 1 in. long, cinnamon brown, sweet and tough; another kind is more pointed at the ends and plumper. Valencias, also esteemed, are broader than the Jordan and rather shorter, flat, pointed at one end and broader at the other, and a dingy brown. Sicily and Barbary almonds are somewhat similar to the Valencia, but generally smaller and not so flat.

Of bitter almonds the French, Barbary, and Sicily are the chief kinds, the French being the largest, next the Sicilian, and then the Barbary, which is the most common. Bitter almonds contain a substance called *amygdalin*, one element of which is prussic acid, a deadly poison. Consequently bitter almonds have to be used with great care in cookery or confectionery, though, as the heat in cooking drives off the poison, there is less danger than might be supposed. The bitter almond is generally somewhat shorter and broader than the sweet; it has a bitter taste, and when rubbed with water has a characteristic odour. A sweet oil, called Almond Oil, is expressed from almonds, and an essential oil is distilled from the bitter almond kernels.

Burnt almonds are the roasted sweet kernels. *Blanched almonds* are sweet almonds without their skin. They are soaked for a short time in hot water, and the skin can then be removed by the fingers, after which they are rinsed in clean cold water and wiped dry or slowly dried in a warm place. *Ground almonds* are these skinned almonds crushed small.

In buying almonds it is well to have regard to the colour. Old almonds are dark, and the boxes may show at the sides a webby appearance on the almonds. The retailer should always endeavour to procure new season almonds.

Preserved ginger consists of the young, green, and succulent rhizomes, washed and scraped, and preserved in syrup; and also of the stem and leaf preserved in the same way. It is imported both from the West Indies and from China, the *Chyloong* and the *Peiwoong* brands of the latter country being two favourite kinds. *Crystallized and Glacé Ginger*, *Ginger Candy*, and *Ginger Chips* or lozenges are all forms of sweetmeats produced from sugar and ginger.

Weights of Dried Fruit as Imported.—The *Grocer Diary* gives the following information as to the importation of dried fruits:—

"Californian Fruits comprise—Pears, Peaches, Apricots, Greengages, Egg Plums, &c., and are imported in cases, each containing twenty-four 2½-lb. or 3-lb. tins (nominal). They are also classed in four grades, known as "Extras", "Extra Standards", "Standards", and "Seconds". Preserved Apples from Canada and the United States come in 3-lb. and gallon tins, both nominal. The former are packed twenty-four to a case, and the latter six; sometimes, but rarely, twelve. Apple Rings from America arrive packed in cases of 25 lb. and 50 lb. net weight, or come here packed according to order, in 14-lb. or 28-lb. boxes. "Cored" Apples are packed in the same styles. The average tare on the larger boxes is from 8 to 10 lb. each. Evaporated Apricots are mostly in boxes of 20 lb. to 25 lb. weight. Apricot Pulp comes over from France, Spain, Italy, and Portugal in cases of 10 + 5 kilo tins (as nearly as possible 11 lb. each); also from California in gallon tins (each tin weighing 6½ to 7 lb. gross), which are packed twelve in a case. Although in the trade these tins are called "gallon" tins, they really contain considerably less than an English gallon. Singapore Pineapples are packed in various ways, either a whole one in a single tin, or in the shape of slices, chunks, or cubes. A case of these Pines contains forty-eight 1-lb. and 1½-lb. tins; or twenty-four to thirty-six 2-lb. tins; or twenty-four 2½-, 3-, and 3½-lb. tins. "Sliced" Pines are in 1½-lb. tins, and forty-eight of these are counted to every case. The general terms are one month or fourteen days, net cash. Ceylon Desiccated Cocoanut arrives in lead-lined wooden cases of 112 lb. to 125 lb. each. GLACÉ CHERRIES and crystallized fruit are sent hither in cases of about 3 cwt. each, containing thirty 9-lb. or 10-lb. boxes lined with paper, which is always weighed as fruit and charged for accordingly. 100 kilos (French) cherries are equal to about 220 lb. (English), and 50¾ kilos answer to 1 cwt. avoirdupois. Metz Fruits in ¼-, ½-, and 1-lb. boxes are sometimes sold publicly for net cash with one month's prompt, or privately at sixty days' acceptance."

CHAPTER VIII.—JAMS, ETC.

Jams are technically described as conserves of the pulp of fruit prepared by boiling it with sugar. A typical jam is made from the whole of the fruit—rind, pulp, and kernel. Jams may be made with whole fruit or broken fruit, and either with fresh fruit or fruit pulp. The quantity of sugar used varies from about two-thirds the weight of the fruit used to about an equal weight of fruit and sugar. In modern factories large steam-jacketed pans are used for boiling down the fruit and sugar, it being necessary in jam-making that the boiling should be conducted at a gentle heat, and finished as quickly as possible after the sugar has been added. With these steam pans the evaporation of the surplus water is effected in the short space of ten minutes or so.

Jams are made in various grades. Thus *Best Raspberry* may consist of equal parts of raspberries and sugar; *Second* may consist of 14 lb. of raspberries, 20 lb. of sugar, and 6 lb. of apple pulp; and *Third* may contain but 10 lb. of raspberries, 30 lb. of sugar, 14 lb. of apple pulp, 12 lb. green gooseberry pulp, and 7 lb. of glucose, with a slight addition of cochineal for colouring.

For **high-class jams** the following is a typical recipe:—

Boil 20 lb. of the fruit with 1 qt. of water; also dissolve 16 lb. of sugar in a small quantity of water and boil it until on cooling it will become brittle. To this now add the fruit, and boil until it will drip like jelly from the spoon.

Another process for fine jams consists in partly candying the ripe fruit by heating it with sugar syrup two or three times, and then storing it in syrup till wanted. Apple juice is used to form the body of these jams, the juice being clear to show the whole fruits which the jam contains.

Common jams as made in the factories consist largely of fruit pulps, and a part of the sugar is frequently replaced by glucose. And since in making some fruit pulps, such as apple pulp, the fruit juice is first removed, and with it so much of the pectose that the jam would be of a syrupy character instead of like jelly, this deficiency is sometimes remedied by adding to the ingredients of the jam agar-agar, or Japanese gelatine—a vegetable compound. As a typical example of this grade of jam the following recipe is quoted:—

Boil together 100 lb. of fruit pulp, 30 lb. of sugar, and 70 lb. of glucose. Before bottling, mix with the jam 20 lb. of Japanese gelatine, previously soaked and dissolved in water. The pulp used may be strawberry, raspberry, currant, cherry, plum, apple, blackberry, damson, gooseberry, &c., colouring (such as cudbear for red jams) being added as required.

Whole fruit jam is made by first gently scalding the fruit, then adding sugar, and boiling.

Jams containing a correct proportion of sugar (in high-class jams about 60 per cent) will, if properly stored, keep sound sufficiently long for ordinary home-trade requirements; but salicylic acid, boric acid, and sulphites are sometimes used as preservatives. It has been urged, even by jam-manufacturers themselves, that the use of these chemicals should be forbidden by law, or at least that the quantity used should be limited.

In **buying jam** a useful method of comparing samples is to place a portion of each between two pieces of glass and press the glass evenly together; then note any differences in colour, the degree of fineness of the pulp, the relative number of pips and their kind, and so on. In judging a jelly, note the freedom from pulpy matter.

Adulteration of Jam.—Strictly speaking, a jam should consist only of the fruit after which it is named, together with sugar, and any additional substance might be regarded as an adulteration. It is a moot point whether apple pulp ought to be allowed, or apple juice, except in those cases where the fruit does not set well without such additions. Gelatine is quite likely to be objected to, as is also any preservative such as borax or salicylic acid. An excessive quantity of water would probably be deemed an adulteration, but there is no actual standard fixed whereby it can be determined what constitutes an excessive amount. A maximum of 50 per cent has been proposed as the standard. As regards sugar, in a case taken to the high court an addition of 13 per cent of glucose to marmalade was held to be legal. It used to be a canon of jam-making that only cane sugar could be used for jam if it was required to be of good flavour and keep well; but as a matter of fact beet sugar is now very largely used, as well as glucose. Figs, vegetable marrow, beet pulp, boiled sago, and such articles have been met with in low-quality jams. These are, of course, palpable frauds; but the use of damaged fruit of the same kind as that which gives its name to the jam is rather a matter of inferior quality than of adulteration.

In **examining jam** for any suspected ingredient, such as a different fruit or a vegetable admixture, about a teaspoonful of the jam is stirred up in a beaker or tumbler with warm water. This dissolves the sugar, jelly, &c., leaving the pieces of skin, seeds, and fibre; these latter can be fished out and any suspected portions further examined under a hand lens or microscope. Apple pulp is detected by means of the starch which it naturally contains. Boil 1 oz. of the jam with about 5 oz. of water for a minute or two; let it get cold, and pour off some of the liquid portion into a test tube or wine glass. To this add a drop or two of tincture of iodine. If any starch was present in the jam the mixture will turn blue. If no blue colour is obtained there is no apple pulp in the jam, nor any other starchy substance. If a blue colour does appear it is in all probability due to apple pulp, because other starch-yielding additions are comparatively rare.

Marmalade, so called from the Spanish name (*marmela*) of the quince, is orange jam, and was originally made in Spain of quinces and honey under the name of "marmelada". For modern marmalade sour or bitter oranges—preferably *Seville sours*—are preferred. About 25 parts of fruit to 22 parts of crushed sugar is a commonly used proportion. The oranges after being cleaned are cut into pieces, which are held against a revolving boss in order to remove the pulp; the pulp is then squeezed to separate the juice from the cellular tissue, and then passed through a sieve apparatus for removing the pips and tough skin. The peel is softened by steaming, and sliced into thin rings by revolving knives. Peel and pulp, with sugar added, are then boiled in steam-jacketed pans to the requisite consistency. *Home-made Marmalade*, as largely produced in factories, differs from the ordinary or Scotch marmalade in that only the orange juice is boiled with the sugar and peel, the pulp being removed.

Fruit jellies are conserves of fruit juice and sugar without the pulp of the fruit. Liquid or semi-liquid when warm, they become stiff on cooling, owing to a gummy principle called "pectin" found in the fruit. Pectin itself is found only in very ripe fruits, but partly ripened fruits contain "pectose", which is easily converted into pectin when the juice is boiled. The juice, obtained by cold pressure or by heating, is boiled down with sugar—1 lb. of sugar to 1 pt. of juice is a common proportion. On the ground that pure sugar jellies are too sweet for some consumers' taste, half the sugar is sometimes replaced by glucose, which is less sweet than sugar. Black, white, and red currants; gooseberries, blackberries, strawberries, and raspberries; apples, pears, quinces, oranges, and pineapples are the chief fruits whose juices are used for jelly-making. But some of these, especially the berries, give a rather soft jelly when the pure juice is employed, so that it is a common practice to mix apple juice with the juices in question, in order to obtain a firmer product. About one-third to one-half of the total juice in such cases consists of apple juice, orange and pineapple requiring the latter quantity. Some jellies (*e.g.* orange and lemon) may be made with no other juice than that of the apple, the jelly being flavoured with about 1 per cent of orange or lemon spirit, and acidity imparted by the use of $\frac{1}{3}$ to $\frac{1}{2}$ per cent of citric acid and tartaric acid respectively. White apple juice is used for light-coloured or yellow jellies such as quince, orange, and pineapple; for red jellies, common or pink apple juice is employed. It is essential that fruit jellies should be bright and clear, to secure which the juices used have to be as free as possible from pulpy matter and cloudiness, while the boiling also must be done carefully if a nice bright jelly is to be produced.

Guava jelly, prepared as above explained, is made from the fruit of the white guava tree, common in the West Indies, America, Ceylon, and South Africa.

Compound jellies, a cheaper article than the pure fruit jellies above mentioned, contain a certain proportion of the Japanese gelatine mentioned above; moreover, the sugar is largely or entirely replaced by glucose. The method of preparation differs a little from that used for the all-fruit jellies, because the gelatine cannot be boiled with the acid fruit juices without undergoing a change which would prevent its setting. Japanese gelatine, sugar, and glucose are heated separately and then mixed in one pan, and the fruit juice is boiled in another. The contents of the two pans are mixed afterwards without being allowed to boil again. For a still cheaper jelly the sugar is entirely replaced by glucose.

Table jellies such as aspic, calf's-foot, lemon, Madeira, Noyeau, port wine, and so on, have in their better qualities true gelatine as their basis, but in others Japanese gelatine or similar vegetable substances are employed. Those containing true gelatine are made bright and clear by clarification with white-of-egg. Various flavouring, colouring, and sweetening ingredients are added to form the different kinds of jellies. With the exception of aspic and calf's-foot (see below) most of these jellies are prepared thus:—

Gelatine is cut small and soaked in water, to which in some cases broth and other ingredients are added, matters being arranged so that about 1 qt. of liquid is present for every 4 oz. of gelatine. This is steamed or otherwise gently heated to dissolve the gelatine, and if necessary clarified by the addition of white-of-egg, then strained from the coagulated albumen, and mixed with any of the requisite colouring, sweetening, and flavouring ingredients that have not already been included.

Many jellies are put up with wine, others "plain", the principal plain ones being aspic, calf's foot, lemon, and orange.

Aspic jelly is an amber-coloured savoury jelly made with gelatine and meat broth, together with flavouring materials, &c. It is used as a decorative moulding for ornamenting cold viands, the latter being visible through the jelly on account of its transparency.

Calf's-foot jelly is now generally made from gelatine, although, as the name indicates, it was originally a preparation of neat's foot or of cow-heel; sherry, Madeira, or Cognac being used as the flavouring ingredient.

Tablet and **powder** jellies, which are popular on account of their portability, include all those named except aspic, and others such as *champagne*, *Cognac*, *currant*, *raspberry*, *strawberry*, &c.

Bottled fruits are put up in water, in syrup, and in spirits, large quantities of all three kinds being sold. Californian apricots, peaches, plums, and pears; the apricots from France and Spain; and the plums from France, Germany, and Holland are examples. Pineapples are thus preserved and largely exported from Singapore and the United States.

Nearly all bottled and canned goods that are to be stored for a long period are **sterilized**, or heated to a point which destroys the micro-organisms. In practical fruit-preserving it is found that a temperature of 170° F. suffices to destroy all ordinary bacteria, mould spores, and other fermentative bodies. It is necessary, however, after the vessel has been sealed air-tight, to submit it to such a temperature, and for such a time, as to ensure that *every particle* contained in the vessel is heated to at least 170°. Usually the vessels are heated either to the temperature of boiling water (212° F.) or higher temperatures ranging between 220° and 240°. These last cannot be obtained in an open bath if water alone is used as the heating liquid, since water boils constantly under atmospheric pressure at 212°. In order to get the higher temperatures it is necessary to heat the water under greater pressure than that of the ordinary atmosphere. For this purpose an *autoclave* or *pressure process bath* or kettle is employed, having a lid that can be screwed down to prevent the escape of steam and so produce a higher pressure and temperature. This vessel is provided with safety valve, thermometer, and pressure gauge, and it is usually heated by steam. For the more delicate varieties of fruits and berries most canners prefer to use the open bath, at a temperature of 212° or less; but for certain pulps and large fruits (*e.g.* pineapples) the higher temperatures are used, especially in those factories where meats are packed as well as fruits. In some cases the cans and bottles of fruit are placed in an exhausting apparatus after being filled, in order to remove any enclosed air before sterilizing (or **processing**, as the heating is technically termed).

Properly sterilized and kept air-tight, fruits may be stored an indefinite length of time without fermenting or putrefying.

Fruits in water include apples, apricots, blackberries, cherries, cranberries, currants, damsons, gooseberries, greengages, plums, raspberries, and rhubarb, also one or two mixtures, such as raspberries and currants and cherries and currants. The fruits, after cleaning, are simply placed in the cans or bottles, and then the latter are filled up, either with hot water or with water that has been previously boiled to destroy micro-organisms, and kept as far as practicable out of contact with air. The cans or bottles of fruit are then sealed air-tight, and heated in the steam-bath for the required time in order to sterilize them.

Fruits in syrup include such as apricots, cherries, damsons, figs, gooseberries, greengages, guavas, macedoine, peaches, pears, pineapples, plums, and raspberries. They are put up either in thin "light" syrup or thick "heavy" syrup, some requiring one and some the other. Fruits such as cherries and greengages, which have easily broken skins, are pricked with copper needles before bottling, to prevent bursting during the sterilizing process. Pears are boiled in water till soft to blanch them. Some fruits are bleached by exposing them to sulphur fumes. (See *Italian cherries* in previous chapter.) Strawberries do not preserve their form in syrup unless first candied. These and *cherry compote* are examples of **Wiesbaden fruits**, which consist essentially of well-candied fruits put up in strong clear syrup of sugar and glucose.

Fruits in spirit are preserved by being placed for a time in brandy or other spirit and then bottled in a mixture of the spirit with sugar and water. Thus cherries (see also the preceding chapter) are picked ripe and placed for six weeks in strong spirit (alcohol of 60 per cent); the spirit is then drawn off, mixed with one-third of its bulk of cold strong sugar syrup, and with either one-third or two-thirds of its bulk of water; the larger quantity of water being for the cheaper quality of preserve. Into this mixture the fruit is returned. Various flavourings are added to the alcoholic liquor; in the case of cherries, for instance, coriander, cloves, cinnamon, and vanilla are used. Partly candied fruits are employed for the higher class goods.

Fruit pulp, largely used in the manufacture of jams and jellies, is usually made by boiling the fruit with water and then sterilizing it in the cans. Apple and apricot are the chief kinds prepared.

Storage.—Unless jams and jellies are put up in hermetically sealed packages they will speedily become mouldy if improperly stored. Mould develops rapidly in moist, stagnant air; therefore, unpack jams and jellies as soon as possible after receipt and store them in a dry cool place. As a rule jams and jellies are covered with vegetable parchment, which, being porous, admits the air freely. Slow evaporation of moisture from the surface of the jam raises the percentage of sugar and thus produces an upper layer upon which the germs of mould do not thrive. Consequently it is recommended to allow free access of the air to every package as far as possible. When the whole of the parchment covering cannot be exposed to the air, expose it as much as possible by placing the jars one over two, two over three, and so on. Never stack one glass just over another unless something intervenes—such as a thin strip of wood. Large quantities may be stored in stacks composed of layers of the jars, these layers being separated from each other by means of light wooden frames. Whenever mould is discovered examine all packages near, remove those that are mouldy, and re-stack the goods in a fresh position.

Chapter IX.—BISCUITS AND CONFECTIONERY

Biscuit, from the French words *bis* and *cuit*, meaning twice cooked, appears to have derived its name from the extra baking to which it was subjected. Enormous quantities of biscuits are now made by machinery, the ingredients used being mainly flour, sugar, salt, butter, lard, margarine, carbonate of soda, milk, and water, with almonds, eggs, and flavouring substances according to requirements.

Sea biscuit, for which there are large bakehouses at the various naval victualling yards, is made of unfermented dough, composed simply of flour, water, and salt. When properly prepared it will keep perfectly sound for eighteen months to two years; and it is so nutritious that 18 oz. of biscuit is deemed equal to 24 oz. of ordinary fresh-baked bread.

Ordinary biscuits are made by a simple process of mixing the flour with the water or milk, and adding salt, butter, sugar, and flavouring or colouring ingredients until a dough of the requisite consistency is produced, which dough is afterwards moulded and baked. The machinery usually comprises a cylindrical iron vessel in which revolve knives or arms, called a *mixer;* a pair of heavy iron rollers, through which the dough is passed backwards and forwards, called a *brake machine;* and an apparatus containing gauge rollers to bring the dough to a sheet of a certain thickness, and a punching mould to cut it into the desired shapes, this being called a *cutting and panning machine.* A travelling web carries the stamped-out bits of dough to tin trays, which pass by a travelling stage to the oven. The patent travelling ovens are about 10 to 15 yd. long, and fitted with endless webs of either plates or chains. The plates are for such goods as large water biscuits, which are placed on them by hand; the chains carry small and fancy biscuits, such as are placed in trays. Biscuits of different sizes and degrees of richness pass through the oven for times varying from about 5 to 40 min., and the temperature of the oven is modified to suit the various qualities, heat and motion being under easy control. In the richest class of articles the biscuits are cut out by hand labour and fired on trays in common ovens. For rout biscuits the dough is placed in a strong metal chamber fitted with a piston moved by a screw; this pushes the dough through a series of holes or dies, whence it is received on a sliding board and cut into proper lengths.

The following are brief particulars as to leading varieties of biscuits:—

Abernethy, round biscuits made from flour and milk and flavoured with caraway seeds.

Arrowroot, circular or oval, of various sizes, and rather sweet.

Cracknels, light, puffy, brittle biscuits, with a peculiar smooth, shiny surface. They are made with a mixture of flour and eggs, to which butter, sugar, and carbonate of ammonia in certain proportions are added. During the firing the ammonium carbonate, being very volatile, is driven off by the heat, and this causes the cracknel to assume its spongy structure.

Cup cracknels are of oval shape, depressed in the centre.

Gingerbread is made with wheat flour, treacle or syrup, sugar, butter, and eggs, flavoured with ginger, mixed spice, and lemon peel. To make it light and spongy tartaric acid and ammonia carbonate are sometimes used. A simpler recipe gives merely flour and treacle, with a little ground ginger.

Macaroons are small, very sweet biscuits, with flat bottoms and rounded tops. Made of ground almonds, sugar, rice flour, and ordinary flour.

Osbornes are round, about 2¼ in. in diameter; slightly sweet.

Promenades are biscuits iced with sugar and flavoured with lemon, chocolate, coffee, &c.

Ratafia biscuits are very similar to macaroons.

Rusks, made with flour, milk, butter, and sugar, are light and spongy; they are first browned on both sides and then finished in a slow oven.

Shortbread is specially crisp and short, and *Scotch shortbread* is particularly rich. It is made of flour and butter or lard, sometimes plain and sometimes flavoured with citron, chopped almonds, or caraways.

Tea biscuits are made of sifted flour, German yeast, milk, butter, and salt.

Water biscuits are thin, white, and circular, with small holes pricked in, and are made of flour, water, and salt.

Storage of Biscuits.—Biscuits should always be kept as dry as practicable, since moulds are very prone to develop upon them if they become damp. Spores of fungus are very common in the air, and if these fall on softened nutrient surfaces, such as moist bread or biscuit, they are liable to develop at a rapid rate and spoil the articles. Hence biscuits should be kept covered up to keep the spores off as far as possible, and stored in a dry place to prevent the development of any spores that may in any case have fallen on them. Biscuits made from unsound flour, or which have not been sufficiently dried, are liable to be affected most by the moisture of the atmosphere. The harder a biscuit is dried in an oven the longer it will keep. Rich biscuits are prone to turn rancid if kept too long; this is probably due to the oxidation of the fat or to its decomposition by microbial organisms.

Sugar is said to retard the growth of moulds; the more sugar there is the better the biscuit is believed to keep, and for this reason most of the biscuits exported to India and other warm countries are of the "mixed" or sweet kinds. But even highly-sugared soft biscuits will become damp if placed long in a moist atmosphere; and the plain, sugarless kinds are readily affected. Ginger nuts and water biscuits alike suffer unless they are kept dry.

Excessive paleness or whiteness is not considered a good feature in biscuits; it is usually suggestive of age or of imperfect baking.

Cakes are now sold by many grocers, and are made in many forms, which need not here be particularized. The staple ingredients of the manufactured cakes are flour, butter, margarine, eggs, sugar, and milk. For the lighter kinds baking powder or volatile salts (carbonate of ammonia) are a good deal used; and for colouring ingredients turmeric and saffron, the latter being used in liquid form, and preferred because of the more uniform distribution of colour.

Lunch cake contains raisins, butter, sugar, eggs, and flour.

Pound cake contains mixed currants, sultanas, and peel, and sometimes dried cherries and cinnamon.

Madeira cakes, without fruit, are generally baked in round hoops or tins, papered, and have slices of citron peel on the top.

Genoa cakes contain currants and sultanas, are baked in square tins, and usually have chopped almonds on the top. In *Seed Genoa* the fruit is replaced by caraways.

Sponge cakes are made of caster sugar, eggs, and flour, with a little essence of lemon.

Tea cakes are made mainly of flour, lard, sugar, and milk, and are fermented with yeast; baked in round hoops and brushed over with egg wash.

The icing used to ornament cakes consists of icing sugar (finest sifted loaf) worked up into a paste with white-of-egg and a little lemon juice, and either coloured or left plain. For *almond icing* blanched sweet almonds are powdered and added;

and *cocoanut* and *chocolate icing* are prepared in much the same way.

Note that while air-tight tins are good for biscuit-keeping they are not advisable for cakes. Make a point of selling the oldest first, whether of cakes or biscuits.

Confectionery includes a very large variety of sweets, fancy fruits, bon-bons, and fancy chocolates.

Sweets include such leading kinds as *lozenges*, *comfits*, *sugar candy*, *fondants*, *barley sugar*, *pastilles*, *toffees*, and so on. Sugar is, of course, the main ingredient, and to give variety to it the sweet-maker uses colouring and flavouring. The following are the chief *colouring substances*:—Vegetable products: Saffron, turmeric, logwood, fustic, Brazil wood, and cherry red. Animal products: Cochineal and carmine. Manufactured products: Prussian blue, magenta, and various other aniline colours. The last-named are now largely used, some large confectioners employing little else. *Flavouring substances* include: (1) Essential oils of almond, aniseed, bergamot, caraway, cassia, cinnamon, cloves, citron, lavender, lemon, nutmeg, orange, orris, peppermint, and verbena. (2) Fruit essences, such as apricot, blackberry, cherry, cowslip, currant, damson, peach, pear, pineapple, plum, raisin, raspberry, strawberry, vanilla, &c.

Lozenges are merely refined sugar ground to a very fine powder, mixed with dissolved gum, and flavoured with essential oils or other ingredients.

Comfits or hard confections have a core or centre such as a coriander, or caraway, or an almond, or another sweet, around which cores successive layers of sugar are deposited till the sweets are built up to the desired size.

Sugar candy is simply sugar which has been crystallized in a special way, and is either coloured or left white. Fancy candies are flavoured with ginger, cocoanut, and are coloured in various hues. The candies most common are white, pale, straw-yellow, yellow, dark yellow, light brown, brown, and dark brown.

Dragées are fruits, nuts, seeds, &c., coated with a candy made of gum tragacanth and sugar.

Fondants are made of sugar syrup evaporated down to the crystallizing point, then coloured and flavoured, and cast in moulds made of starch.

Chocolate creams consist of an inner core of white sweet "cream" in a shell of chocolate, the "cream" being either sugar alone or a mixture of sugar and cocoa butter (which see).

Barley sugar consists of sugar boiled until on cooling and hardening it assumes a glassy appearance and fracture. This boiled sugar is worked up into many forms of sweets such as balls, sticks, coils. By drawing it out while plastic the boiled sugar becomes opaque and porous instead of glassy, and in this state it forms what is known as *rock*.

Pastilles are preparations containing large proportions of gum or gelatine, in a solution of which the sugar is dissolved. They are usually tinted and flavoured with fruit essences.

Toffee and *Butter Scotch* are made by boiling sugar, honey, and butter together; frequently the honey is omitted.

Caramels are prepared by boiling sugar, cream, glucose, syrup, and butter together until the mixture will set hard on cooling. Various flavouring substances are added whilst the ingredients are still hot: thus vanilla caramels, raspberry caramels, and strawberry caramels are produced.

Jujubes are manufactured by boiling down sugar syrup and glucose, and then dissolving in the hot mixture a quantity of previously soaked gelatine and a little tartaric acid. The proper flavouring is then added (*e.g.* essence of lemon for lemon jujubes), and any desired colouring substance such as cochineal. The mixture is poured out to form a sheet, and cut into patterns with a machine or scissors. Gelatine goods are "crystallized" (*i.e.* covered with sugar crystals) by dipping them while soft into white sugar.

Liqueurs are sugar which has been boiled to the proper degree of concentration, coloured with colouring ingredients, and flavoured with the proper essence or liqueur (*e.g.* brandy or brandy essence for brandy liqueurs).

Nougat is a confection of crushed nut with honey or sugar.

The nuts used are such as almonds, pistachios, or filberts. *Marseilles white nougat* is stated to consist of almonds and pistachios boiled with Narbonne honey.

Bon-bons comprise various sweets, sugar plums, and other "goodies", and modern English usage applies the word specially to *Christmas crackers*, otherwise called *cosaques.*

Flowers, fruits, and other decorations on cakes are usually made of *marzipan*, or of *gum paste* the basis of which is gum tragacanth. This substance is in fine white pieces which form with water a thick sticky solution. A paste is made from the powdered gum with sugar and water and starch kneaded together. This paste may be dyed if required, and when it contains a large percentage of starch it is easily moulded by the fingers into any shape. Leaving out most of the starch, this kind of gum-paste is used for making dragées.

Chapter X.—BACON AND HAMS

Bacon has from time immemorial formed an important item of the food of some of the most virile races of mankind. The great Roman foods, for instance, were bread, bacon, oil, wine, and cheese, and Gibbon tells how the successors of Constantine on the throne of the Caesars were in the habit of distributing to the poorer people at large not only bread but, during five months of the year, a regular allowance of bacon, 3,250,000 lb. of that article of food being consumed yearly in Rome in the days of the third Valentinian. This bacon mainly came as a kind of tribute from the forests of Lucania, where the acorns fattened large droves of wild hogs. There is an amusing smack of modernity in the story that one of the Popes made a pile of money by obtaining a good bacon contract for the Roman army. Another ancient story, more creditable to Roman character, says that when the Persians interviewed the soldier-Emperor Carus in the field, they found him seated on the grass eating bacon and peas for supper.

In modern Britain bacon and ham are amongst the commonest of daily foods with all classes. A recent Government return reported that even the working people's families spend about 1*s.* a week on it, the proportion of the family income spent in meat, bacon, and fish averaging in Great Britain about 17½ per cent, rather less in Scotland, and rather more in London. The United Kingdom consumes not only a very large quantity of home-produced bacon and ham, but imports every year some £16,000,000 worth.

The **sources of supply** of the British market for imported bacon and hams are, according to true countries of consignment, as follows:—

BACON.

	Quantity.	Value.
United States	3,084,129 cwt.	£7,657,512
Denmark	1,463,660 „	4,323,218
Canada	883,102 „	2,337,761
Russia	59,897 „	168,261
Holland	40,413 „	123,805
Sweden	6,400 „	19,026
Other Foreign Countries ...	3,776 „	11,481
Other British Possessions	1,245 „	3,051

HAMS.

United States	1,254,616 cwt.	£3,364,971
Canada	45,658 „	118,436
Denmark	1,158 „	3,768
Germany	722 „	2 337
Other Foreign Countries ...	447 „	1 692
Other British Possessions	121 „	390

Swine are native to most countries of Europe and Asia. In America they have been introduced, but it is estimated that of the 118,000,000 in Europe, America, and Australasia, nearly one-half are in the United States. The Chinese pig is noted for fertility and the rapidity with which it puts on flesh, and this breed, and another easy fattener, the black Neapolitan, have been crossed with British breeds, the most noted breeds in the United Kingdom being the Yorkshire, Berkshire, Suffolk, and Tamworth, and in America the Chester-white and Poland-China. So much has the industry of pig-breeding—or, as the American says, hog-raising—been developed of recent years in the little country of Denmark, that the average number of pigs per thousand of population in Denmark is about 500, whereas in England it is 93; and Denmark, as the statistics above show, has become the second largest supplier of the British bacon market. There are about 1,250,000 pigs in Ireland; in the past twenty years the Irish bacon industry has to a considerable extent declined. Whilst the bacon factories in Limerick, Cork, and Waterford twenty years ago killed up to 20,000 hogs a week, they now kill but half the number. In Denmark from 30,000 to 40,000 hogs a week are killed, and in Canada almost as many, although twenty years ago Canada exported no bacon at all. In the United States in a recent year nearly 23,000,000 hogs were killed, 5,750,000 in Chicago alone.

World's Bacon Supply.—A German authority recently published the following survey of the world's supply of bacon:—

"South-eastern Europe, the original home of the pig, may be completely passed by, for since epidemics and want of food have decreased the number of pigs, and the German market has been closed, Hungary, Servia, Roumania, and Russia no more influence the world's price for bacon. Italy and France, which supply their own requirements of bacon at about two-thirds of the price in Germany, cannot be reckoned with in the world's market. Switzerland, Spain, and Norway belong to the bacon-importing countries. Sweden produces its own requirements, and is endeavouring again to become an exporter of bacon, which it has not been since the introduction of the duty on maize and other articles of food for the pigs eleven years ago. There are in Europe only two countries which export pigs or bacon, and they are Ireland and Denmark. The former country exports every week 30,000 hogs to England, of which two-thirds are alive, and the rest in the shape of bacon. The export from Denmark to England likewise amounts to about 1,500,000 hogs annually in the shape of bacon. Ireland, with a population of 4,000,000, exports two hogs for every five inhabitants; whilst Denmark, with its 2,500,000 inhabitants, exports three hogs for every five inhabitants. At this rate Germany, if adopting the same tariff and the same rational agriculture as Denmark, ought to be able to export 36,000,000 hogs annually. From where are the ever-increasing requirements to be supplied? Outside Europe there is only North America to reckon with, as

Mexico does not export bacon. In Canada, in the province of Ontario, 40,000 export hogs are killed every week. The other Canadian provinces have no importance for the world's market. Of these 40,000 hogs, some ten years ago 32,000 went to England as bacon; but by and by Canada's home consumption of bacon steadily increased, whilst the production remained about stationary, and of the 40,000 hogs produced per week only 15,000 to 18,000 are now exported to England, and the price is therefore almost as high as in Denmark—viz. 37 marks per 50 kilograms live-weight. If the Canadian population goes on increasing as has hitherto been the case, Canada's export of bacon to England will cease in the course of a few years. There only remains then the United States, and it is that country that regulates the price of bacon on the world's market. In the course of time, and under the influence of the immense increase in population, things, however, are subject to such changes that there is every reason to believe that this apparently inexhaustible country within a measureable time will consume its own production of bacon. The large slaughter-houses west of Chicago, which as little as twelve years ago competed with Chicago on the Eastern market, now send almost everything that is not used in the States around the Missouri to the Western and Southern States, whilst the East more and more has to fall back upon its own production. This state of affairs must likewise account for the fact that bacon prices in the United States, contrary to all expectation, have been slowly rising, and at the big slaughtering centres pigs now cost 31·50 marks (one mark about 1*s.*) per 50 kilograms live-weight, a price which has been reached but once before during a severe failure of crops. New places for export of bacon are Oklahoma, Arkansas, and Wisconsin, but so far they have not made much progress. The maize-growing States of Iowa, Illinois, Minnesota, Missouri, Kansas, and Nebraska are the only places in the world where an increase in the number of pigs raised takes place, and if it happened, through some cause or other, that the number of pigs in those parts was reduced by, say, only 20 per cent, we should see prices which would make the producers jump for joy, whilst millions of people, to a smaller or greater extent, would have to give up animal food."

Wholesale Trade.—The bulk of the trade is done in Great Britain by large wholesale importing houses. American bacon, for instance, is sold to the United Kingdom:

(1) F.o.b. or c.i.f. to the large wholesale importers—who use the bacon for their regular weekly sale to their own customers. A considerable amount of speculation underlies this trade, as the importers often buy three to four months' delivery at a time.

(2) The goods are sometimes consigned to the different

markets in England. The size of the consignments depends upon the demand in the home market. The consigned bacon is sold through the agents in England, either to those wholesale firms who do not care to import themselves, or to the large buyers who have many shops, and at the same time often have a limited wholesale trade. This means buyers who can do with twenty bales a week of all kinds of bacon.

The Bacon Pig.—In Great Britain the breeds of pigs have been reduced to three great classes: the Yorkshires (white), the Berkshires (black), and the Tamworths (reddish). More minutely they are classified thus: (1) Large Yorkshire, (2) middle white Yorkshire, (3) small Yorkshire, (4) Berkshire, (5) Tamworth, (6) large black, (7) small black. The Berkshires, crossed with the long white Yorkshire, give an excellent pig for bacon-curing; a large Yorkshire or Tamworth boar with Berkshire sows, or a large Yorkshire with an admixture of the middle white. Experiments in one of the United States Government's agricultural stations led to the conclusions: (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 lard types of pigs. The Irish Pig Improvement Association has informed Irish breeders 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 st. (stone = 14 lb.), the live-weight being rather less than 16 st. 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 st. 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 8½ and 11 st. 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 st., an *over-weight* hog; those weighing more fetch 2*s*. or 3*s*. per cwt. less, as the bacon made from them fetches considerably less money in the British market. What is required is a well-bred pig of about 168 lb. dead-weight, and this pig may be produced in seven months from birth. 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 British butchers and farmers commonly speak of pigs *alive* as weighing so many "score", the score being 20 lb. They are also referred to (but chiefly in dead-weight) by the stone of 14 lb.; but in British newspaper quotations of prices the Smithfield stone of 8 lb. is often used! Wiltshire *lean sizeable* and *sizeable* sides are produced from pigs weighing about 8 scores (160 lb.) dead-weight.

Pig-feeding for Bacon.—For producing good bacon, the foods which have been found most suitable 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 celebrated Yorkshire and Cumberland pigs are largely fed on potatoes and ground oats, which is a food that produces fine meat, not too fat. In Cumberland, Yorkshire, and the Midlands of England it has long been a custom to give the pigs skimmed milk for a month or so before killing. In Wiltshire the pigs are largely fed on barley meal. In Ireland the feed is generally a mixture of maize meal and potatoes. Maize (Indian corn) is very largely used in America, but is said to be the reason why the fat of American bacon melts away too much in the cooking. One reason for the good quality of much of the Danish bacon is said to be that the pigs in Denmark are largely fed on separated milk. At the Wiltshire factories it is customary to fatten up pigs bought for killing by feeding them on barley meal and milk: the barley is ground at the factory and given unscalded, mixed with the skim milk. The best authorities think that a mixed and rather varied diet is best for pigs intended for bacon. Foods to avoid for this purpose are fish and the refuse of breweries. It is stated that the latter produces a bacon that is watery and soft, which when cut glitters and sparkles —a kind called "shiners" in the wholesale trade, which will neither cure well nor keep. Fish, on the other hand, affects both the taste and smell of the bacon made from pigs fed upon it—a most unpleasant result.

Bacon-curing on the Small Scale.—A great deal of bacon and ham is still produced on farms, where the methods of curing practised are the same as have been used for many generations, if not from time immemorial. This method involves heavy salting, and the flavour of the meat is thereby rendered salter, while the keeping properties are extended beyond the time now commonly necessary. Nevertheless the farm-fed and farm-cured hams of Yorkshire, Cumberland, and Westmorland deservedly maintain their high reputation.

The process of curing bacon on a small scale is as follows. The pig's carcass is placed for a minute or two in a tank of boiling water, whereby the hair on the skin is loosened, so that it can be at once and easily scraped off. With large or bacon pigs the hair is singed off before the dipping. After the washing and scraping the pig is disembowelled and the carcass cleaned inside, and it is then hung in a cool place for twenty-four hours or longer that all the natural heat may be got rid of. When cooled the pig is cut up, the flitch or side of bacon being separated from the rest of the meat, and the ham removed or not according to the method of cutting adopted. On a stone floor or raised sill, in a dry, airy cellar or other cool, sunless place, the pieces to be cured are laid down skin undermost upon a thin bed of salt. A thin sprinkling of saltpetre is put over the meat and then a good layer of dry salt. Sometimes a little sugar is mixed with the salt. In this state the bacon is allowed to lie for a week, when it is lifted, the salt removed, and a new bed of fresh salt made. More saltpetre is sprinkled on the bacon when again laid down, and it is re-covered with salt as before. In about a week or ten days afterwards the bacon is again lifted and the salt swilled off. The bacon is then hung in a cool, airy place, where it gradually becomes dry and firm. When dry it may be used at once, or may be smoked—a process which both extends the curing and imparts a particular flavour, which some consumers like while others dislike.

Ham-curing.—A farmer's recipe is as follows:—"When the meat is *quite* cold, carefully trim each ham to make it as smooth as possible. (Every cut or ragged place in a ham adds to its liability to spoil, because such places are nearly always where decomposition or insects begin their work.) To 100 lb. of salt add from 5 to 8 lb. of sugar and not more than 1 oz. of saltpetre pulverized. Too much saltpetre injures the texture and flavour of the meat. Pack the meat in this mixture, making provision for drainage. When the meat has lain in salt long enough—and this need never be longer than four or five weeks —scald each piece in boiling water (which will be brine soon after the process begins) for from one-half to one minute. The object of this scalding is to destroy any insect germs or fungus spores that may be on or near the surface. Then hang and smoke." For **sugar-cured hams** the process is as follows. The fresh meat (which must always be quite cool from the animal heat) is rubbed thoroughly with salt and then placed on a stone slab or sill, when 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 1 lb. of saltpetre and a handful of salt to 70 lb. of meat. Brown sugar and molasses mixed—1 lb. of each—is then rubbed over the hams daily for a fortnight, and finally they are hung in oak smoke.

Scottish Bacon-curing.—*The Scottish Farmer* in describing the method of bacon-curing as generally practised in the best districts for Scottish home-cured bacon some years ago, pointed out that the chief points to be observed are perfect cleanliness, thorough salting of the whole flesh, and proper storage. The process is as follows. Lay your flitches of bacon on a stone floor or on stone scones in a cool, airy, sunless, but not damp apartment. Rub them on both sides with common salt, leave for a day, then rub it off. Then prepare a mixture in the following proportions: 4 lb. common salt, $1\frac{1}{2}$ lb. bay-salt, $1\frac{1}{2}$ lb. brown sugar, 4 oz. saltpetre. Be sure not to overdose with saltpetre or the flavour will be injured. Spread a thin layer of this mixture on each side of the flitches and let them lie in it for a month, turning and rubbing them every day, giving more of the salt mixture when necessary. Be careful to rub well into the folds, ends, &c., and examine daily to see if there are any spots turning mouldy and clammy, when these must be removed. At the end of a month hang up to dry in a cool, airy room, or smoke for a week.

Ayrshire Bacon.—Mr. Robert Kerr, of Edinburgh, writes:—"For Ayrshire bacon—that is, bacon with the skin taken off, all bones removed, cut into quarters, and rolled up—the pig is carefully skinned after head and feet have been removed, and all the bones having been taken out, the carcass is cut into four quarters. These are put in pickle for two or three days in winter, or for four days in warm weather. The pickle is prepared with salt, saltpetre, sugar, and if possible some old pickle that has retained colour and flavour. When the three or four days are up the bacon is taken out, partly dried, and then rolled up, and after 'firming' a little longer is ready to be sent out for sale. Bacon thus cured is not intended to keep long."

Wet Cure.—For curing in a small way the "wet cure" is sometimes adopted. The meat when cool is thrown into a purging tank to eliminate the blood, and remains there a day and a night, after which it is taken out and any blood veins pressed so as to squeeze out all blood remaining. It is then placed in a pickle. The pickle is made by taking 55 lb. of salt, 5 lb. of saltpetre, 5 lb. of pure cane sugar, and 5 lb. of "dry antiseptic", mixed with 20 gal. of pure water and boiled till clear, then allowed to cool and placed in large earthenware pans or similar receptacles. In a clean pickle thus prepared the meat remains fourteen days or so, if for mild cure; if for long keeping the pickling must last a week or a fortnight longer. The meat is then removed from the pickle and hung up to dry. The "purging tank" which has been mentioned is merely a tank of pickle prepared in the same way as that described.

Ham-curing for the East.—Mr. Loudon Douglas, writing in the *Meat Trades Journal*, gives the following information:—"The hams wanted in the East should be of an average weight of 15 lb., and should be cured pretty fully, as they are subjected to various temperatures on the voyage. When they arrive, say in China, they are kept till wanted for use at a high average temperature. It is therefore essential that the preparations at this end should be very carefully attended to. The following are the rules which should be observed:—

"The hams should be chilled to 38° F. if possible, and should then be plunged into a pickle made from the following recipe: 55 lb. salt, 6 lb. dry antiseptic, 5 lb. saltpetre, 1 lb. sal prunella, made up to 20 gal., and if not clear, boiled, skimming off any matter which might rise to the surface. This pickle, which should be marked 'purging pickle', should be kept by itself. Another pickle should be prepared from the following recipe: 55 lb. salt, 6 lb. dry antiseptic, 4 lb. saltpetre, 1 lb. sal prunella, made up to 20 gal. with water, and boiled and skimmed till clear. This pickle should be marked 'pumping pickle'. The hams are thrown into the purging pickle, which is kept in curing tubs, or vats, in the curing cellar, and they are allowed to remain there overnight. On the following day they are taken out and the blood from the blood vein squeezed out. Immediately afterwards they are pumped only once in the blood vein, the needle being pushed well up to the joint. They are then laid down in the curing bed, which should be at a temperature of about 42° F., and placed with the shanks down. An equal mixture of dry antiseptic and granulated saltpetre having been previously prepared is dusted over the whole of the cut surface by means of a dredger, and on top of that is laid a heavy layer of fine salt. The hams should not be touched for 21 days, except that some of them may want a little more salt added. . . . Now, take the hams up and wash them in cold water. If they are wanted very white this colour is obtained by scalding them for a minute. Under ordinary circumstances, however, all that is wanted now is to dry them. The drying should be conducted in a room heated to 85° F. and kept constantly at that temperature. In about 30 days the hams will be dry and can, if needed, be smoked."

Wiltshire Bacon.—Wiltshire bacon is cured without the bladebone, and the pig is "scorched" instead of scalded. The carcass is run into a very hot furnace, where in about half a minute all the hair is singed off. The pigs then slide along an 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 they go to the 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, with the bones except the bladebone left in, they are salted and treated by the injection of brine with a special force pump. 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.

Factory Curing.—Half a century ago hogs were always singed of their hair, after killing, by means of burning straw. The modern factory process includes a singeing chamber; and for convenience the various departments of the factory are arranged in the form of a hollow square, following each other in sequence right round, and connected by a continuous rail on which runs a wheeled frame, so that each pig can be hung up and travel from one process to another without loss of time. The curing process as carried out quickly by pumping brine into the meat is thus described by Mr. Douglas:—"The sides are placed one by one on a bench, and are pumped with a pickle of the following constitution: 55 lb. salt, 5 lb. saltpetre, 5 lb. pure cane sugar, 5 lb. dry antiseptic. Make this quantity up to 20 gal. with water, and boil and skim till clear. We take 20 gal. as a convenient quantity to handle, but, of course, either a smaller or larger quantity may be produced at will by dividing or multiplying the ingredients by the same figure. This pickle is kept at the same temperature as the cellar itself, and is utilized by means of a pickle pump. The needle of the pickle pump is so constructed that when the pickle is pumped through it, it is distributed at various openings in the form of a spiral, and thus enters the meat in all directions. The pressure at which this pump works is about 40 lb., although in some cases I have found a pressure so high as 60 lb. on the square inch. The number of places in which a side is pumped amounts to about fourteen, and generally these are the fleshy parts. The pocket hole which is formed by the removal of the bladebone is generally washed with a brush and is filled up with salt, saltpetre, and antiseptic at once. In some places also the trimmed side is washed with a brush on the inside with the same pickle. The side, having been pumped, is placed upon the cellar floor, and is immediately sprinkled over with an equal mixture of saltpetre and dry antiseptic. A thin layer of this mixture is laid on the side, or dusted on by means of a dredger. On the top of this a thick layer of salt is then placed. 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. In this form it is 'green' bacon."

The "Auto" Cure.—A development of this method is the "Auto" curing process, in which atmospheric pressure is employed in order to force the curing pickle into the bacon. *The Practical Grocer* states that 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; and (3) the "Auto-cure" method. The verdict was that the injection method gave a smaller, and the Auto-cure a larger outturn 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, 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.

Bacon-smoking.—Although not invariably or necessarily so, bacon is often smoked as a part of the curing process. For this purpose the cured bacon, when dried, is placed in a smcking-house or stove. When the bacon is about twenty days old this can be done with safety. The smoking-house may be a single stove, or a tower of stoves, as it were, one over the other. In the stove at the bottom a little straw is spread, and over that a bag of sawdust—oak or elm preferred—and a few bits of wood. The bacon is dusted with pea meal and then hung in the stove. The edges of the straw are then ignited, and the doors of the stove are closed, the straw and sawdust being left to smoulder, producing a thick, milky-white smoke. In this smoke the bacon hangs for a period depending upon the degree of smokiness preferred in the flavour. In the district around Edinburgh, Mr. Kerr says a single night's smoking gives flavour enough for the consumers; in other districts the smoking may go on for two or three days. The temperature is maintained at about 85° F.; that is, care must be taken that it is not high enough to cook the meat.

Borax is frequently used to assist in keeping bacon, but it is merely a preservative, not a curing agent. Box meats and bacon are often packed in borax powder, as also mild-cured hams. An American technical authority says:—"For fresh meat, sprinkle a little salt on the pieces of meat and cover well with the borax. It will not injure the taste of the meat, and is said by the best authority to be perfectly harmless when used in this way. It is also excellent to preserve hams and shoulders, and keep them free from flies. It is used for this purpose in the packing-houses of large cities. Leave the hams and shoulders in salt as long as desired; take them out, wash and dry carefully, covering the flesh side with the borax. Be careful to put it in every crevice where a fly might locate. Some immerse the joints in strong pepper tea before using the borax. This is scarcely necessary, but will do no harm. Meat treated in this way may be left hanging in the smoke-house all summer without sacking."

Cuts.—These are best understood from diagrams, but the following particulars may be of service. The pigs used for the Cumberland hams and bacon are very heavy and fat. A York or Cumberland ham is a large one; a "Picnic", a small one. 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 "bladebone", 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. 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 *gammonless sides*, *three-quarter sides*, and *middles*; the gammonless sides being the whole sides 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, cured or smoked.

The *Grocer Diary* gives the following particulars of the various cuts of Canadian and American pork and bacon:—

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 in. wide, running from back to belly.

Ordinary Mess Pork is cut as above, but made from lighter hogs, ranging from 170 to 200 lb.

Prime Mess is cut from a still lighter class, ranging from 100 to 150 lb., the shoulder being included. It is generally cut into 4-lb. pieces, so that fifty should make a barrel of 200 lb.

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.

Cumberlands, the shoulder and side together, with backbone out; the shank cut short.

Stretfords, sides and shoulders together; the shoulder and bone taken out, shank left in; backbone and upper half of rib removed.

Bacon made from the shoulders and ribs is known as *rib*, *clear rib* having the backbone sawn out, and *clear* being free from both backbone and ribs.

In *long English hams* the whole hip bone is left in, and the ham is cut the full size.

With regard to the use of the word "cut" generally, the novice should note that there is a good deal of difference between describing a piece of meat by a proper name and describing it by that name *plus* the word "cut". The latter simply means that the meat has been cured or cut in the manner of the former. Thus "Wiltshire-cut" bacon is not "Wiltshire" bacon, or even the bacon of imported Irish pigs killed and cured in Wiltshire; it is a piece of bacon that has been cured and cut in the same fashion as real Wiltshire bacon is cured and cut. An American ham cannot be sold as "Scotch ham". The use of such phrases as "Wiltshire cut" appears to be on a somewhat different footing, and to be tolerated by custom, at any rate in the wholesale trade; but of course the application by a retailer of the term "Wiltshire" to Wiltshire-cut American or Danish bacon would involve risk of prosecution.

Weights and Sizes.—The wholesale dealers classify bacon sides, according to their size and weight, as *lean*, *prime*, *stout*, *sizable*, and *sixes*. Taking sizable as the normal size, there is *lean sizable*, *prime sizable*, and *stout sizable*. Then comes a term *sixes*, for six smaller sides to make up about the same weight as four larger sides, and thus we have *lean sixes*, *prime sixes*, and *stout sixes*. 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 four sides of sizable bacon weighs from 1 cwt. 3 qr. to 2 cwt. 1 qr. net; sixes weigh from 2 cwt. 1 qr. to 2 cwt. 3 qr.; stout sizable, from 2 cwt. to a quarter more; and heavy, from 2 cwt. 2 qr. to 3 cwt. The average weight of a single side of Nos. 1, 2, and 3 Danish bacon is 56 lb.; of four-sided stout (Nos. 1 and 2), single side, from 63 lb. to 70 lb.; and sixes (of full weight), 46 lb. to 49 lb. Canadian bacon in No. 1 selection averages 36/42 lb. to 58/62 lb.; No. 2 selection, 46/50 lb. for sizable, and the others in proportion, heavy being over 62 lb. Canadian pea-fed bacon and American sides, middles, shoulders, and legs are imported in boxes of about 4 cwt. to 6 cwt. net; while New Zealand bacon comes in wooden cases, containing six sides each, and weighing 3½ to 4 cwt. gross. The weights of individual sides and hams vary. In Liverpool the Cumberland-cut ham, sold in the poorer districts, averages 20 lb. to 30 lb.; and in bacon, prime weights, of 56 lb. to 60 lb. a side, or stout, of 70 lb. to 75 lb., are mostly taken.

Packing.—In baled bacon clean fresh straw is used to separate the sides. Borax powder and salt are commonly used as packing materials. Smoked hams are often rubbed with a cloth soaked with fresh vaseline before being packed. For export (as for the East, mentioned above) Mr. Douglas says a slight dusting of antiseptic pepper serves to make the hams fly-proof, and they are then tightly rolled and sewed into fresh new canvas.

A Large Warehouse.—A large modern English bacon and ham warehouse, which may be described by way of illustration, contains three floors and a basement, each measuring 120 ft. by 40 ft., and divided off into various sections and departments to suit this special business. The principal trade is in box meats from the United States and Canada, but other goods are also handled; the quantity dealt with is about a hundred tons of bacon and hams every week. The goods are landed on the first floor by means of a bridge, and as the boxes arrive they are at once dismantled and their contents placed in soaking or steeping vats so as to remove salt and borax. They are left for a day thus, and are then taken out and brushed with water in washing vats. One style of washing is by means of a special arrangement, whereby the water is forced round by a concentric rotary pump and used over and over again, and so much economy is effected. From the washing-troughs the meats are passed into drying-rooms on trolleys. Here, by means of an arrangement of steam pipes and circulating fans, they are rapidly dried, afterwards being wheeled out to make room for others. One of the many drying-rooms is fitted with tinted glass, to prevent the rays of the sun from darkening the lean of the meat. From the drying-rooms the meats are either immediately cooled off, or are hung up in the smoke stoves to be smoked. Sometimes meats are hung directly in the smoke stoves after washing, and without the intermediate drying. Smoke stoves have come to be constructed on scientific principles of late years, and the six large places devoted to this section of the work are fitted with every modern requirement. The process is known as the Douglas system, and involves the use of grilled steam pipes, patent ventilating and regulating shutters, and the use of thermometers fixed in the walls, which can be read from the outside. The object is to control the smoking process mechanically, and with regard to the proper drying temperature (85° to 90° F.). Throughout the various floors there are "miles" of hanging bars, from which are suspended the hams, bacon, &c., and there is also a complete set of tables for trimming, boning, rolling, and carrying out all the other operations incidental to such a large establishment. The goods are packed and delivered from the ground floor, two 1-ton hoists being in constant use for the removal of goods ready to go out. On the top floor there is a large ham-cooking department. Here, by means of three patent ham-cookers, some 2000 to 3000 hams per week can be cooked. The hams are first of all boned and then placed in the cookers for from three to four hours, according to size. The heating effect is due to wet and dry steam—no water being used, and by this method the loss in cooking is minimized. As the cooling of such large numbers of hams is a serious affair, a pre-cooling chamber is provided, into which racks fresh from the steam cookers are run, and by means of a fan the excess of heat is rapidly removed. The racks are then run into one of two long tunnels capable of holding five trolleys apiece. Here the cooling effect is produced by means of a refrigerating machine fitted with a circulating cooler and storage reserve of brine in brine drums. The temperature attainable is about 35° F., and a short time under this hardens the hams and renders them easy to pack and send out. By means of the patent cookers and the cooling-tunnels hams can be boned, cooked, cooled, packed, and sent out all in one day.

Reception and Storage. — Most retail grocers buy their bacon and hams already smoked and dried, or green and dried, and many receive them in a condition fit for sale. In that case all that is necessary is to hang the meat in a cool and airy place after carefully weighing and noting the weights as received. The sides of bacon are usually hung up, not higgledy-piggledy, but arranged in lefts and rights for neatness and convenience. Dirty hooks should always be avoided, and as few hook-holes as possible made. All hooks used in hanging sides should be scalded every three weeks or so. For hanging up hams use instead of a hook a piece of stout cord looped round the shank at the knuckle.

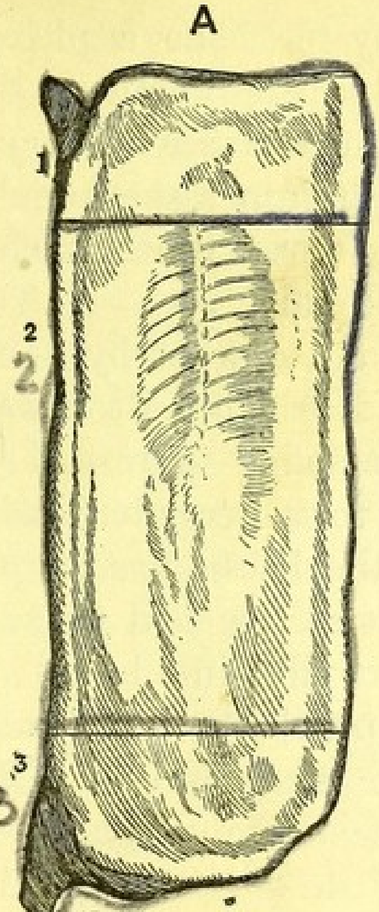
Washing and Drying.—Imported meats have always—and others commonly—to be washed and dried to remove the superfluous salt or borax, &c., used in packing. The proper drying-room is a room set apart for that purpose, if not specially built, heated all round by steam pipes, and kept at a temperature of 85° 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. Regarding the loss in washing and drying bacon, Mr. R. Rutherford, a Liverpool trader of large experience, writes: "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 lb. to 10 lb. 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 lb. to 5 lb. 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 28*s.* per cwt., it must necessarily cost two farthings to dry it at 56*s.* . . . To illustrate the seriousness of not carefully noting the loss in drying—if eleven boxes of bacon, weighing 5500 lb., be hung up for seven days and then re-weighed, it will be found that about 500 lb., which would represent one complete box, has 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 lb. to 12 lb. per cwt., from drying 7 lb. to 10 lb. per cwt. Taking the mean of these calculations and estimating the loss at 20 lb. per cwt., or calculating 92 lb. when rolled at the box cost of 112 lb., it works out as follows: Bacon costing in the box—30*s.* 6*d.*, Liverpool terms, will cost 4*d.* per lb. rolled and dried; 34*s.* 6*d.*, 4½*d.*; 40*s.* 3*d.*, 5¼*d.*; 44*s.*, 5¾*d.*; 48*s.*, 6¼*d.*; 51*s.* 9*d.*, 6¾*d.*; 55*s.* 6*d.*, 7¼*d.*; 59*s.* 6*d.*, 7¾*d.*; 63*s.* 3*d.*, 8¼*d.* 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 1*s.* 6*d.* per cwt. over dry price. 'C.i.f. terms' are approximately 1*s.* 6*d.* on 50*s.* per cwt. over Liverpool terms. 'Box weights' are approximately 1*s.* on 50*s.* per cwt. over Liverpool terms."

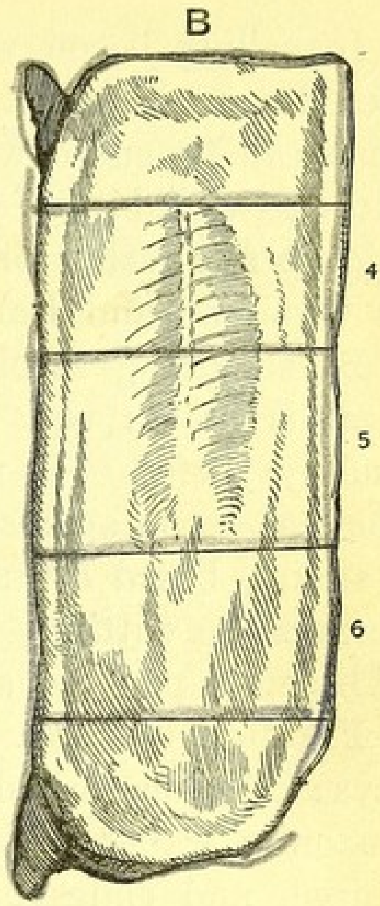
Cutting up Bacon.—In cutting up bacon for retail the first question to arise is that of the minimum price to be charged in order to show a working profit, having regard to the cost of the bacon as actually cut and your working expenses. On this point Mr. Rutherford observes: "Owing to the fluctuating 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 5¼*d.* per lb., a seventh added will bring the price to 6*d.* 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."

Next comes the question of the actual mode of cutting up the bacon and the prices to be allotted to different portions. The object is obviously to cut the meat so that portions which customers prefer, and will give best prices for, shall be as large as they can reasonably be. Clever cutting has much to do with the profit on bacon or ham in a retail shop. Methods of cutting vary somewhat, as also does the bacon itself, but the accompanying diagrams will illustrate the process.

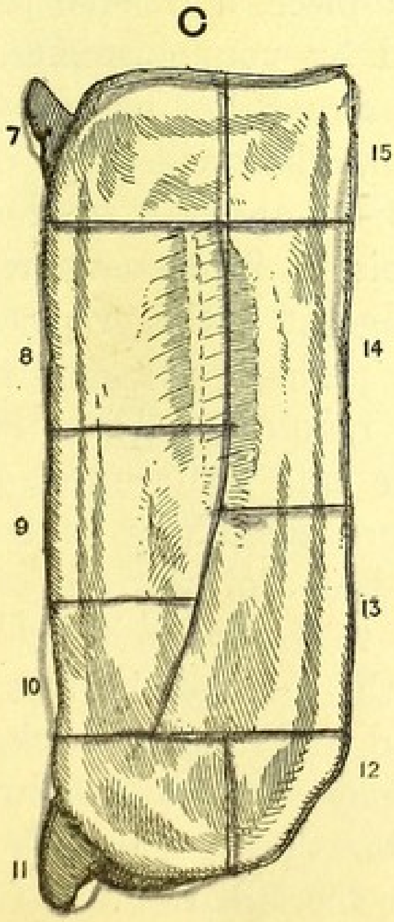
The following calculations, laid before the Oxford Retailers' Association by one of their members, indicate how a side of 50 lb. weight may be cut up and priced according to the respective values of the portions, on (as will be seen) three different scales of prices, based respectively upon the gammon at 9*d.*, 8*d.*, and 7½*d.* a lb.:—

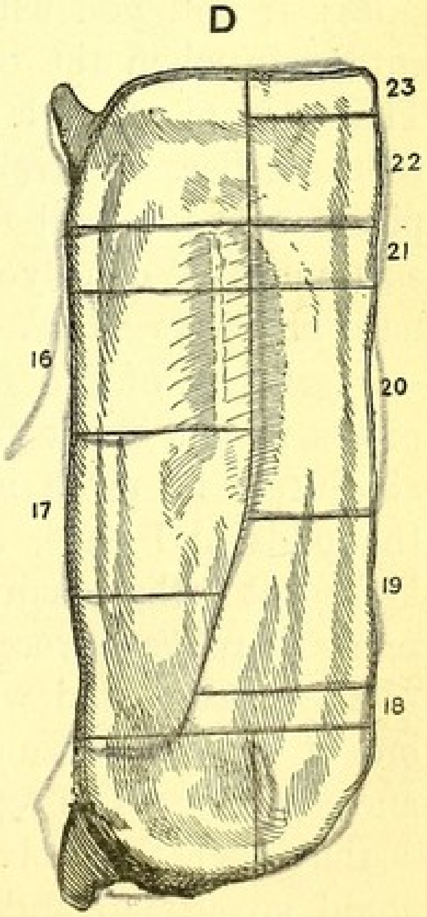
Cut.	Weight	Per lb.	Total.	Per lb.	Total.	Per lb.	Total.
	lb. oz.	s. d.	£ s. d.	d.	£ s. d.	d.	£ s. d.
Gammon ...	11 14	0 9	0 8 11	8	0 7 11	7½	0 7 5
Loin	6 2	1 0	0 6 1½	11	0 5 7½	10	0 5 1½
Ribs	7 10	1 0	0 7 7½	11	0 7 0	10	0 6 4½
Streaky ...	5 7	0 11	0 5 0	10½	0 4 9½	9½	0 4 4
Flank ...	2 2	0 5	0 0 11	5	0 0 11	5	0 0 11
Top ribs ...	2 0	0 9	0 1 6	9	0 1 6	9	0 1 6
Top streaky	1 10	0 8	0 1 1	8	0 1 1	8	0 1 1
Collar ...	6 3	0 8½	0 4 4½	8	0 4 1½	7½	0 3 10½
Fore-hock	7 0	0 5½	0 3 2½	5½	0 3 2½	5	0 2 11
	50 0		1 18 9		1 16 2		1 13 6½





No.
1. Fore-end.
2. Middle.
3. Gammon with corner.
1, 2, 3 constitute the side.
2 and 3 form a three-quarter side.
4, 5, 6 cut through side.
7. Fore-hock.
8. Thick streaky.
9. Thin streaky.
10. Flank.
11. Gammon.
12. Corner of gammon.
13. Long loin.
14. Back and ribs.
15. Collar.
16. Top of thick streaky.
17. Streaky, middle cut.
18. Leanest part of loin.
19. Loin.
20. Back ribs prime cut.
21. Thick back.
22. Prime part of collar.
23. End of collar.





No.	Weight about	
1.	16	lb.
2.	30	,,
3.	14	,,
4.	10	,,
5.	11	,,
6.	9	,,
7.	8	,,
8.	8	,,
9.	4	,,
10.	3	,,
11.	10	,,
12.	4	,,
13.	7	,,
14.	8	,,
15.	8	,,
16.	$2\frac{1}{2}$	,,
17.	$5\frac{1}{2}$	,,
18.	2	,,
19.	5	,,
20.	6	,,
21.	2	,,
22.	6	,,
23.	2	,,
Whole side	60	,,

BACON CUTS

In selling bacon which contains the oyster bone a piece troublesome to sell is sometimes cut. By a little practice this bone can be cut out, when reached, at the sacrifice of very little meat, and the portion left can be cut into rashers and sold at full rasher price. Note that mild-cured bacon, such as Canadian and Danish, requires a quick sale.

Bacon-slicing machines are in common use whereby the meat is cut in very thin slices, a method which customers usually prefer. A wooden stand with a ledge to rest the piece of bacon against is sometimes fixed to the counter, and a sliding board arranged so as to hold the bacon firmly in place while cutting. To avoid waste, cut as few odd pieces of bacon as possible, and do not leave bacon piled in a heap.

Practical Advice.—An experienced provision merchant says: "When asked for bacon, enquire 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 themselves; 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 1*s.* per lb. for your prime cuts when bacon is 68*s.* to 70*s.* per cwt., or if a piece is taken which is cut off, say 11*d.* 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 ½ oz. weight being put on the scales to see if it will go, or the 1½ oz. if it will not go 2 oz. I have checked the weight of a pound of rashers and found it go 1 lb. ½ 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."

Customers' Preferences.—It is usually necessary for a retailer to take careful note of the various preferences of his best customers. For the purpose of doing this some retailers adopt a plan of keeping data to which any assistant can refer thus:—

Bacon List

Mrs. Black	B.
Mrs. White	L.
Mrs. Brown	S.

The letters are merely for convenience to save time; B signifying back; L, loin; S, streaky; G H, gammon hock, and so on.

To Keep Fly from Hams.—A retailer, who writes on this practical point, recommends the use of borax. Another advises thus: "With each 2 lb. of finely powdered table salt add ¼ lb. finest white pepper and 1 oz. of fine ground ginger.

A little powdered borax may be added if one desires, but my own opinion is against borax or boracic acid for cured meats. The above should be well mixed, and stored in a jar or wide-mouthed bottle, to be easily got at with the hands. When a cask of hams comes in, each should be thoroughly rubbed with it to fill all cracks, unless very large holes, which should be previously stopped, and, after rubbing with the powder, each should be again rubbed with some lard or fat to keep it on if they are to be hung. It is not wise to keep them hanging for long, unless in a cool and not too dry room, as they perish with wind and heat. Buying three months ahead for stock is the best plan; then, if straight from curing-house or smoke-house, they should hang, say, for three weeks or a month; then pack down in straw, to get a little blue mould, for the second month, and sell from them hanging in the third month. During the hot months hams should be turned over and scrutinized for fly each ten or fourteen days, to keep them in check."

Chapter XI.—CHEESE

The dairy product known to us as *cheese* and to the Romans as *caseus* (compare the German *Käse*) is defined in the United States' food standards in the following convenient summary:—

"*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. *Whey* is the product remaining after the removal of fat and casein from milk in the process of cheese-making."

The British Board of Agriculture and Fisheries was approached in 1906 by several local authorities who desired the fixing of standards for cheese under Section 4 of the Sale of Food and Drugs Act, 1899. But the Board decided not to do so, advancing the following reasons:—"It seems doubtful, in the first place, if the fixing of a standard for cheese would assist purchasers who ask for the kind of cheese they require under any of the numerous names by which the various cheeses are designated. There appears to be no difference in principle between fixing a standard for, *e.g.*, Dutch cheese, and fixing a standard for milk, but there are numerous practical differences. There are at least 40 different kinds of cheese on the market, and the expenditure of public money in experiments and enquiries necessary to fix so many standards would be considerable. The proportion of moisture in cheese decreases, and the proportion of fat consequently increases during the time a cheese is kept in store. The change which occurs is very marked in some cheeses, and would constitute an additional difficulty in the fixing and administration of standards for this article. Some persons eat certain kinds of cheese as a relish only and in small quantities. These require an article which displays certain characteristics, some of which do not depend on the proportion of butter fat in the cheese. To others, who regard cheese as food, the proportion of butter fat is of importance, but the results of the enquiries that were made tend to show that, generally speaking, a reduction of the proportion of butter fat in cheese is accompanied by a deterioration in quality which is apparent to the purchaser. When once a cheese is made no one can do anything to add moisture to it or abstract butter fat from it. The risk of cheese being adulterated is therefore much less than the risk of adulteration of milk or butter. There is no reason to suppose that there is any considerable fraudulent sale of cheese, except margarine cheese, being carried on at the present time. There are some cheeses on the market which contain practically no butter fat, and the quantity of these has increased lately, but their poorness of quality is obvious to the purchaser, and they are only sold at a price which they may be worth, notwithstanding their lack of fat. One reason for regulating the sale of milk is that it is used as food of infants and invalids. This reason does not apply in the case of cheese."

Composition of Cheese.—The American standard speaks of "milk" simply. It is from cows' milk that cheese is chiefly manufactured, but not exclusively. In the United Kingdom ewe-milk cheese was at one time an article of diet not uncommon; and on the European Continent a considerable quantity of cheese is made still from the milk of goats, or in some cases from that of ewes. Chemically, cheese is composed of water, casein, fat, sugar, and a variable quantity of common salt, with alkaline and earthy phosphates. (See *Chemistry of Cheese* in this chapter.) The varieties of cheese depend upon the pasture of the cows, the mode of manufacture, and the after treatment. The Ayrshire cow is generally regarded as pre-eminently suited for the cheese dairyman, not only on account of the large percentage of casein contained in the milk, but because the smallness of the fat globules renders them less liable to be dispersed and lost in the whey during the stirring of the curd. One gallon of milk will usually produce a pound of cheese.

British Cheese Import. — The importation of cheese for the British market was as shown below in a recent year, the true countries of origin being given:—

	Cwt.
Canada	1,908,555
United States	251,705
Netherlands	229,072
New Zealand	126,216
Italy	89,880
France	18,977
Switzerland	8,792
Other countries	5,597
Total	2,638,794

The average import price for the period 1896 to 1900 inclusive was 5½d. a lb. For the period 1901 to 1905 it rose to 6d. a lb., and in 1906 it rose further to 6½d. a lb. It has been estimated that the grand total of the home production and imports of the United Kingdom for a single year amounts to about 280,000 tons of cheese, rather more than one-half being made in the British islands.

Kinds of Cheese.—As mentioned above there are forty different kinds of cheese known on the British market. Authorities state that as many as a hundred different varieties are made, but some are merely the same as others under a different name. They are classed as (1) *Hard* and (2) *Soft*, according to their consistency, firm or otherwise; and again they are spoken of as *Fat*, *Half-fat*, and *Lean*, according as they are made from full milk, half skim milk, or skim milk respectively. *Hard* cheeses, such as Cheddar, Cheshire, Derby, Dunlop, and Gloucester, are intended for keeping, and, when well salted, will keep for years. *Soft* cheeses, such as Camembert and Cream cheese, are not subjected to great pressure in making, and will not keep for long. A more scientific classification, depending upon the chief differences of manufacture, as explained below, is as follows:—

(I). **Hard Cheeses.**—These are produced by coagulating the milk at a temperature of 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-Cavallo, 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.

(II). **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'Évêque, made in France; and Stracchino, made in Italy.

(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.

Generally speaking, a cheese with a more or less "smeary" substance is classed as soft, and one that is friable and dry as hard; but there is no hard-and-fast line between the two classes. Details as to the varieties of cheese will be given further on.

Manufacture.—The cheesy principle of milk is called *casein*, a substance which, when dry, is white or yellowish. When milk is boiled a film of casein forms on the surface. 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, which is partly due to the growth in it of certain bacteria and fungi, and partly to the action of a chemical ferment natural to milk and called an *enzyme*.

Rennet itself is an "enzyme", an extract from the fourth stomach of a calf preserved by the addition of a brine solution. The acid in it which acts upon the milk is peptic acid, a secretion from the peptic glands of the stomach. Rennet is now commonly used in the form of an extract, or a powder;

but formerly, and to some extent still, it was customary for the cheese-maker to prepare his own extract, as required, from the dried and salted "vells" which grocers in the cheese districts used to keep in stock. The proportion of rennet required to coagulate a given quantity of milk depends on the cheese desired. For making Cheddar about 4 oz. of rennet is used to 100 gal. of milk. In some parts of Holland curd is obtained by the use of hydrochloric acid or acetic acid. In whatever way obtained, the **curd**, it will be seen, is the raw material from which cheese is manufactured.

The **process** of cheese-making varies with every kind of cheese, but generally speaking is as follows:—

As milk curds best with rennet when slightly sour or "ripe", it is frequently allowed to stand at a favourable temperature, or is heated, or the evening's milk is added to the morning's, or a small quantity of sour whey is added as a "starter". When the desired degree of acidity is obtained, the proper quantity of rennet is well mixed with the milk in a vat or tub by careful stirring. This causes the milk to become gradually 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 twenty to forty minutes are required, although in exceptional cases as much as one and a half to two 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.

When a sufficient time has elapsed the curd is cut with knives, in which the blades are set vertically and horizontally so as to divide it evenly into small sections. The temperature of the whole is slowly raised, usually by steam in a steam-jacketed vat, until the whey separates from the curd and can be run off. The curd is then placed upon a rack or drainer and afterwards (for some cheeses) put through a curd mill and salted and pressed. The object of the salting is to check the fermentation and prevent too much acidity, and also to harden and dry the curd. Boron preservative is sometimes used with the salt. In the case of large cheeses the curd is "crimmed" or ground up, and the fine salt thoroughly incorporated with it; with small cheeses the salt is applied to the outside after the cheese has been moulded. The **moulding** consists in filling the curd into moulds such as hoops lined with cloth. If the cheese is to be pressed the mould of curd is placed in a press. In making Cheddar a pressure of about half a ton is applied during the first two hours or so, and this is increased gradually to a ton or more on the third day.

Curing.—The curd is now true cheese, but insipid, and has to be "ripened" to become 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. fermitatis.* 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.

Varieties of Cheese.—"There is a general idea", says an authority, "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; 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 product of their speciality than dairyers in other localities are likely to be. The nature of the soil may 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 Britain as in France. In this connection it may be mentioned, that whilst the British 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". This matter is of importance in two ways. It should encourage farmers to imitate and surpass the specialities of other lands, and so assist trade and prosperity; and it relieves cheese merchants of anxieties that sometimes attach to the public's fondness for naming articles. Cheddar is geographically a small place in Somersetshire, but its name is given to the particular kind of cheese no matter where produced, and some of the very finest made is produced in Ayrshire, while Canada is also famed for her Cheddar, and makes it in enormous quantities for British eating.

Cheddar, the typical British pressed cheese, is made in Great Britain 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; but the largest sizes may require nearly two years. Cheddar cheeses are cylindrical in shape, and a common size is about 10 in. deep by 14 in. in diameter. The weight of the smaller sizes is usually 18 to 22 lb., an average cheese will weigh about 60 to 70 lb., and the largest may be 1 to $1\frac{1}{2}$ cwt. One great drawback in English cheese-making is that the dairies are not sufficiently large to make cheese of uniform size. This difficulty, of course, does not apply where cheese factories have been established, as in the British colonies and the United States or Holland. **Canadian** or **American** Cheddar is chiefly made in such factories, the process of manufacture being little different from the British. It is made either from whole milk or from milk partly skimmed, and great stress is laid on the aeration of the milk after milking. Probably owing to the difference in the quality of the milk, the imported article is held by the best judges in Great Britain to be as a rule inferior in flavour and "meatiness" to the English or Scotch Cheddar. The best kinds of Cheddar are of firm wax-like consistency, while having at the same time a more or less porous texture. It is a fine-flavoured cheese—at its best it is preferred by some consumers to all other kinds. A certain quantity of Cheddar is made pale, *i.e.* without the addition of colouring matter. A kind which has become popular in some parts of Great Britain is **Loaf Cheddar**, which is simply the ordinary kind, but pressed somewhat firmer and made in the form of a tall cylinder, the whole cheese usually weighing about 14 lb.

Cheshire cheese is made in several ways, either by a quick, a medium, or a slow ripening process, the first being that most generally employed, although it is said that the other processes give the best quality in the result. 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. The cheese is generally coloured with annatto to meet the consumers' supposed demand for a high-coloured article. After being placed in the curing-room the cheese requires about four months to ripen. Quick or early ripened Cheshire has low keeping qualities, and requires to be disposed of as soon as ripe. The medium and late ripened cheese will keep for some months. Taken all round, Cheshire cheese 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. The taste is usually a little sweet—thought by some to be due to the high proportion of milk sugar left in the curd on the Cheshire system. The texture of Cheshire cheese is less waxy than Cheddar, the aim being to make it loose and flaky or crumbly—a feature which many cheese-eaters prefer. In size and shape Cheshire cheeses are somewhat similar to Cheddar, though the heaviest may reach as much as 200 lb. each in weight.

Cheshire-Stilton is a special kind of Cheshire having the Stilton flavour, which is imparted to the cheese by the blue-mould, called by the scientific men *Penicillium glaucum*. The texture, shape, and general character are the same as those of Cheshire.

Derbyshire cheese is a product between Cheshire and Cheddar, being 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 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. **Lancashire** cheese resembles Derbyshire, and has usually a softer and mellower flavour than the common Cheddar. **Leicester** is described as more flaky than Derbyshire, but less so than Cheshire. The curd is not scalded, and, like the Derby, is not mixed with salt, but the cheese is salted from the outside. **Dunlop** cheese, the making of which in Ayrshire has been largely supplanted by the Cheddar industry, is a cheese of the Derbyshire type, but larger; it is of round shape, and may weigh from 30 to 60 lb.

Gloucester is a cheese in some degree resembling Cheddar, being more solid and less flaky than Derby. It is made in two forms — *Single Gloucester* and *Double Gloucester*. Consumers sometimes labour under the impression that single Gloucester is made from ordinary whole milk, while double has a double proportion of cream. The difference is merely one of thickness and weight. The single or Berkeley is from 2 to 3 in. thick, and weighs about 14 lb.; the double is 4 or 5 in. in thickness, and may weigh something like 24 to 28 lb. or more: both sizes are some 16 in. 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. **Dorset** cheese, made in much the same way as Derby and Gloucester, carries rather more water than the average Gloucester, but has a Cheddar texture. It is a mellow cheese ripened with blue mould—"blue-vinney" or "blue-veiny" being an article of local fame which has earned its name from the blueness. In **Wiltshire** are made cheeses shaped like Gloucester or Cheddars, but the curd is heated a second time as in Cheddar-making, which increases the fermentation and so makes the texture and flavour somewhat different from the Gloucester. **Wiltshire Loaves** are small cylindrical cheeses of about 9 in. diameter, prepared without a second heating of the curd, and in make essentially similar to Gloucester. **Stilton**, the famous Leicestershire cheese which used to be sold at the Bell Inn, Stilton, to the coach travellers of a century ago at the good round price of half-a-crown a pound, is the principal British cheese of the blue-mould class. Formerly a double-cream cheese, made by adding the cream of the evening milk to the next morning's, it is now usually 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, and there are other differences in the manufacture. The best Stiltons are those produced from May to September.

Wensleydale and **Cotherstone** are, like Stilton, blue-mould cheeses. Two shapes of Wensleydales are made, however—one like a distorted Stilton, the other flat. The former is the blue-mould cheese of Stilton character, but with the mould distributed through the substance instead of in veins; while the flat-shaped has less of the Stilton quality and is ripened more quickly. Wensleydales are usually small cheeses, ranging from 7 lb. to 20 lb. in weight. **Cottenham** is a cheese made from new milk in the district of Cottenham, Cambridgeshire. It is flatter in shape than Stilton, but resembles that cheese in appearance and shape.

The above cheeses, all of them of the hard class, are of British origin, though now made in America and the British colonies or elsewhere. We now proceed to give particulars of some of the best-known European cheeses:—

Edams and **Goudas** are the well-known Dutch cheeses, both of small size. The **Gouda** is a flat cheese, not unlike Cheddar when well manufactured, and of mild flavour—not so salt as the Edam, for instance. Both white and red Goudas are exported. In texture the cheese is commonly pretty good, but in flavour and general quality the bulk of the cheese is not equal to the British cheeses. In Friesland *Factory Goudas* are made from skimmed or partly skimmed milk, and although by no means rich, are so uniformly made that they are a fairly important item of trade, meeting the requirements of the British market for cheaper cheese. The **Edams** (from the town of Edam in North Holland) are the well-known globular cheeses, as a rule about 4½ to 6 in. in diameter, and weighing from 4½ to 9 lb., although occasionally as much as 25 lb. Whole milk is sometimes used for making the cheese, but skimmed or partly skimmed is generally used. The smaller kinds are divided into *May*, *summer*, and *autumn cheese*, the first being usually from 4½ to 11 lb. in weight, the second about 3½ lb., and the third 4½ lb. A special small variety called *präsent* is said to be the finest made. The best Edams are made in the neighbourhood of Hoorn, on the Zuyder Zee. For export the cheeses are coloured bright red, blue and red, or yellow. Piled up in great heaps like cannon-balls in row after row in the Hoorn market, they assist in producing a quaint picturesque scene which every visitor finds interesting. The loads of cheese are brought in by the wagons of the boers, or farmers, who are often accompanied by their vrouws and families. "The work of unloading the cheeses and piling them in rows goes forward", writes a spectator, "with astonishing rapidity and dexterity. The golden-yellow balls fly from hand to hand, sometimes across a considerable distance. Looking over the market the air seems full of them, a peaceful battle of yellow cannon-balls in which there are no wounded. Never a cheese falls to the ground, though they are fairly heavy and very slippery. The experts show their skill by receiving and tossing two at a time." To return to our trade technicalities, it may be added that good Edam cheese will keep for years. They are fairly heavily salted—a flavour which some people like. In order to improve the reputation of Dutch cheese by ensuring that purchasers shall receive cheese showing at least 40 per cent of fat, a Cheese Control has been established in South Holland.

Gorgonzola, the speciality of Lombardy, is not made, as some suppose, from goats' milk, but from the milk of the cow. Small farmers make it and sell it 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. **Parmesan** is a term now applied to all hard and sweet cheeses made in the north of Italy, though but little is made in the vicinity of Parma itself. It is made from partly skimmed milk, curdled at a high temperature (120° F.), and is coloured with saffron. At a fortnight old the outer crust is cut away, the new surface brushed over with oil, and one side of the cheese coloured red. As with Gorgonzola, it is not as a rule cured completely by the Italian farmers, but is sold by them to the large merchants who own cheese caves and curing cellars, and who complete the ripening and preparation for market. As the curing process for the best is said to take three years, the cheese is commonly expensive. When kept long it becomes hard, in which state it can be grated or powdered and sold in bottles as *Grated Parmesan*. The typical cheese of Southern Italy is **Cacio-Cavallo**, chiefly made at Asso Romano, Abruzzi, Puglie, and Calabria, also in Lombardy. It is nutritious and palatable when good; when inferior it has a slight but somewhat obnoxious odour of the sheep, being made from the milk of the sheep. A soft cheese, made also in Italy from ewe's milk, is called **Stracchino**; the former centre of its sale was the town of Gorgonzola.

Gruyère is the name given in France, and more or less in Britain, to the whole-milk hard cheeses of Switzerland, of which **Emmenthaler**, made chiefly in the canton of Berne, is perhaps the best. **French Gruyère** is the cheese mostly used in France. The large "eyes", which are the chief outward characteristic of the Gruyère cheeses, are due to gas-producing bacteria. The formation of these "eyes" may begin almost immediately after the cheese is removed from the press, but as a rule it is about twenty days before they are formed. Cheeses of the largest size require from eight to twelve months in the cheese room before they are perfectly ripe. The Emmenthalers are of millstone shape, and the largest kinds may weigh as much as 1 cwt. 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 2 in. 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. The Swiss cheeses are sometimes kept to a green old age. A correspondent of *The Grocer* informed that journal that in the canton Waadt (Vaud) it is customary to make special cheeses for children's birthdays, in which the child's name and the year of birth are inscribed; and these cheeses are kept for years, to be eaten on such notable occasions as confirmations or weddings.

Roquefort, in the genuine state, is made from sheep's milk, and is the only cheese so made that is largely placed on the world's market. 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 Tarn. 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 in. high and 6½ in. in diameter, and average about 4½ lb. in weight. When well ripened they are friable in appearance, neither soft nor oily; they are also permeated with greyish-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 *Crême de Roquefort*, and the genuine cheeses are usually marked "Société" on the outside, to distinguish them from the imitated cheese made from cow's milk.

Port de Salut is a partly pressed cheese, circular in shape, flat, and about 1 in. thick. Formerly a trade secret of the Trappist monks, its manufacture is now fairly common in Normandy. 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 exported weighs about 5 lb. The interior is mellow or creamy, but of firm consistence, and dotted with holes.

Of the **soft cheeses** proper, **Caerphilly**, which somewhat resembles Port de Salut, but is less firm in texture, may first be named as a cheese popular in South Wales and neighbourhood. It is made to a considerable extent in Monmouthshire and also in Somersetshire, besides South Wales itself.

Bondons are French cheese shaped like small cylinders, 3 in. high and 2 in. in diameter, and weighing when fresh about $\frac{1}{4}$ lb. Two kinds are made—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 teacup, 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. **Neufchâtel** is the name of a cheese similar to the Bondon.

Brie is a round flat cheese 1 in. or less in thickness, and from 8 in. to 1 ft. in diameter, weighing commonly about $1\frac{1}{2}$ lb. It is made from whole milk and allowed to ripen before use. Thin slices of curd are placed in moulds, and the whey 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 become 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. **Coulommiers** is a cheese made on the Brie system, and eaten either new or after ripening. In shape it is a thick disc, thicker than a Camembert, but rather smaller in diameter. **Pont l'Évêque**, which came originally from New Havre, is an unpressed cheese, firmer in texture than Brie, and with a rather tough crust. Its shape is either square or oblong, about 1 in. thick and 1 lb. in weight.

Camembert (which Coulommiers somewhat resembles) is largely made in the French province of Calvados. It should properly be made of whole milk, but much of that exported is made from partly separated milk. The curd is drained in perforated cylindrical moulds, turned from time to time (about twice a day) until firm enough for the moulds to be removed. They are then salted on each side, a little salt being rubbed in, and are placed on mats in the making-room. Here they are turned regularly until white mould commences to grow, when they are taken to the drying-room. There they remain until blue mould begins to form, when they are removed to a cellar. In the cellar good ventilation is needed, and a slightly humid atmosphere for the proper ripening, but in wet weather draughts are excluded and the room kept as dry as possible; as, if the atmosphere is too moist, the white mould changes to black and produces a bad flavour. A cheese as sold usually weighs about 11 oz.

Of miscellaneous cheeses **Limburger** is a soft Belgian cheese, allowed to ripen before eating. **Schabzieger** is a small cheese made from soured milk, and is of strong flavour. **Godamine** or **Semendrian** is a special cheese made by the Trappists in Servia, resembling Swiss cheese but finer, and described as by far the best made in Servia. **Dounavatz** is a hard Servian cheese. **New Forest**, **Surrey**, and **Victoria** are soft British cheeses.

Cream cheeses are 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. Among cream cheeses may be named **Pommel, Gervais, Cream Gouda, York,** and **St. Ivel.** The Gervais is like a Bondon, but made from a mixture of new milk and cream and eaten fresh. The cheeses weigh about 3 oz. each, and are often sold at 3*d.* each. St. Ivel has a Cheddar flavour, said to be produced by adding cream in which have been steeped for at least twenty-four hours mashed-up pieces of Cheddar cheese.

Margarine cheese is the legal name in the United Kingdom for what is sometimes called **filled cheese**, an imitation cheese made (chiefly in America and Holland) from skimmed milk and oleo-margarine. The legal definition of this cheese as given in the Sale of Food and Drugs Act, 1899, is: "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 act the provisions of the Margarine Act, 1887, as amended in the later act, are extended to the sale of margarine cheese.

Chemistry of Cheese.—The following analyses of average cheeses indicate their chemical composition:—

(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

(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

(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

The British Board of Agriculture and Fisheries found that the average composition of a large number of samples of ripe Cheddar cheese was:—Water, 35·6 per cent; fat, 31·3; curd, &c., 29·1; mineral matter (ash), 4·0. It is hardly necessary to remark that cheese is bought for flavour rather than nutriment, so that the chemical analysis is not deemed of special importance.

Judging Cheese.—At the Kilmarnock Cheese Show, which is the largest held 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. To some extent *flavour* is a matter of opinion, mildness being preferred by some and pungency by others, but there should be nothing objectionable in either case. "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." *Richness* depends on the quality of the milk from which the cheese is made: the amount of butter fat in milk varies, and other things being equal, the richest milk makes the best cheese. A rich cheese (of the hard kind) can easily be distinguished by its soft and unctuous feel when rubbed through the fingers. *Texture* explains itself. A firm and close-cutting cheese is less risky in handling and more economical in use than one of loose texture. A cheese should be neither dry, hard, chippy, tough, nor soapy. Regarding *shape*, inferior cheeses, faulty in texture or firmness, sometimes show a bulged and distorted shape. An old cheese-maker's maxim is—"A good cheese is never of an ill shape". Regarding Canadian cheese, which figures so largely on the British market, the following standards were laid down by the Dominion Department of Agriculture in 1905:—

First Grade.—Flavour—Clean, sound, and pure. Body and texture—Close, firm, and silky. Colour—Good and uniform. Finish—Fairly even in size, smoothly finished, sound and clean surfaces, straight and square.

Second Grade.—Flavour—"Fruity", not clean, "turnipy", or other objectionable flavour. Body and texture—Weak, open, loose, "acidy", too soft, too dry. Colour—Uneven, mottled, or objectionable shade. Finish—Very uneven in size, showing rough corners, black mould, dirty or cracked surfaces, soft rinds.

Third Grade.—Flavour—Rancid, badly "off", anything inferior to second grade.

July or August American cheese are sometimes passed off as Septembers, but can be distinguished by capable judges from their appearance, flavour, and condition. Summer cheese thus sold is detected by its staleness and from being sometimes heated, whereas the Septembers newly received are generally fresh and cool. The season, whether in America or Great Britain, has always much to do with the quality of 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.

With regard to **weights**, when cheese is bought at "marked weights" this phrase means that the weights taken are those marked on the boxes, and any loss of weight is borne by the purchaser. "Marked weight" prices are, of course, lower than actual weight prices, being fixed to allow for the usual shrinkage. The average weights of the many different packages of cheese will be found in the trade annuals.

Cheese Pests.—The cheese fly (*Piophila casei*) which plays great havoc with some kinds of cheese, usually favours (writes Mr. C. W. Walker-Tisdale) a cracked cheese, and especially one of a somewhat moist character. It lays its eggs in the cracked, torn, or cut surface, and these hatch out into the cheese "skippers", or "jumpers", which eat into the cheese and quickly turn it into a deplorable condition. Like most household animals, the cheese fly is cosmopolitan. Professor F. V. Theobald describes it as a small, black, glistening fly, about $\frac{3}{16}$ in. in length, with transparent wings. It lays its eggs in compact clusters of ten or more, and also singly, but exactly how many each female may deposit is not known. The egg is white, slender, and oblong, and besides being deposited in cheese may also be found on hams and bacon. The period of incubation varies according to season and time of year, usually occupying from thirty-six hours to four days.

when the maggot hatches out. These maggots or larvæ are the cheese "skippers", so called on account of the habit they have of jumping, which action they perform by bringing the two ends of the body together and then suddenly releasing them. This effort may carry them a very considerable distance, even of 1 or 2 ft. This pastime seems to be indulged in more by those individuals who are crowded out from the food, or perhaps it may be an effort to seek a quiet retreat for pupation, which they are ready for after from a week to a fortnight's vigorous feeding on the cheese, after which the maggot is fully grown. The maggot, generally resting in some dry crack in the cheese, turns into a golden-brown puparium, and in about ten days emerges as the fly ready to propagate a new generation. There are some three generations in a year. The winter is passed chiefly in the puparium stage, though some of the flies hibernate in pantries, &c. Taking into consideration the life-history, it is seen that cracked cheeses are a great enticement for the fly in search of a place in which it may deposit its eggs. In such there is a certainty of the eggs hatching out, and ample food is provided for the maggots. Cracked cheeses are often due to fault in the making, such as may be produced by too dry a curd or over-development of acidity. Too wet a curd often produces a cracked cheese owing to uneven shrinkage in the ripening-room, and again, cracking may result from the curing-room having too high a temperature, and from the air being too dry. To form a tough coat on the cheese it is the practice of many cheese-makers to dip the cheeses, after taking them from the press, into a bath of hot water for a short time. This is not at all a bad plan, and if the cheese is well greased with lard before bandaging, is likely to prove beneficial in preserving a sound coat. To prevent cheeses from cracking they should always be well greased and tightly bandaged; a cheese fly has considerable difficulty in finding a suitable spot in which to lay its eggs if a cheese is enveloped in a tightly laced bandage. Cracks in woodwork, floors, crevices in the walls of the cheese room, will harbour the maggot in the puparium stage in which it exists throughout the winter, and where also the flies will hibernate. Such places should be, if possible, filled up or periodically cleansed. Spaces between floor boarding may with great advantage be filled up with red lead, and walls plastered and lime-washed. It is by such means that the troubles caused by cheese flies may be minimized.

Cheese mite (*Acarus siro*).—The cheese-mite attacks cheese of a dry character very readily, especially where either from bad storage or the nature of the cheese there are cracks in the rind. The mites, when seen under the microscope, or indeed any lens of good magnifying power, appear as repulsive-looking creatures possessing eight legs. They appear on the cheese as a fine brown dust, but on very close attention this apparent dust may be seen by the naked eye to move, and further microscopic examination reveals the mites amidst the debris of the cheese. They multiply very freely, and in cheese-curing rooms where they put in an appearance it is very necessary to thoroughly scald the shelves and even dip hard-pressed cheeses (if they are not too heavy to handle in this way) into scalding water or brine. Rubbing the cheese over several times with oil, or with strong brine, will destroy the mites if done early enough. The cheese which suffers most from the ravages of mites is Stilton, which, being unpressed, has a coat which is particularly suitable for harbouring them. To prevent Stilton cheeses from crumbling entirely away during the four months that they are kept in the ripening-room, and afterwards until sold, it is necessary to brush off each cheese daily the mites congregated on the outside, and also to sweep the shelves on which they are resting. Where Stilton cheeses are placed to ripen on shelves which are directly one above another, it is a good plan to have each shelf about $\frac{1}{2}$ in. wider than the one below it, so that when brushing the cheese on any one shelf the debris does not fall on to the cheese on the shelves below. Mites will appear whatever is done to prevent them, and one must be content with checking their ravages rather than exterminating them altogether.

Storage and Handling.—Cheese should be stored if possible in a cool dark place, fairly well ventilated and dry, but not too dry. It should be away from strong smells, and the temperature about 50° to 55° F. In cold storage the temperature for cheese already ripened is 31° to 32° F., according to some authorities; others say 38° to 40° F.; but this is a matter which seldom concerns a retail dealer. A damp, cold cellar is not recommended. New cheese in store should be turned over once or twice a week. This is particularly necessary with Cheddars and Stiltons. Rich cheeses do not as a rule keep so well as those poor in fat. In handling cheese see that the slab and all utensils are kept clean. 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 emeried. For the counter, to prevent pieces of cut cheese being dried up and spoilt in appearance, a glass-fronted case is recommended.

The retailers' stocks of cheese in the United Kingdom average from twelve to fourteen days' consumption from April to September, and from three to five weeks' consumption in the period between September and April.

When **margarine cheese** is sold in the United Kingdom, note that the law requires that it be handed to the customer wrapped in a wrapper with only the words "margarine cheese" on it, in capital block letters at least ½ in. in length.

Chapter XII.—BUTTER

The definition of butter given in the United States' food standards is as follows:—

"*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 re-working, 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."

As will be explained more in detail in the paragraph of this chapter dealing with the chemistry of butter, the chemical constituents of butter are—fat, curd and milk sugar, salt and ash, and water. In Great Britain there is no standard for the amount of butter fat, as in the American case, but there is as to the water. By regulation of the Board of Agriculture (Sale of Butter Regulations, 22nd April, 1902), it is laid down 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".

Again, the Margarine Act, 1887, in Great Britain recognizes as permissible the artificial colouring of butter, and allows "salt or other preservative" as an ingredient.

British Importation of Butter.—In 1907 it was officially stated in the House of Commons that the following were the quantities and values of butter imported into the United Kingdom in the years given, with the averages for the periods given:—1903, 4,060,694 cwt., value £20,798,707; 1904, 4,241,005 cwt., value £21,117,162; 1905, 4,147,866 cwt., value £21,586,622; 1906, 4,338,383 cwt., value £23,466,252. Average: 1891–1895, 2,409,317 cwt., value, £12,802,379; 1896–1900, 3,246,608 cwt., value £16,377,403; 1901–1905, 4,025,478 cwt., value £20,665,316.

In addition to this vast quantity of imported butter, the United Kingdom consumes also very large quantities of butter made in the country itself, at farms, co-operative dairies, and factories. A quarter of a century ago the standard supply was drawn from Ireland and France, but now it is estimated that for every 1 lb. of butter made in the

United Kingdom about 2 lb. are imported, and that nearly one-half of this imported supply comes from Denmark. The butter export is the most important item in Danish trade, and nearly the whole is sent to the British market. In that market the colonial supplies come next, Australia being the largest contributor, with New Zealand and Canada following. Russia (especially, of late, Siberia), France, Holland, Sweden, the United States, and Argentina are other notable sources of the British butter supply. The Canadian butter trade began to develop rapidly at the beginning of the century; and Siberia, in spite of the Russo-Chinese war and the disturbed state of the country since, has already made great progress as a butter-producer. Of Holland, the province of Friesland alone exports nearly 30,000,000 lb. of butter yearly.

In hot countries the making of butter is conducted under much disadvantage, for which reason the place of butter is largely supplied by the use of oil—olive oil, for instance, in Italy. This is doubtless the reason why in ancient Greece and Rome butter appears to have been used only as an unguent and a medicine, though it is believed that the Scythians were in the habit of eating it.

Cows and Milk.—The value of milk for butter-producing varies considerably, some breeds of cows giving milk of far better quality than others; that is, containing a larger proportion of the essential butter fat. The milk of the Jersey cow contains more butter fat, and fat globules of a larger size, than does the milk of any other breed. The Frisian breed of black-and-white cows—kept in that Dutch province from which the best historians suppose one of the leading branches of the inhabitants of Great Britain to have emigrated to England and Scotland—is a breed that gives extraordinary quantities of milk, but the butter fat contained therein is a much smaller proportion. The percentage of butter fat in the milk depends to some extent on the feeding and general management of cows.

Not only does the amount of butter fat, but the flavour, and to some extent the chemical constituents of butter, may be affected by the cow's food. In an official report by the principal chemist of the British Government Laboratory, it is stated that green fodder and mangel-wurzel tend to produce butter comparatively rich in what are called the "volatile acids", which are constituents of distinctive importance in butter, and that oats, decorticated cotton cake, beans, and peas are found to be beneficial in their effects on butter, while linseed meal, grains, Paisley meal, and foods containing much sugar are best discarded, or at least reduced to a minimum. Hills tried the effect of adding various oils to the cow's food, and found that with cotton-seed oil the butter was hard and of good quality, linseed meal rendered it soft and sticky, and maize oil made it soft and oily. Baumert and Falke state that not only does feeding with various fats change the character of the butter fat, but that the particular fat of the feed imparts its own character to the butter; that is, the butter-fats produced by feeding cows with sesamé, coconut, or almond oil exhibit, on analysis, the same characteristics as are found in artificial mixtures of butter fat with these three oils.

This latter point is of considerable practical importance, for in a highly interesting butter prosecution at Skipton, in Yorkshire, in which the evidence of respectable farmers was diametrically opposed to that of the analysts, this natural fact was probably the explanation of the conflict of evidence.

From Milk to Butter.—In the milk the butter fat is in the form of countless minute globules; it is these tiny globes of fat which give the milk its white opaque appearance. It is believed—though there has been a good deal of controversy on the point—that these globules are enveloped in thin watery fluid, the "serum" of the milk. By shaking, and in the concussion of churning, this envelope is broken, and the globules of fat enabled thereby to join each other. They coalesce to form granules or little lumps, and these, as more and more are joined on, become larger and larger, till they form masses of butter that can be seen and handled.

Butter may be obtained by churning either the milk or the cream. To obtain it from milk is naturally a longer process than obtaining it from cream.

The cream may be obtained by allowing the milk to stand, or by using what is called a *separator* on the centrifugal principle. If milk is allowed to stand, the force of gravity causes the heavy watery part of the milk to sink to the bottom, and the lighter part, or cream, to collect at the top, whence it can be skimmed off. In a separator centrifugal force instead of the force of gravity is turned to account. The milk is set revolving so rapidly that it flies off, as water flies from a trundled mop. But in this flight the lighter particles and the heavier particles are flung to different distances, and all that is necessary to do to separate them is to provide a means of catching each part by itself. This the separator does with beautiful efficiency. To speak more technically, the milk is enclosed in a steel drum rotating at several thousand revolutions a minute, whereby the heavier milk particles are caused to arrange themselves around the periphery, while the fat globules form a column around the axis internal to the separated milk. Originally a Swedish invention, this centrifugal separator has practically revolutionized dairying, and in one form or other is in use now in all parts of the world where dairying is practised on a large scale or on modern principles.

The cream, obtained in either way, is usually "ripened" or soured" before using, because butter made from sweet cream differs little in taste from cream itself, whereas butter from soured cream is not only better in flavour and aroma, but more in bulk. In the same way, when milk is used instead of cream it is first soured. New sweet milk is not used for butter-making, the yield of butter from such milk being unsatisfactory.

Ripening the Milk or Cream.—The ripening of either milk or cream is a matter of days, but may be accelerated and regulated artificially. The process of ripening involves certain changes due to the growth and multiplication of myriads of bacteria. "The process", says a scientific writer in the *New*

Popular Encyclopedia, "is a true fermentation, during which certain of the bacteria affect the milk-sugar, producing lactic acid; others act upon the fat, and others upon the casein (or cheesy principle in the milk) and albuminoids. The bacteria find their way into the cream or milk from various sources, such as the teats and udder of the cow, the milk-vessels, and the air of the cow-shed or dairy. It is fortunate that as a rule the bacteria, whose advent the butter-maker cannot entirely prevent, produce a *desirable* change in the cream. But it sometimes happens that the predominance of one or several unfavourable species will result in an inferior product, and in like manner the predominance of favourable species will produce butter of exceptional aroma and flavour. It is possible to influence the quality of the ripening by what are called 'starters', and these starters are already in use in some butter factories. 'Starters' are pure cultures of bacteria which are known to induce ripening that results in butter of the best quality. A sufficient quantity of a starter is added to the cream, in the hope that the extra number of favourable organisms will influence the ripening of the cream more than those already existing in it. Fair results are obtained in this way, but uniformity of the product is not possible. A better but more troublesome method is to heat the cream to 150° F. for a short time in order to destroy most of the bacteria. When a starter is added to cream thus **pasteurized**, the artificial organisms have a fair field and the ripening takes place under their auspices. This method is being rapidly adopted in butter-making countries."

A *natural starter* has also been found to give good results where carefully used. This is simply a quantity of cream obtained from a good dairy, or from cows producing good cream, and allowed to sour, and then added to the cream to be ripened. By this method the butter-maker has no control over the kinds of bacteria used, but if the source is good the results are usually favourable. The cream is warmed to about 60°–64° F. for twelve hours, and about 3 per cent of soured cream is then added.

In **whole-milk butter-making**, as still carried on in parts of Ireland and Scotland, where the buttermilk left after churning is consumed as an article of food, the milk has to be kept for a few days, or even a week, till it naturally coagulates and sours. But as with cream in the treatment just explained, an improved method consists in causing it to coagulate artificially by pouring into it about 3 per cent of cream, milk, or buttermilk which has been previously soured carefully, and allowing the whole to ferment at a temperature of about 70° F. for twenty-four to thirty-six hours, when it is churned.

Churning and Working.—In the churning process the butter fat of the cream is separated from the more fluid portion by agitation and concussion, as already explained. It is quite possible to make butter by simply shaking up cream in a closed bottle. In a churn the motion may be either vertical or rotary. The only indispensable point is that the churn shall be of such a shape as to be easily cleaned, cleanliness being of the utmost importance in all stages of butter-making if the result is to be good butter. The ripened cream (which is sometimes scalded up to a temperature of 150°, to prevent "turnipy" flavour when that is feared), having first been strained, should be churned at a temperature of from 50° to 55° F. in summer, or a little warmer in winter, and the churning should cease as soon as the butter has formed in small granules. 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 buttermilk, which cannot afterwards be got rid of without "overworking" the butter and spoiling its texture.

When left in the butter, the constituents of the buttermilk 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 buttermilk that may have become incorporated with the butter during its formation in the churn. For this purpose, after the buttermilk 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 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 buttermilk and any excess of water. Any further working is to be avoided, for "over-worked" 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.

Salt is added either while the butter is still in the churn, in which case brine is used, or when it is rolled out in a layer in the butter-worker, in which case the salt is dry and is sifted through a fine sieve on to the butter. In the latter method a quarter of an ounce of salt to the pound of butter is sufficient for flavouring, and half to three-quarters of an ounce per pound if for preserving. The salt must be pure white of the finest quality. For **colouring**, which is practised in some dairies to meet the supposed demand of the consumers in certain districts, annatto, pulped carrots, or "butter yellow" (a coal-tar colour) is used, being added to the cream before churning.

After the working and salting the butter is made up to suit the various markets in tubs, kiels (a special form of wooden tub named from the port of Kiel, whence many are exported), baskets, &c.; or, if fresh butter, is moulded into rolls or other forms by the aid of "Scotch hands" of wood; or is pressed into rectanglar or circular pounds, half-pounds, and so on, by means of a butter press.

Butter Manufacture.—The operations above described are the essentials of butter-making, whether carried on by individual farmers or dairymen, or in "creameries" or "factories". On the large scale, butter manufacture is nowadays carried on with the aid of co-operation in various forms. Thus farmers in a district may co-operate to run a dairy factory or creamery, or such an enterprise may be conducted by a private person or company. There are three forms:—

(1) Farmers send their milk to a central factory, where it is paid for according to the richness as tested by the Babcock or other apparatus, and is turned into cream and butter at the factory. The separated milk from which the cream has been abstracted is disposed of by selling it to the farmers again for feeding their calves or pigs, or by using it to feed stock owned by the factory itself, or by making skim-milk cheese. This system is chiefly adopted in England and the colonies, also in Holland. The factories are **milk factories.**

(2) The farmers separate the cream themselves and deliver it at the factory each morning. The farmers take back the buttermilk, and are credited with the actual amount of butter produced, each farmer's delivery of cream being churned separately. Payment is made weekly or monthly by cheque, and the system is generally on a co-operative basis, each farmer being a shareholder. This is the chief factory system in Ireland, and is also in vogue in Denmark, Holland, and elsewhere. The factories are termed **Creameries.**

(3) The farmers make their own butter, or get it made in creameries, and the various butters are bought up by a central factory for sorting and blending. This system is prevalent in Normandy and Denmark, also to some extent in Ireland.

At the factory the butter is sorted out by experts, and the best quality, made up into rolls, is packed in boxes or baskets of 28, 36, or 56 lb. 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 buttermilk. 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. The blending factories are termed **Butter Factories,** or simply **Factories.** A better term would obviously be **Butter-blending Factories.**

Classification.—To avoid confusion it would appear desirable to class milk factories and creameries together as "creameries", and to distinguish these carefully from "butter-blending factories". In the milk factory, as distinguished from many "dairies", it is customary to make butter as in "creameries" from cream separated by the centrifugal separator. Such "original" butter is obviously different from that which is made in factories by blending butters already made. It has been pointed out by a firm eminent in the butter trade that in the country where the centrifugal system was first introduced butter factories are still called "Mejerei", which means simply "dairy". The Scandinavian butters are not called either "creamery" or "factory", but the best are sold in the name of the dairy itself, while Denmark and Sweden have introduced "national" brands. In Ireland, however, there is a great difference between butters, and the "creamery" represents in history a great advance from the farm butter-making before the 'eighties of the last century. "About the years 1880–4," writes the firm referred to, "the supremacy which Irish firkin butter had so long held in the English markets began to wane. The public taste was changing to milder and more uniform butter, of which Denmark and France were the greatest exporters. Denmark rapidly expanded under the influence of the new invention, the centrifugal separator; whereas France increased under the factory system. Reformers arose in Ireland. On the commercial side Mr. W. J. Lane, late butter exporter, now chief manager of the New York Life Insurance Company, continually preached uniformity in Cork, and the late Canon Bagot, of Kildare, did the same in the country. The latter was the chief influence in starting a few central stations where the farmers brought their cream. It was churned for each farmer separately to ascertain the weight of butter fat it contained and to judge its quality. It was paid for accordingly. The resulting produce was graded into two, or even three qualities, and blended to produce a uniform article. These were styled 'Creamery Butters'." But the main point of Canon Bagot's well-meant efforts was, that by the establishment of creameries the farmers were enabled to get their butter properly made, and while the farmers' butter was fetching on the Cork market but 6½*d.* a lb., the creamery butter fetched 1*s.* Later on, Mr. J. B. Dowdall wrote letters in the Dublin papers on the same topic, and in 1886, in conjunction with Messrs. W. and C. M'Donnell, opened at Limerick what he claims to have been the first creamery in Ireland on the Danish principle. The point is that there is an essential difference between centrifugal creameries and butter-blending factories. The Danes have been wise enough to apply thorough scientific principles to their butter-making, and while they have very large establishments of both kinds—such as the Hasler "creamery" and the Esbjerg butter factory—the two great differences between their creamery 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. It may be added that on the New York

Mercantile Exchange "creamery" butter is defined as "made in a creamery from cream obtained by the separator system, or gathered cream".

A Typical Creamery.—A creamery described by the British Food Preservatives Committee in 1901 as typical of over 300 in Denmark is a self-contained creamery on the co-operative system, complete down to its telephone and its own electric plant. It is 30 miles from any large town. 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 heterogenous 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 lb. of butter. When the buttermilk 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.

A Typical Factory.—A butter-sorting factory, which may be described as typical, exports in a year some 10,000,000 lb. of butter, none of which is made in the factory itself. It handles two classes of butter: (1) saltless, and (2) containing about 3 per cent of salt. This butter reaches the factory in a half-worked condition from some sixty creameries. It is stipulated that all cream used shall have been pasteurized, as explained in the preceding paragraph. Some of the saltless butter is sent to England without further treatment. The remainder is classified, and the butter in each class blended. Any not regarded as good enough for packing in rolls is salted and sent away as second-class butter. The butter is then "worked" to press out the buttermilk thoroughly, and salt added during the second working—it is passed through the butter-workers thrice in all. Women and girls weigh the butter, frequently rinsing their hands in hot water during this operation, after which the butter is put up in parchment-paper and cartridge-paper boxes.

Varieties of Butter.—Taken all round, the factory-made butters are better than the average farmhouse butter, but not so good as the best produced in first-class private dairies. Of the fresh butters, Normandy and selected Devonshire usually take top prices, and in the salt Danish commonly sets the price. An expert says:—"Dairy farmers in England and Scotland would do well to devote their attention mainly to the 'fancy' and 'fresh' trade. There is an ever-increasing demand for freshly made butter, and this Continental countries find it difficult to supply, as they are too far removed from the point of consumption. There is a big field for this profitable branch of the industry if dairy farmers would only develop it." The different kinds of butter at present seen upon British markets are as follow:—

1. Butter made on the farm from naturally risen cream; known in Ireland as *salt firkin butter* and *lump butter*, elsewhere as *dairy butter*.

2. Butter made from whole milk on the farm; known in Ireland and on the markets as *butt butter*.

3. Butter made from centrifugally separated cream, universally understood as *creamery butter*.

4. Butter known as *factory*, but in Ireland also known as *milled*. It is not necessarily made from milk treated in any one manner, and is as frequently as not a mixture of farm and *secondary creamery* butters.

5. Of recent years there has been offered at some centres

an article known as *hand-separated butter*, but this is a branch of the industry which is comparatively new, and the supply has been very limited.

6. A further class on the British market is *milk-blended butter*, recognized specially under the Butter and Margarine Act of 1907.

Many butter-makers still adhere to antiquated methods, and to this fact, more than anything else, may be attributed the decline in dairying which has been so marked in English dairying counties of late years. "It is a fallacy to believe that what our grandfathers considered efficient cannot be improved upon. We must keep pace with the progress of scientific discoveries in the matter of dairying if the industry is to be prevented from extinction in several districts." Meanwhile it is satisfactory to observe that the butter now obtained from the model dairy farms of Great Britain and Ireland is voted by judges to be the most perfect butter for make and flavour that it is possible to find in the United Kingdom.

Irish Butter.—"Cork's" butter is 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. The highest point ever reached in Ireland for first Cork butter was in the decade 1867–1876, when that article averaged 128*s.* In the next decade it averaged 119*s.*, and in 1887–1896 it was 101*s.* 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 ½-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 Districts 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. As regards salt, the amount used depends partly upon the market for which the butter is intended, and partly upon the habits of the individual makers, but common proportions are as under:—

Fresh butter for London ...	2	oz. salt used	to 14 lb.	butter.
For Dublin	5	,,	,,	,,
For manufacturing districts ...	$10\frac{1}{2}$	,,	,,	,,
Cured butter	16	,,	,,	,,

Factory butter represents about 10 per cent of the Irish output. There are over 600 creameries, including over 150 co-operative dairies.

French Butter.—This butter is farm-made chiefly, but sorted in factories and despatched very promptly to the London market. It 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 a high reputation in French butter, is made by every farmer at his own farm. That from the Isigny district holds the foremost place; next comes probably that from Gournay. Brittany also produces much good butter. The Charente 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 (17,600,000 lb.). 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 fresh butter has long enjoyed a very high reputation. It is now, however, a declining trade, partly owing to the ever-increasing competition on the British markets of Danish, Argentine, Australian, and Russian butter, and partly to the increasing demand in Paris and large French towns; but also because less butter is made by the peasants who, according to a consular report, "are in many parts abandoning their villages, where they say they can no longer make a living, and flocking into the towns". The fresh butter comes forward during the whole of the year in considerable quantities. It is entirely unsalted, but contains $\frac{1}{2}$ per cent borax. Salted French butter is generally shipped from the beginning of May to the end of November; what little is shipped at other times is generally not very good. During these seven months French butter is shipped in four qualities. The first and second come from Normandy, the third is inferior Normandy mixed with best Brittany butter, and the fourth is Brittany butter alone. There is about 4*s.* difference between the qualities. Almost all French creamery butter goes to Paris, where it commands higher prices than can be obtained in London. Paris, as a rule, is the principal market for French butter, and it is only the surplus that is shipped to London. Nearly all the exported butter is sent on consignment to London, where the receivers generally guarantee "London quotation", a price fixed twice a week by two of London's greatest importers. When salted, French butter at times commands the same price as Danish, or even higher, and at other times drops as much below Danish. The reason is that the production of fresh butter goes on right through the year, whilst salted French butter only comes forward at certain times, when butter is scarce. Nearly all produced is fresh, and the buyers who insist upon salted French butter are then compelled to pay prices dictated by the value of the fresh butter. Towards the end of April, however, the production greatly increases, and the shippers are compelled to pack butter with salt, for which lower prices have to be accepted until other markets are found.

A Normandy butter market is one of the old-world sights still interesting to witness by reason of its quaintness. "At St. Lo", writes a traveller, "the scene, typical of many such markets in this part of France, was all bustle and colour. The quaint costumes worn by the peasants, of the same style as by many generations past, were extremely picturesque, and blended well with the ancient buildings surrounding the large open space in front of a Gothic church of imposing grandeur. Here in one spot were the ducks and fowls, all tied by the feet, looking most uncomfortable and unhappy; there the fruit, and there the vegetables, &c. What, however, was perhaps of most interest was that portion of the market-place allotted to butter. Close to the terrace, from which, by the way, a remarkably splendid view of the river and valley may be seen, under shady trees, a large space was roped off in which were a number of weighing-machines with their attendants, and close to the ropes was a line of testers with little wooden or steel spatulas. To them came the peasants, mostly women, each with the butter for sale, large or small in quantity, neatly wrapped in snowy-white cloths and contained in conical baskets. The top cloths were removed, and the testers dug out some of the butter, and after examining it and smelling it, the butter was marked on the top of the lump with some sign which apparently designated it either as first or second grade. The peasant then entered the space and proceeded to have the lump weighed, for which payment was made on the spot. Amusing were the indignant gestures and speech of the unfortunate peasants whose butter was not considered of first quality—though not much of the speech was understandable to me, the dialect being far too pronounced for my modest knowledge of the French language. Of course, each peasant's butter was the finest that could be produced, &c. &c. Why then was it marked second? But the tester merely shrugged his shoulders and passed on to the next waiting peasant. The weighing was done smartly, with all wrappers removed, and here again I noticed some wrangling about the weight, though most of it was of a good-natured character, and usually ended in chaff and laughter on both sides. The lumps of butter were then dumped into huge conical baskets, which, when full, were covered with hay and corded up. From St. Lo many cart-loads were taken away to a not very distant butter factory, where, with collections from other markets, each grade would be mixed together so as to make one uniform quality in each grade, and then packed and despatched chiefly, so I was informed, to England."

Danish Butter.—It was Denmark which dethroned France as the leading source of supply for the London butter market. Made by the up-to-date factories and creameries already described, Danish butter is characterized not only by good quality but by a striking uniformity, while another great point — in which the Irish butter, not being as yet made to any great extent in winter, does not effectually compete with it—is that the supply is continuous all round. Thus Danish butter practically rules the market. *The Practical Grocer* gives a list of the prices of Danish butter month by month for ten years, up to and including 1905, from which it appears that the average prices in the respective years were: 1896, 104*s.* per cwt.; 1897, 101*s.*; 1898, 100*s.*; 1899, 108*s.*; 1900, 108*s.*; 1901, 109*s.*; 1902, 107*s.*; 1903, 104*s.*; 1904, 100*s.*; 1905, 107*s.* (There are fractional differences in some cases, the quotation for Danish being given in kroner and öre: a krone is 1*s.* 1¼*d.* in English money, or about 26 cents American, and an öre ⅛ of a penny.) The official quotation is fixed every Thursday by a committee sitting at Copenhagen. Danish butter is a pale, mild, sweet butter, containing from 10 to 14 per cent of water. Experts look for a rich, clear flavour, a close texture, and a colour neither too dull nor too pronounced. A good deal of Danish butter is shipped under the national "Lur" brand, used only by dairies complying with certain regulations.

Australasian Butter.—Australian and New Zealand butters are distinctive owing to their hardness. New Zealand butter, made while the cows are on pasture, is undoubtedly one of the best imported to the British market, and Australian, also a grass product, is also good, though as a rule not quite equal to New Zealand. Australian appears in the British market in September and October, two months in advance of that from New Zealand. New Zealand butter is high-coloured, high-flavoured, and full of body. These Australasian butters are frequently found with only about 8 per cent of moisture, 8 to 10 being their average. The best Australian butter is usually the Victorian.

In New Zealand **the Grading System** is applied to butter for export. The dairies are registered and officially numbered and classified, and the produce exported is "graded" by official experts. In New Zealand, for instance, there are seven appointed "grading ports", through one or other of which all exported dairy produce must pass. 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. One box of each day's make is 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 ½-cwt. 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 Government's control ending with the official checking of the weight as the goods are handed out of the cool store. New Zealand butter comes forward both salted and unsalted, and is sold partly c.i.f. and partly on consignment. The grading system unquestionably tends to improve the quality, and as a rule it is accepted by the British buyers.

Australian.—Under the Commerce (Trade Descriptions) Act of Australia, which came into force in October, 1906, the following regulations were laid down with respect to exported butter:—

"Packages must have label or brand setting out a true description: the word 'Australia', and the name of the State, net weight, and the name of the manufacturer or exporter, or his registered brand.

"In regard to butter not packed in tins the trade description shall specify whether it is *pure creamery*, *milled*, or *pastry*, as the case requires, and shall be indelibly impressed on the cases. The trade description shall in addition (unless the goods have been classified or certified to with an approved stamp) comply with the following provisions, viz.:—

"Set out the name and percentage of any preservative, casein, water, and colouring-matter (if any) contained therein.

"The trade description may, instead of being contained in the label or brand, be set out in a certificate, signed by the exporter, and delivered to the examining officer at the place of inspection. The trade description shall have relation to the condition of the goods at the time of shipment.

"*Quality Standards.*—Export of butter not complying with standards is prohibited unless the trade description contains the words "Below standard", or states fully wherein it does not comply with the standard. Butter shall contain no fat other than butter-fat. It shall not contain more than 16 per cent of water, 3 per cent of casein, 0·5 per cent of boric acid, 4 per cent of salt, and any colouring-matter deemed harmless by the minister. Nor shall it contain less than 82 per cent of butter-fat.

"*Classification.*—It will be classified as follows:—First class superfine, pure creamery butter, containing not more than 14 per cent of water, and classified at 94 points or over; first class, pure creamery butter, classified at 86 to 93 points; second class, pure butter, classified at 75 to 85 points; third class, pure butter, classified at less than 75 points. In classifying, the officer shall take into consideration the flavour and aroma, the texture, and condition. The maximum points to be awarded in respect to those matters shall be as follows:—Flavour and aroma, 50 points; texture, including body, grain, and moisture, 30 points; condition, including colour, salting, packing, and covering, 20 points—total, 100 points."

When any butter has been repacked by an exporter, the trade description must state that fact. It will be seen that the grading (classification) is merely voluntary (not compulsory, as in New Zealand), though the Act prescribes penalties and forfeitures for false trade descriptions. *Creamery Butter* is defined as butter made from centrifugally separated cream. *Pastry Butter* means butter which is not fit for ordinary table use. *Milled Butter* means butter which is a mixture or blend of two or more butters ordinarily packed alone and under separate names or brands, and which have been mixed or blended at a place other than where manufactured, and packed under other than the original names or brands.

Canadian Butter.—This is an increasing trade, although supplies vary somewhat, according to the demand for milk for the Canadian staple trade of cheese-making. It is a sweet waxy butter, sometimes of excellent quality, but the supply of "choicest" is small as a rule. The Government is taking steps to put the trade on a sound footing by attention to grading, packing, cold storage, and proper transportation. Most of the Canadian butter is collected from the dairies and sorted; the dairies are not all constructed for making butter as well as cheese. Creameries have been started, however. The practice is to make contracts for milk by the month, and to sell to either the butter-maker or the cheese-maker, as the case may be, whichever is able from the state of his own market to offer the highest price. In 1903 the Dominion Parliament passed a Butter Act prohibiting, under heavy penalties, the importation, manufacture, or sale of adulterated, process or renovated butter, oleo-margarine, butterine, or other substitute for butter, and the improper marking of butter. The following may be quoted:—

"2. In this Act, unless the context otherwise requires,—

"(*a*) 'Creamery' means a place where the milk or cream of not less than fifty cows is manufactured into butter;

"(*b*) 'Dairy' means a place where the milk or cream of less than fifty cows is manufactured into butter in a building equipped with proper appliances;

"(*c*) 'Butter' means the food product commonly known as butter, which is manufactured exclusively from milk, or cream, or both, with or without the addition of colouring-matter, common salt, or other harmless preservative;

"(*d*) 'Creamery Butter' means butter which is manufactured in a creamery;

"(*e*) 'Dairy Butter' means butter which is manufactured in a dairy;

"(*f*) 'Renovated Butter' or 'Process Butter' means any butter which has been melted, clarified or refined, and made to resemble butter.

"3. No person shall manufacture or import into Canada, or offer, sell, or have in his possession for sale, any butter containing over 16 per cent of water.

"4. No person shall mix with butter any acid, alkali, chemical, or any substance whatever, which is introduced or used for the purpose or with the effect of causing the butter to absorb water or any part of milk or cream.

"5. No person shall manufacture, import into Canada, or offer, sell, or have in his possession for sale, any oleo-margarine, butterine, or other substitute for butter, manufactured wholly or in part from any fat other than that of milk or cream.

"6. No person shall manufacture, import into Canada, or offer, sell, expose, or have in his possession for sale, any renovated butter, process butter, or butter which has been treated in the manner described in section 4."

Argentine butter, which has come into considerable prominence of late years, is rather pale in colour, and in consistency more resembles Danish than Colonial butter. It commands usually as good a price as New Zealand and finest Victoria, and is found to displace the Australian product in a market equally accessible, such as South Africa. It is sweet and palatable, and keeps well. South Africa has become its chief export market, but a portion finds its way to Great Britain between the beginning of November and the end of March. It is expected that Argentine supplies will increase as the steady development of the country proceeds.

Dutch butter is retrieving its reputation under what is known as the "Control" system, by which factories voluntarily place themselves under strict Government supervision to ensure a pure product, and use "Control stamps" on the butter itself, to ensure its not being tampered with on the way to the consumer. The "Control" is exercised through "Control stations" in the several provinces, the provincial governments taking the supervision; and the agricultural societies intend to co-ordinate the system under the supervision of the State. The officially appointed inspectors visit the factories at unexpected times to inspect them and take samples of the butter which is being manufactured. Two samples are taken, and these are wrapped up, sealed, and provided with a label, whereupon the director of the factory or his substitute places his signature, thus declaring that such sample has been taken in his presence. The different samples may be classified as follows:—(1) Samples from casks of finished butter ready for export; (2) samples from butter which has been entirely manufactured in the presence of the inspector; (3) samples of cream which is in the factory and which is going to be churned to butter in the laboratory of the station of control itself. The analysis of butter made from sample No. 3 must, as far as the volatile fatty acids and the numbers of the refractometer are concerned, give the same results as the butter made in the factory on the next day and from the same cream from which the said sample No. 3 was taken. All particulars found at the laboratory of the controlling station are carefully registered, and, as every factory is inspected at least once in a fortnight, very full statistics are obtained of the chemical composition of the butter of each factory separately. If large deviations in these statistical figures are observed, the control becomes closer, and if it be proved that the deviations were due to adulteration, a heavy fine is levied. The manufacturers subject to this system of inspection are granted the right to use paper "Control" stamps, which are placed on their butter only, and which enable it to be identified wherever found. These stamps, even when used for the smallest sizes of butter, such as $\frac{1}{2}$-lb. rolls, are all numbered like bank notes, and the system of issuing them is so ingenious and complete that it is claimed to be possible thereby to trace any piece of stamped butter back to the factory where it was made. The label is of the very thin India paper, and bears the arms of the Netherlands, with the words in blue ink, "Nederlandsche Botercontrole, under Rykstoezicht". The firms using them are not allowed to be connected in any way, directly or indirectly, with the trade in margarine or edible fats and oils, and must not buy butter from anyone outside the control. Names of the manufacturers in the control are from time to time published by the Dutch Government.

The "Control" system has been forced upon the honest butter-makers of Holland by the unpleasant fact that of late years that country has been notorious for the quantity of spurious butter received from it—much of it so cunningly concocted as to give the British analysts a good deal of trouble. Another feature of the Netherlands butter trade is the dubious quality of some Dutch butter exported at a certain season of the year. Samples of Dutch butters having been declared adulterated, whilst the exporters maintained their purity, the Dutch Government caused an investigation to be made by Dr. J. J. L. van Rÿn, Director of the Station for Agricultural Experiments at Maastricht, in order to ascertain whether the characteristics of the butter on which the analysts founded their conclusions 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 British 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. The lowest results were given, it may be noted, in the Dutch butters of September and October.

Russian Butter.—A large exportation of butter from Siberia is looked upon as one of the market certainties of the near future. The Finnish supply is also of some importance in the trade. The commercial reputation of Siberian butter is not yet very high, but the article, nevertheless, proves useful each year in meeting the demand for second quality butter, and thus keeping down the price the poor would otherwise have to pay, unless they preferred margarine. Only a few years ago British analysts held the opinion that Siberian butter was always of abnormal composition, resembling the "winter" butters of countries where the cows are kept out at pasture late in the season. It has been found, however, that in many districts Siberian cattle yield milk unusually rich in fat. In the butter-producing districts of Siberia the inhabitants of a village own collectively large herds of cattle —a thousand or even ten thousand head. It is the practice to collect and mix the milk from the whole herd. The butter is mainly produced in co-operative creameries owned by private traders and by associations of farmers. Mr. S. Turner, F.R.G.S., who has published an interesting account of a commercial tour in Siberia, states that as late as 1896 the only dairy in Siberia in which butter was made by European methods was one started by an Englishwoman, married to a Russian at Chernaya Rechka, in the district of Tiumen. Thanks to lavish Government assistance in scientific instruction and many other ways, rapid progress has been made, "so much so, indeed", writes Mr. Turner, "that in winter stall-fed butters the best dairies can easily compete with those of our colonies, while in a few years they will run Danish very close all the year round. The uninterrupted production of butter, winter and summer, moreover, will give Siberia a decided advantage over our colonies and Ireland, which can only supply butter during seven months of the year. The quantities supplied have already reduced the price of butter to the British public by quite 3*d.* a lb. since the first appearance of the Siberian product on our market, and it is abundantly evident that within the next four or five years a further reduction is bound to take place, when the British working-man will be able to buy good wholesome butter at 8*d.* per lb." The total number of cows owned in Siberia is roughly estimated at 25,000,000, cattle-rearing being general on account of the abundance of rich pasture land and the cheap and plentiful fodder available for the winter months. In the opinion of the authority quoted, the best protective policy the British or Irish farmer can adopt is that of educating himself in the most approved scientific methods of dairy farming, and devoting to the work the same industry and energy that are displayed by his Danish rival; and he must specially aim at producing in butter the best quality, since second-grade has to face the competition of quite two-thirds of the butter imported to the United Kingdom from abroad.

Finnish butter is not a large supply at present, owing perhaps to its paleness, but the Government is doing all in its power to improve the manufacture and develop the export trade. A recent development was the erection at Hangö of a special laboratory for testing the quantity of water in the butter, the volatile acids, consistency, flavour, &c. Samples of butter from thirty to fifty dairies are tested every fortnight, and a report is published giving the results, the twelve best being honoured by a special mention, while the faults of the others are pointed out and the method of avoiding them in future explained.

Swedish butter is as a rule excellent, and has an aroma and fine flavour which fully justify the high prices it commands. A good deal of it is shipped via Denmark. Not only is Sweden famed for the manufacture of dairy plant and for her good pastures, but the country is well known for its people's habitual cleanliness — a very great point in dairy work. The Swedish national butter mark is the "Rune" brand, which is a quality brand, being allowed only to dairies which comply with regulations and to butter which meets certain tests. Every dairy joining in what are called the National Butter Tests has to allow its butter to be tested at least three times a year. The sample of the butter is taken direct from the warehouse of the shipper the day it arrives, so that it is impossible for the dairy to know when its butter will be tested, and consequently no special pains can be taken with the test cask; it is bound to be a fair sample, giving the average of the quality. Each cask remains for a calculated time in the warehouse for the butter tests in order that the butter may have the same age when tested as when sold on the English market. The butter is tested by nine judges, operating in three sets, who work independently of each other. The testing done, the three sets of judges compare notes, and the average of these three awards constitutes the number of points given to each dairy, unless there should be any serious discrepancy between the three awards, in which case the testing has to be done over again. After the testing, samples are taken of each dairy's butter for the purpose of having it examined as to purity, percentage of water, and degree of pasteurizing. When all this has been done the result is sent to the dairy, as well as to the dairy expert (consulting dairy chemist) of the district, so that the latter is fully conversant with the quality of the butter coming from the dairies of his district. The consulting dairy chemist in question is then called upon to visit the dairies that have sent in unsatisfactory butter, so as to enable them to improve the quality. In order to obtain the right to carry the "Rune" brand the dairy's butter must consequently have passed muster at the official national butter tests (and at least two consecutive tests); but even this is not considered a sufficient guarantee as to the continuous good quality of the butter, inasmuch as the quality might alter between the tests —further improve, or, in some cases, deteriorate. The shipper has therefore the right at any time to call upon the agent of the butter tests to interfere. The latter, assisted by two impartial judges, is then to decide whether the butter in question is still entitled to carry the "Rune" brand or not. This latter arrangement is an effective preventive against any abuse of the brand. In 1905 and 1906 the Swedish butter imported by the United Kingdom came next to the Dutch supply in quantity, and next to the Danish in price, the order of average prices per lb. for the chief butters being: Danish, Swedish, French, Irish, Australasian, German, Canadian, Dutch, Russian, American.

The **American** supply would be of more importance than it is but for the fact that the United States itself consumes most of its butter as a rule, so that the amount available for export is a highly variable quantity. The fact that it figures last in the list above quoted of prices obtained is not at all an index of its quality, since the American average was greatly reduced by the amount of "renovated butter" included.

Renovated butter, as we saw in the official definition at the head of this chapter, is *reworked* butter—stale or other butters which have been melted down, the undesirable components skimmed off or otherwise removed, and a new butter washed in brine thus made "without the addition of chemicals or any substances except milk, cream, or salt". This is sometimes called **Process** butter, and as it is obvious that the "process" may conceivably cover things almost as objectionable as the sins which charity cloaks, this kind of butter needs strict attention from the food authorities and the trade concerned. The taste is usually pretty fair, but the butter soon becomes tallowy and rancid unless the weather is cold.

A British variety of reworked butter attracted a good deal of notice under the name of **Milk-blended butter.** It appears to be simply butter worked up with warm milk in such a way as to render the finished product more watery than it otherwise would be, the percentage of water being about double that of the original butter. Under the Butter and Margarine Act, 1907, its sale is legal provided certain conditions are complied with; but this "butter" must be called by a special name fixed by the Board of Agriculture, and it must not contain more than 24 per cent of water.

Judging Butter.—The chief points upon which butter is judged are flavour, odour, texture or grain, body, solidity, keeping quality, and colour. These are all more 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 debris of hairs. 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 buttermilk or curd not having been properly removed; or, sometimes, from the cream having been kept too long before churning. *Keeping quality* depends upon the composition of the butter itself and upon how it has been made. The more heavily salted butters will, of course, keep best; 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. As to *colour*, it is one of the market requirements that butter shall be of a rich yellow, bright straw, or golden colour. Grass butter has naturally a rich colour, and consequently consumers suspect that pale butters are of inferior quality. In spring or late autumn, however, butter made from the milk of cows fed on hay is naturally deficient in colour, occasionally almost white. The desired colour has therefore to be imparted by artificial means.

Buying Butter.—In buying butter, the way to test flavour is to 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 in the above paragraph as to judging. In a practical address at the Glasgow and West of Scotland Technical College, Mr. James Hamilton said:—"To begin with, let your purchasing be done in a systematic manner—that is, have a day in the week for securing your supply, and see that that day is the one when the butter you chance to be selling arrives on the market. Further, be early on the scene, as other good judges will be there on the same errand, and naturally the best goes first. Also, have your mind made up how much you need to buy, and do not exceed it. Have the state of the market studied for yourself, and never forget that the salesman is there to sell, and, further, that your customers prefer the butter with a fresh bloom on it. Also, do not go up to the door of the warehouse smoking a pipe or chewing cloves after having 'a half or two with a friend round the corner'. Keep before you the fact that you need to take full advantage of your sight, smell, and taste in the work you have on hand. When testing the butter use the butter pale yourself. The inserting of the pale gives you some idea of the solidity of the packing, and badly packed butter is never good for keeping, and when you draw out the sample you can have at least a rough idea of whether or not it contains a superabundance of moisture. On drawing the sample take it to the best light, and if it does not please the eye, go no further with that package. I do not mean that you are to reject it if too pale or too deep-coloured. Butter may be underdone or overdone in this respect and still be otherwise perfect, but if cloudy in colour, greasy-looking, or marled, leave it, as no customer will ever appreciate even well-flavoured butter if it is not pleasing to the eye. If, however, the back of the pale shows the moisture in crystal beads on the clear steel with the butter itself bright and clean-looking, then it may be said to have passed the first ordeal, and for the second, you test its aroma by your sense of smell from top to bottom of pale, taking careful note that the top gives off no windy smell hinting of age or deficiency of keeping quality when exposed to the air. The test by smell is the safest, and if you are gifted with a keen nose it is almost infallible. Should the aroma vary in any part, or indicate an off-flavour in even the slightest degree, if it is the best grade you are buying, put back the sample and pass on. If, however, you are satisfied, it may then be tested on the palate, and in doing so do not be too hurried. Should it pass the latter test, then if you are equal to your work there is little fear but that your purchase will be satisfactory. Possibly some may think this too elaborate a system of selecting butter for those who are regularly at it, still, as one who for over thirty years was daily in the way of buying and selling this commodity wholesale, I can assure you that the retail men who stand out as the most successful in my experience are those who did not select their butter unless on such systematic lines. There is one word of warning I would like to add, and that is, 'Beware of cold-stored butter'. As you know, or ought to know, no one can test the true flavour of butter when in a chilled state. Therefore, when you are shown it just taken out of the cold store, do as a shrewd old horse-dealer whom I knew did when he saw the horses brought out on the bounce, and giving what is termed a false show—be in a special hurry, and say you will call again. Many a crack judge has been astonished at his own awards at a show, where he had judged the butter standing on blocks of ice in the morning, on going over his decisions later in the day, when the heat of the room or the tent had thawed the ice and softened the butter. Therefore, in these days of cold stores always remember that chilling in butter, like charity in your brother-man, hideth a multitude of transgressions."

Chemistry and Adulteration.—There is no doubt whatever in the minds of well-informed authorities that the adulteration of butter is largely practised, but its forms may be shortly summarized thus:—

(1) The addition of fats or oils foreign to butter naturally made.

(2) The addition of moisture, *i.e.* water beyond the natural quantity.

(3) The use of an excessive quantity of preservative, such as boric acid.

(4) Leaving in an excessive quantity of curd.

To understand these sophistications, one or other of which is continually occupying the magistrates and involving retailers in disgrace, very often through no fault of their own, unless it be ignorance, it is necessary to understand a little of the chemical composition of butter as made in the way and according to the standards universally recognized.

In genuine butters the constituents as determined by analysis are nearly always within the following limits:—

	Percentage.
Butter fat	78 to 90
Water	7 „ 16
Curd and milk sugar	0·8 „ 3·5
Ash, not salt	0·1 „ 0·3
Salt	0·4 „ 4

Dr. A. W. Blyth and Dr. James Bell give the analyses of a large number of butters of different districts. The following are from the first-named authority:—

	Normandy.	Fresh.	Isle of Wight.	Guildford.	Winchester.	Mean of 89 Foreign Samples.
	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
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

The United States official standard is, as we have seen, 82·5 per cent for the **butter fat**. With regard to **water**, this constituent is ordinarily 11 to 13 per cent. Irish "brined" butter and some English farm butter sometimes contain more, though the latter seldom, unless badly made. But 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, 22nd 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". Under the Butter and Margarine Act, 1907, milk-blended butter, sold under a special name and the conditions prescribed by the Act, may contain as much as 24 per per cent of water, but not more. As to **curd**, too much 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. **Boric preservative** is used instead of salt, and is usually a mixture of borax (boracic acid) and boric acid; it is found in about a third of all the butter imported by the United Kingdom, Belgium, France, Australia, and Holland being the chief users. Danish butter contains no boric acid. The British Margarine Act, 1887, allows "salt or other preservative" as an ingredient of butter, and at present (1907) no legal limit has been fixed for the amount of boric acid which butter may contain; but in 1901 the Food Preservatives Committee recommended that the maximum allowed should be 0·5 per cent.

Butter Fat.—This is, of course, the most important element in butter, and in order to prevent adulteration by the substitution of foreign fats for this, the analysts have had to give it very special attention. *The Practical Grocer* gives the following as 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)	49·5	= 85·6
	Oleic acid	36·1	
Glycerine			= 12·5
			106·3
	Less combined water		6·3
			100·0

Butter fat, being lighter than water, can 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 student may try this in a test-tube.) 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 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. 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.

In 1903 a Departmental Committee, appointed by the British Government to report on the desirability of further regulations for butter, went carefully into the methods of adulteration then known and the analysts' methods of detecting them, and the following paragraphs of their final report are specially interesting:—

"6. Butter fat—that is, butter freed from water, curd, salt, and extraneous matter—is, like the greater number of the natural fats, what is known in chemical terminology as a triglyceride—or rather, a mixture of triglycerides—that is, combinations of glycerin with certain substances of the nature of acids. Butter fat is, however, sharply distinguished from the vast majority of the natural fats, and in particular from those substances which are or may be used to mix with butter, by the circumstance that a considerable proportion of its acids, when separated by chemical means from the glycerin, are readily soluble in water, or may be readily volatilized either alone or in a current of steam, whereas the acids separated from the foreign fats are practically both insoluble and non-volatile. This fundamental difference serves at once to distinguish, for example, between butter and margarine (a preparation from suet or other fat, mixed with vegetable oils and coloured so as to resemble butter), and has been largely made use of by analysts, not only for this purpose, but also with a view of determining the relative amounts of butter and margarine in a mixture of these substances. It is the principle of the method prescribed and jointly adopted by the Society of Public Analysts and the Government Laboratory (Somerset House) to determine, with sufficient accuracy, the extent to which butter has been added to margarine, and to discover infractions of the law, which forbids the addition of more than 10 per cent of butter fat to margarine.

"7. Other methods of discriminating between butter and margarine, and of detecting the admixture of margarine with butter, are known to analysts and are frequently employed by them. Thus some analysts, after liberating the acids from the glycerine, determine the amount of those which are insoluble in water, butter fat furnishing on an average only about 88 per cent of insoluble acids, whereas margarine usually affords upwards of 95 per cent of insoluble acids. Other analysts ascertain the amount of alkali which will combine with the total acids which may be obtained from the butter, and thereby differentiate between butter fat and the fats that may be used for admixture, since the foreign fats require less alkali for complete combination than butter-fat does. The relative density of the melted fat is also useful as a criterion, since a given volume of melted butter fat at a known temperature weighs more than the same volume of margarine fat at the same temperature.

"8. It is also found that the refractive index of butter and that of margarine are sensibly different. Instruments have been constructed in which this principle is applied, and by which butter can at once be distinguished from margarine. Such instruments are now largely used, especially in Germany.

"9. There are other differences in the chemical and physical characters of butter and margarine which are at the service of the analyst, and which are occasionally made use of; such as the different appearances under the polarizing microscope, and the different behaviour of solutions of butter and margarine in certain solvents. Margarine almost invariably contains a considerable amount of certain vegetable oils, and reactions are known to chemists whereby some of these oils can be detected with ease. The margarine is, in fact, "ear-marked" by the presence of the oils. The addition of margarine to butter might be detected with comparative readiness if it could be ensured that only oils admitting of certain detection were used in its manufacture, and that the characteristic component of such oils was not liable to be introduced into the butter through the agency of the oil-cake given to the cows.

"10. All the tests hitherto devised, whilst serving to distinguish with absolute certainty between butter and commercial margarine, break down to a greater or less extent when applied to the discovery of small quantities of foreign fat in butter—that is, quantities such as 5, 10, or 15 per cent. There is no difficulty as regards the manipulative processes: these are not affected by the nature of the substance to be tested. The difference arises in regard to the inference which is to be drawn from the results.

"11. If butter fat had a constant composition the difficulty would not occur. But butter fat is not absolutely constant in composition, and the variations are sufficiently wide to render it occasionally very difficult if not impossible to establish the presumption, on the basis of a deficiency in the normal proportion of some one or other of its constituents, that the butter has been mixed with a small quantity of foreign fat. Observation has shown that the chemical nature of butter fat is dependent to a certain extent upon climatic conditions, period of lactation, nature and amount of food, breed, and idiosyncracy of the cow; and this variation in composition has a corresponding influence upon such of the physical characteristics of butter as are used by analysts to supplement their chemical tests."

The special characteristics of Dutch butter and others as causing and bearing upon this difficulty are then dealt with in detail, and the report proceeds:—

"32. The Committee, having decided to recommend a limit based on a deficiency in the normal constituents of butter, for the purposes of Section 4 of the Sale of Food and Drugs

Act, 1899, had next to consider what, in their opinion, that limit should be, and how it should be determined. From the evidence before them it appeared that analysts were almost unanimous in recommending that if a limit were to be imposed, as to the expediency of which there was a considerable difference of opinion, it should be based upon a determination of what all were agreed in regarding as the characteristic constituents of butter fat, namely, the volatile acids. That the proportion of volatile acids is by general consent by far the most important criterion in butter analysis will be evident from the whole body of the evidence. Originally suggested by Reichert as the foundation of a quantitative estimation, the process has been worked out by the co-operation of a number of analysts, among whom may be mentioned Meissl in Holland and Wollny in Germany, and is now in such a condition that by attention to the prescribed details, which are capable of being precisely stated, the method is capable of affording accurate and strictly comparable results. What is known, therefore, as the Reichert-Wollny method of determining the amount of the volatile acids which butter may contain fulfils, in the opinion of the Committee, the conditions of a quantitative method which is to be made the basis of judicial proceedings. This method consists in taking a definite amount of the butter fat, converting it into a soap by the action of alkali, liberating the acids of the soap by treatment with dilute oil of vitriol, and then heating the acid solution in an apparatus of prescribed form and dimensions in such a manner that a definite and uniform volume of the liquid is distilled over in a definite and uniform time. The liquid so distilled contains about nine-tenths of the volatile acids obtainable from the butter, and their amount is determined by finding the quantity of alkali which is required to exactly neutralize them. (The exact details of this method, as adopted by a committee consisting of the Principal of the Government Laboratory and members of the Society of Public Analysts, to determine the amount of butter fat in margarine, are contained in a schedule attached to the report.) We suggest that the process thus described should be adopted in connection with the regulation which we recommend should be framed in terms of Section 4 of the Sale of Food and Drugs Act, 1899.

"33. With respect to the limit to be set up by regulation under this section, the Committee are of opinion that if the amount of the volatile acids in any sample of butter, as determined by the Reichert-Wollny method, should fall below the number 24, a presumption should be raised that the butter is not genuine.

"34. In arriving at this decision the Committee had before them the evidence of analytical experts and the tabulated results of some thousands of determinations, more particularly of the volatile acids contained in butters of very variable origin.

"35. The analytical numbers furnished to the Committee show that more than nine-tenths of the samples have a Reichert-Wollny number comprised between the limits of 24 and 32, and that by far the greater amount of these are comprised between the limits of 26 and 31. Samples have been met with as high as 35 and as low as 18·4, but they are relatively very infrequent, and are produced under exceptional and for the most part abnormal or remediable conditions. Many of the exceptional instances brought to the knowledge of the Committee were the produce of single cows or of very small herds. As the greater mass of commercial butter—that is, the butter which comes within the purview of the Sale of Food and Drugs Acts—is the product of large herds, or the mixed products of different dairies, abnormalities due to idiosyncrasy or to exceptional causes tend to disappear. Indeed, as the factory and creamery systems of manufacture extend, and as modern methods of dairy management become more and more prevalent, it is obvious, as in the case of Denmark, that butter must become more and more uniform in its composition, and the Reichert-Wollny numbers therefore must tend to aggregate round the average, and the range of variation to become less and less.

"36. The Committee assume, therefore, that a Reichert-Wollny number of 24 will not act prejudicially upon any appreciable quantity of butter made in the United Kingdom. Colonial, American, Argentine, Danish, Swedish, French, and Italian butter will also be practically untouched by the limit. It may, however, occasionally affect Norwegian, Frisian, and Siberian butter. The ample information furnished by the representatives of Holland and of Russia, supplemented by the evidence which they were able to obtain from independent sources, enables the Committee to form a fairly accurate estimate of the extent to which the butter imported into the United Kingdom from these countries would be affected."

In 1906 a Select Committee of the House of Commons again investigated the subject of butter adulteration, and made further recommendations which were embodied in the Butter and Margarine Act of 1907. This Act gives power to the Local Government Board to lay down regulations as to milk solids and preservatives in butter.

Butter-testing and Analysis.—Without going more fully into the Reichert-Wollny and other methods of testing which concern the analysts, we may mention one or two rough-and-ready tests of a more simple nature for **detecting adulteration** of butter—though it must not be supposed that absolute reliance can be placed on tests of this kind.

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.

A method of detecting margarine which has been suggested 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.

Heated in a spoon over a flame, butter boils free from noise, while margarine "bumps and spits and crackles".

The **Valenta test** for margarine requires a test tube, a measuring 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°–212° F.), whereas genuine butter does not become turbid until the temperature has fallen to about 57°–62° C. (133°–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.

To test for the quantity of water 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 grams of butter weigh, after drying, only 88 grams. Then the water = loss of weight = 100 − 88 = 12 grams. Since 100 grams of butter were taken, the 12 grams lost also express the *percentage* of loss, so that the water is 12 per cent.

Professor Carroll's apparatus for this purpose consists of a water-boiler heated by a spirit lamp, a glass test tube, and a measure. The measure cuts out the proper quantity of butter from any tub or block of butter. This measured sample is put into a test tube, which is then placed in the hot bath and kept in the boiling water for about three-quarters of an hour. The butter fat in that time rises to the top of the test tube, while the water sinks to the bottom. At the bottom of the tube where the water settles there is a graduated scale by which the percentage of water in the sample can be read off at once.

Boric acid 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 wineglassful 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.

Storage.—High-class lightly salted butters will keep good for five or six weeks under proper conditions of storage, but most will not. If butter when pressed with a knife blade gives out moisture which is milky—due to the buttermilk being left in—its keeping properties will be found inferior. If it is necessary to keep such butter by any means available, the buttermilk should be squeezed out as much as possible and the butter then packed in large pieces with ice all round it, if ice can be procured. 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 "crocks", levelled off, and a layer of salt put on the top—to cover. In packing the butter into the crocks a wooden beater is used to consolidate it thoroughly. The crock 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 crock 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 buttermilk has not all been extracted. Salted butter taken from the crock 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 crocks, they should be washed out thoroughly with hot water and soda.

All butter that has been turned out in a shop during the day should be removed into the cellar for the night. For the counter a dust-excluding glass case is recommended. A small quantity of butter cut from a large package and left exposed will soon lose its freshness. Butter should be kept in bulk and in a cool, even temperature, and when exposed for sale should be kept separate from articles of any pronounced odour. For wrapping, the best grease-proof paper is recommended, the delicate flavour of butter being sometimes ruined by contact with common or printed paper such as was once often used by small retailers. The cutter, beater, or wooden pats should be kept in a jar of cold water changed several times a day, and should always be scrupulously clean.

Chapter XIII.—MARGARINE

Under the British law the legal name for butter substitutes is margarine, and all margarine factories have to be registered. At a recent date there were twenty-one margarine manufactories in England and twelve in Scotland. The margarine manufactories in England were two in Middlesex, one in East Sussex, one each in Birkenhead, Birmingham, Bridgewater, Greenwich, Hove, Hyde, Warrington, and Southampton, two in Liverpool, and eight in Poplar. In Scotland the margarine factories were one each in Kirkcudbright, Lanarkshire, Midlothian, and Leith, and two each in Ayrshire, Wigtownshire, Aberdeen, and Glasgow. Besides these an official return showed that there were in England eighty-eight and in Scotland four "butter factories" where butter was "blended, reworked, or treated by any process, as distinguished from creameries or dairies where butter is churned from milk or cream". It may be added that in the United Kingdom not only manufacturers of margarine, but all wholesale dealers in margarine or margarine cheese, must register their names with the local authority, and must keep a register showing the quantity and destination of all margarine and margarine cheese sold by them to be sold again. In some countries (France, for instance) it is forbidden to sell butter and margarine in the same shop, or to manufacture both in the same factory. The reason for these and other precautions is not that margarine is an unwholesome food, but that it obviously lends itself to fraudulent sale as butter. It is *not* butter, though so excellent a substitute for it that it is very often absolutely indistinguishable from genuine butter by anybody except the cleverest and most experienced of analysts. For this reason—its facility for deception—many honest butter-dealers have a strong antipathy to the sale of margarine, arguing that it enables unscrupulous competitors to undersell them, and by taking heavy profits upon one fraudulent article to carry on business at a lower rate of net profit upon other goods which they sell under honester conditions.

"A Good Thing if Well Used."—Under this comment *The Practical Grocer* observes 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 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."

The wholesomeness of margarine depends upon the cleanliness of the methods employed in the factory, and upon the nature of the raw materials used. A first-class margarine factory is as cleanly as a first-class dairy. But there is a good deal of latitude as to the raw materials, and the practice in this respect of the best factories is not that of all.

Raw Materials.—The French chemist Mège-Mouriès, commissioned by Napoleon III to find a substitute for butter for the use of the Paris poor during the scarcity of the Franco-German War, discovered by his experiments with animal fats that a very good and wholesome butter substitute could be obtained from beef fat. When this manufacture was sanctioned by the Paris authorities it quickly spread, to such an extent eventually that the Mège-Mouriès recipe had to be altered owing to the limit being reached of the supply of beef fat when used as he used it. Other animal fats and vegetable oils were thus introduced into the manufacture, including such as pork fat, veal fat, cotton-seed oil, coconut oil, earth-nut (arachis) oil, and others. The raw materials now used in the best margarine factories are "oleo" (short for the substance now specially called oleo-margarine), neutral lard, milk, cream, arachis oil, and for the cheaper qualities, cotton-seed oil.

Oleo is produced from the fat of the ox by a method which a manufacturer describes as follows. "The fat is removed from the slaughtered animal as quickly as possible, and is then taken into the works (which are adjacent to the abattoir), and there carefully sorted. The selected fat is then carefully and thoroughly washed and cleansed with warm water, after which it is transferred into water at a very low temperature to secure rapid hardening. The fat is then cut into small pieces and shredded in a shredding machine, being finally ground between rollers. The mass is then immediately transferred into tin-lined jacketed melting-vats and heated to the necessary temperature, this temperature being maintained by steam passing through the jacket. Salt is then sprinkled over the surface of the melted fat to assist the separation of the fat from the tissue. This melted portion is then run off into shallow tin-lined trays, which are placed in tiers in a cooling-room where the bulk of the stearine separates out in a crystalline condition. The crystallized mass is then divided into pieces weighing a few pounds each and placed into hydraulic presses, and a clear fat is expressed. This fat is then run into vats, in which it stands for a few days at a temperature suitable for the crystallization of the stearine.

The whole is then mixed up into a homogeneous pulpy mass, which is again placed in the hydraulic presses in small pieces wrapped in canvas cloths, and the oleo-margarine or oleo oil which flows out from the presses forms the principal raw material for the manufacture of margarine, leaving behind in the canvas bags the stearine, which is the indigestible portion of the fat."

Neutral lard is prepared from the leaf lard of the pig.

Arachis oil is obtained from nuts which are the seeds of the plant *Arachis hypogœa*, cultivated extensively on the West Coast of Africa, and in America and Southern Europe. The nuts having been shelled by machinery, the inner skin is removed by an air-blast similar to that employed to clean wheat in flour mills. The cleaned kernels are then ground and the mass packed into bags, which are put into hydraulic presses under a pressure of about 2 tons to the square inch. The oil then exudes readily. Its flavour resembles that of salad oils, for which it is said to be very often substituted; the "nuttiness" is a recommendation.

Cotton-seed oil is obtained by a somewhat similar process from cotton seeds after they have been divested by a de-linting process of that woolly hair which yields the cotton fibre. The best refined oil is almost neutral in smell and taste. Formerly it had a rather sickening odour and nauseous taste, but modern chemistry has removed these, so that to the eye, taste, and smell of the ordinary consumer specially refined cotton-seed oil is barely distinguishable from olive oil.

Coconut oil is another oil capable of being refined to neutrality, and therefore used, like cotton-seed oil, not only in the production of butter substitutes, but for adulterating butter itself.

Manufacture.—In one of the largest British manufactories of margarine the process of combining oleo, milk, and the oils (the proportions and kind of the latter vary with different factories) to make margarine is carried on as follows.

The milk is pasteurized and matured in steam-jacketed open tanks before being churned with the oleo and oils.

The oleo, received in casks from the lairages, is in summer a colourless or light-yellow fat, in winter solid enough to require an axe. In the melting-room it is melted in steam-jacketed oval vats, each capable of holding about 3 tons, and within which are moving paddles to keep the fat in motion till fluid.

Brought to the right temperature and fluidity, the oleo, milk, and vegetable oil pour through their several pipes into the churning-room and into steam churns. These are great steel oval pots, heated, and each capable of holding 3000 lb. of the mixed fluids. Within are paddles, each double set driven by its own engine, revolving amidst the dark-yellowish, creamy-looking fluids to be incorporated. The proportions of these fluids have been carefully gauged, while the temperature and other conditions are regulated to a nicety. The churn being filled, and the materials inside it mixed up by a few slow turns of the paddles, the receptacle is closed up and the paddles within set revolving at a speed of 130 revolutions a minute. The stirring and mixing or churning process reduces the contents of the churn to an emulsion—the first form of margarine. The emulsification completed, the thick, warm, frothy liquid is drawn off from the churn, meeting, as it flows away, a current of ice-cold water. This at once cools and crystallizes the emulsion, and the light-yellow, grainy margarine heaps up like a pretty yellow foam.

The margarine has to be cooled, worked like butter, and packed. Before and after being worked it rests in a maturing-room, where long open tanks contain it in an atmosphere kept as cool and sweet as possible—glazed walls, a watered floor, and adequate ventilation being features of this room. The working process consists in passing the new-made margarine through various forms of squeezing and kneading apparatus in order to press out all superfluous moisture and give the margarine consistency and texture. In the course of this it is salted to taste. The proper texture having been arrived at, the margarine is moulded and weighed up into rolls, bricks, or any other desired shape, and finally placed in a cool store ready for despatching.

Packing.—In a large factory such as that described the margarine is packed in all manner of shapes and sizes. A visitor writes:—

"Of the larger packages there are *boxes* oblong, square, flat, and pyramidal, 'colonial', 'baker's tray', &c., in halves, quarters, and eighths of a cwt.; next come *round packages*—Danish casks, American pails, beech and oak kits, kiels, cools, oval tubs, handled tubs, Dutch casks, and Irish firkins, the larger Danish casks being 1 cwt., the Dutch casks 100 lb. and 94 lb., the Irish firkins 84 lb., 72 lb., and 56 lb., the American pails, 56, 36, 28, and 14 lb., the kiels halves, quarters, eighths, and so on. Then come the *baskets* of wicker-work—square, round, French, grocer's, baker's, market, 'square arm', the largest being the grocer's and baker's, which carry 1 cwt. apiece, while the others range in size down to 14 lb. Then there are *tins* for shipping and export, in sizes from a single lb. up to 28 lb., and *crocks* of enamelled earthenware, 36 lb. and 28 lb. Equally various are the sizes and shapes of the pieces of margarine to be packed in these receptacles. There are, for instance, 'Irish lumps' of 4 lb. to 6 lb. each, irregular in shape, twelve in a box; other 'lumps' of 3, 4, 2, and 1 lb.; rolls of 2 lb., 1 lb., or ½ lb.; cartons in pounds and halves, prints in pounds and halves, and so on. Here we have a box of ½-lb. pats, two dozen in a box, each pat wrapped in parchment-paper, and duly labelled 'Margarine', as required by the law. Here again are 'English lumps', oblong in shape, temptingly done up in muslin, with paper bands in blue and red. In the north of Scotland the fancy is for 4-lb. 'lumps'. 'Finest fresh rolls' is the legend on some dainty-looking 2-lb. rolls in muslin and fancy paper, done up like choice fruit in a neat wooden box."

It will be seen that in a thoroughly up-to-date margarine factory the manufacturers have not much to learn from the ordinary dairy. In such matters as electric plant, refrigerating plant, automatic machinery for making packages and for packing, the use of purified water, and so on, great enterprise is shown. Cleanliness, too, is scrupulously insisted upon, and is regarded as a great point. The great manufacturing-room, for instance, is washed down thrice a day; the employees' aprons and overalls are washed for them and distributed clean daily; and by the use of "Scotch hands" and other contrivances any actual handling of the margarine is avoided. There is no doubt that the use of these wholesome methods (encouraged, if not necessarily secured, by a strict system of government inspection) must be in any country a great safeguard to the public in the preparation of this now important article of food, whilst it is also advantageous to the manufacturers themselves in ensuring a successful product. As in ordinary dairying, absolute cleanliness in every detail of the process is essential. It is probably in the lairages, and other places where "oleo" is made, rather than in the margarine factories, that there is the greatest need for thorough supervision in the interest of public health.

Chemistry.—Margarine manufacturers publish the following analytical comparison of margarine and butter to support their argument that their own product is a wholesome and nutritious substitute for butter:—

	Butter.	Margarine.
Water, per cent	13·71	10·93
Fat, „	83·11	84·99
Casein, „	1·09	1·14
Salt, „	2·09	2·94

It will be noticed that the word "fat" is used above, not "butter fat". In the chapter on butter it was pointed out 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. The matter may be shown 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 margarine is made up with butter it to this extent approaches the true butter character. 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 the United Kingdom is believed to be made with cotton-seed oil.

Butter Fat.—The bearing of the above remarks regarding the absence of butyric acid from margarine will be understood when it is mentioned that the British law makes it illegal to sell margarine containing more than 10 per cent of butter fat. The Sale of Food and Drugs Act, 1899, Section 8, states:—

> "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".

The British Government Laboratory, in concert with the Society of Public Analysts, deduces the proportion of butter fat according to the volatile acids, as shown by the Reichert-Wollny number. (See **Butter.**) The Reichert-Wollny number 4·0 is equivalent to 10 per cent of butter fat in margarine. Any higher number than 4·0, therefore, renders the margarine an illegal compound which cannot be sold in the United Kingdom.

Mixtures.—The operation of this law has the effect of prohibiting the sale of what are called "mixtures", although the term is still often used in the trade. The Butter and Margarine Act, 1907, declared that

"For the purposes of the Sale of Food and Drugs Acts and this Act the expression 'margarine' shall mean any article of food, whether mixed with butter or not, which resembles butter and is not milk-blended butter".

Therefore "mixtures" are margarine, and as margarine must not contain, under the Act of 1899, more than 10 per cent of butter fat, "mixtures", although advertised, cannot in the United Kingdom be legally manufactured, sold, exposed for sale, or imported.

Imitation Butters and others.—Amongst these may be mentioned the following:—

Coconut butter, also known as **Copra butter**, is a form of coconut oil expressed from the "copra" or dried slices of the kernel of the "cokernut" or coconut. It is largely manufactured at Marseilles, being so treated in some processes as to resemble greatly ordinary butter, and to be miscible with it. *Vegetable butter*, *vegetaline*, *cocose*, *nucoline*, and *palmin* are other names. In Germany *palmin* is largely sold at about 8*d.* a lb., and is used by cooks as a substitute for butter and lard. It is usually white in colour, of the consistency of mutton tallow, and almost tasteless. In a cool room it will keep several months.

Cocoa butter, more correctly **Cacao butter**, is a sweet vegetable fat or tallow obtained from the cacao bean in the process of manufacturing cocoa, or simply by heating and grinding the theobroma beans. It is much used for the inner contents of chocolate creams.

Dika butter, a West African product obtained by crushing the kernels of the ibo tree.

Ghee, a liquid butter largely made in India from the milk of buffaloes and cows, twice boiled, and bottled with salt and betel-leaf.

Kokum butter (frequently mixed with Ghee), a tallowy substance yielded by the seeds of *Garcinia indica.*

Mahwa butter, from the Indian mahwa plant, used in making candles and soap.

Shea butter, a vegetable tallow obtained from the nuts of the "butter-tree", *Bassia parkii*, a forest tree which grows wild in the West African interior.

Handling Margarine.—Margarine supplies should be as fresh as they can be procured, as, although margarine will not turn rancid, it loses its flavour and becomes flat and insipid when stale. Storage conditions are much the same as for butter, but in the United Kingdom there are special legal requirements to be observed. Every tub, cask, or basket containing margarine must be marked with the word "Margarine". In keeping margarine in stock care must be taken that it remains in the branded or marked tub, and that the mark is not defaced or the label detached. When exposed for sale margarine must bear a label with the word "Margarine" in letters $1\frac{1}{2}$ in. square; and, to prevent mistakes, every lump on the block should be labelled, even though it is not exposed to the customer's view. When sold, margarine must be handed to the customer wrapped in a wrapper with only the word "Margarine" on it, in capital block letters at least $\frac{1}{2}$ in. in length.

Chapter XIV.—LARD

Lard, "the rendered fresh fat from slaughtered healthy hogs", as it is defined in the United States official standard, differs in different samples according to the way in which it is made and the kind of fat from which it is made, since not all the fat of the hog—or pig, as the British say—is of the same consistency. There is no lard better than **British home-made**, which is made from, more especially, the back fat, and the "leaf", loin fat, and kidney fat. In America the practice on the large scale is to make lard from any fatty parts of the animal. 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, and the fat is best for lard-making purposes in the winter months.

Home-made Lard.—The British method of making lard on a small scale is to free the fat from skin and flesh and cut it up into small squares, either by hand or machine. After being rinsed with water, the fat is placed in a vessel for "rendering" or melting. The vessel may be of tinned copper heated over a fire, or of enamelled iron heated by a steam-jacket. During melting the fat is stirred well. When quite clear and free from water it is poured through strainers into pans or other receptacles to cool and set. Occasionally a little powdered alum is mixed with the fat to make it set firmer. The strainer keeps out "greaves" or "scratchings" (the English term), which are, of course, portions of flesh tissue and fat membrane. Such "scratchings" are sold by the pork butchers as food, and are also used in manufacture, being very rich in nitrogen.

Manufacture.—On the large scale, as practised in the large hog-slaughtering packing-houses at Chicago and elsewhere, the rendering of the fat is effected by steam under pressure. The "renderer" is a steel vessel 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 ft. long and 4 ft. 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.

Varieties of Commercial Lard.—The United States definitions of the varieties of lard are as follows. *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 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 60. *Neutral lard* is lard rendered at a low temperature.

Various classes of lard, however, are recognized in the trade, as mentioned above, according to the parts of the fat used and the methods of rendering it. A bulletin issued by the United States Department of Agriculture describes the kinds of lard produced in the States as follows:—

(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.

"**Refined lard**" is a term formerly used in America to describe a low-class product composed chiefly of cotton-seed oil and lard stearin; this is now more generally—and a little more honestly—called "**lard compound**", or "compound lard".

American lard is imported to the United Kingdom in kegs, tins, and pails. "First quality keg lard" corresponds to the "prime steam lard" above mentioned. Ireland sends to the British market a great deal of lard, Waterford ranking next to British home-made. Denmark is also a large supply source. A great deal of the lard sold is "bladdered", and this is received from all the sources of supply.

Chemistry of Lard.—Pure lard is white, or nearly so. It is essentially a mixture of three substances called *oleïn*, *palmitin*, and *stearin*, of which oleïn is the softest and stearin the hardest. When wrapped in cloth and submitted to pressure, about 60 per cent of the lard is forced out in the form of *lard oil*, a pale-yellow limpid oil. The solid residue left in the press is the *lard stearin*, and is used for soap- and candle-making, whilst oleïn is the chief constituent of the lard oil. The three substances named—oleïn, palmitin, and stearin—are, chemically, compounds of glycerine with fatty acids, called oleic, palmitic, and stearic acids. In lard there is about 6 to 8 per cent of glycerine and 93 to 95 per cent of these acids. The chemical composition varies considerably, because lard varies greatly in quality as made from different parts of the fat, by different methods, and at different seasons of the year. Figures as to melting-point, "iodine value", and so on are only approximate, and it is sometimes very difficult for an analyst to say, for instance, whether lard has or has not been "stiffened" with beef fat. Beef fat or mutton fat is sometimes used in making the "compound lard" mentioned above, and also in adulterating genuine lards that are "soft".

Detecting Adulteration.—Only an experienced analyst can detect the small quantities of beef fat used in adulteration; but the method is to dissolve the melted sample in ether in a glass tube, immerse the tube in water at a temperature of 13° C. (55·4° F.) for twenty-four hours, and then observe very carefully the character of the white crystals deposited, which, if the lard is pure, are feathery or "plumose". 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. A block or bladder of lard, when cut through the centre, will often show a dark heart-centre if adulterated or improperly refined. To detect adulteration with starchy ingredients drop a little iodine on a few grains of the lard. If it is adulterated the colour will turn to blue or almost black.

Storage.—A dry, cool room—not a damp cellar—should be used for storing lard. If too long exposed to the air it will turn rancid. Earthenware or stoneware vessels are suitable enough for keeping lard in, unless they are glazed with a "soft" lead glaze, in which case, if the lard turns rancid, the acid thereby produced attacks the lead glaze and dissolves it, rendering the lard injurious to health.

Chapter XV.—EGGS

Eggs in one form or other are the means whereby nearly all animals reproduce their kind. Breaking the shell of any bird's egg, we find enclosed in a membrane the white of the egg or *albumen*, the yolk or *vitellus*, and in the yolk a small lens-shaped speck in which is a little oval sac of a greyish colour. This little sac is the place where the young bird originates. And, as a point of importance to grocers who are concerned with the keeping properties of eggs, we may note the further physical fact that both the shell and the inner membrane of eggs are porous, though the membrane not so much so as the outer shell. Keeping out the germs of decay means stopping up the pores in some effectual way; and it is because of the porosity of the shell that a dirty egg will not keep so well as a clean one.

An ordinary fowl's egg weighs from $1\frac{1}{2}$ to 2 oz., the latter size by no means uncommon. A duck's egg weighs from 2 to 3 oz.; a turkey's 3 to 4 oz.; a goose's 4 to 6 oz. It is now known that as regards laying-powers the newly produced or composite breeds of fowl, those in which the vigorous blood imparted by the crossing process is still dominant, are better than the older breeds. In the past the Brahmas and Cochins, Dorkings and Spanish, were the prime layers. These were beaten by the Plymouth Rocks and the Langshans, and these again are out-layed by the Wyandottes and the Orpingtons. In some poultry experiments on the American Government agricultural station at North Carolina it was found that, generally speaking, larger eggs were laid by hens than by pullets of the same breed. In an English competition under the Utility Poultry Club in 1902–3 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. It has also been proved by experiment that the hen's food affects the flavour of eggs.

Egg Importation.—The two great egg-importing countries are Great Britain and Germany. The British imports have increased five-fold in thirty years, the annual consumption in Great Britain being estimated at about 4,000,000,000 eggs, of which rather more than one-half are foreign, one-third British, and the rest Irish. The largest foreign contributors to the British egg market are Russia and Denmark.

The following table shows the true countries of origin of the eggs imported into Britain in a recent year:—

Country Consigning.	Great Hundreds.	Value.
Russia	7,340,673	£2,420,223
Denmark	3,678,484	1,640,044
Austria-Hungary	2,283,808	854,274
Italy	1,606,421	673,652
Germany	1,323,771	489,374
France	1,036,443	429,652
Egypt	488,206	147,545
Sweden	263,746	106,461
Canada	204,733	92,925
Holland	197,315	69,415
Morocco	158,770	54,840
Belgium	143,033	59,949
United States	68,683	30,183
Turkey in Asia	31,072	8,966
Spain	20,658	8,181
Portugal	16,205	6,406
Roumania	1,560	599
British possessions besides Canada	8,430	4,782
Other foreign countries	2,048	651
Total,	18,874,059	£7,098,122

A *great hundred* is 120 eggs. In market quotations the general rule for imported eggs is to quote so much per great hundred, although Danish and Russian eggs are quoted by weight. All foreign eggs are packed to the number of 1440, equal to 12 long or great hundreds, in a single case, with the exception of extra and best Italians, of which 1380, or 11½ great hundreds, go to a case, or small eggs, which take 13½ hundreds or 14 hundreds to fill a case. It may be added that in the trade it is a recognized thing for importers to allow wholesale egg merchants half a hundred per case for broken or bad eggs, but this allowance is not recognized as due from egg merchant to retailer.

Large quantities of eggs brought from various European countries to the British market are packed in wood wool, while Canadians are packed in layers of compartments formed of strong paper, an egg in each compartment. Irish eggs are commonly packed with straw, the Irish Department recommending new oaten straw or specially prepared wood wool (fibre), or wood wool with a thin layer of clean dry straw top and bottom of the case to prevent injury from concussion. Eggs are graded into three or more sizes, and only eggs of a certain size and weight are put in the same box, a number on the outside of the crate denoting the size for the dealer's convenience.

Gathering Eggs.—In the chief egg-exporting countries the co-operative principle is adopted to secure prompt collection of eggs and their continuous supply to the market. In the Kehl district of Germany 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 pfennigs (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. In Ireland the trade has been revived by the adoption of very similar methods. Irish eggs rank next to British new-laid in the estimation of the British trade, but owing to want of organization of the trade in Ireland and the bad packing by the peasants the trade dwindled to a low ebb. The Irish Organization Society then stepped in and formed co-operative poultry societies, which adopted the plan of buying eggs from members by weight instead of by the dozen or score, and refusing to take any eggs not perfectly fresh and clean. The eggs, packed under expert superintendence, soon reasserted Ireland's position on the British market, and the enlightened activity of the Irish Department of Agriculture has continued the success.

Danish Eggs.—Of imported eggs Danish take the highest place on the British market, and this is due to the fact that small, bad, and dirty eggs have been kept back by the proper organization of the trade. It was a Danish co-operative poultry society, formed in 1878, which introduced the system of selling eggs by weight, with the result that larger prices have been obtained per egg than was formerly the case. State aid, moreover, has been granted to certain experimental stations where the work conducted has been definite and satisfactory. The leading societies of the country have formally united, and number some 9000 to 10,000 members, their work leading up to that which is carried on by the Egg Export Society, which practically markets the products while working in perfect harmony with them. The general movement has been followed by the establishment of some hundreds of local societies, which include over 350,000 members, each local society sending its delegate to the meetings of the chief organization, to which it pays a trifling fee of a few pence per member. A local society provides its own egg collector and pays all expenses until the eggs are ready for shipment, at which point the parent society takes charge of every consignment, in its turn paying the necessary expenses until the eggs are on board the ships intended to convey them to this or any other country. At the end of each year the profits are ascertained, one-half being paid to each local society and the balance being credited to it; for it is essential to retain money in hand in order to conduct the work; in a word, to provide ways and means. The eggs are collected by the collector on fixed days and delivered at the society's station at the end of each day. No egg must be handed to a collector which is more than a week old. All eggs are purchased by weight. It is estimated (writes Professor Long) that the total cost from the nest to the ship is three farthings per dozen eggs. The packing, like the grading and testing, is performed by women, before whom are six trays, one being provided for each size or grade. These frames hold from 60 to 120, and are provided with a hole for each egg. As each frame is complete it is removed and weighed, and care is taken that the correct weight, neither more nor less, is balanced. The next movement is to the dark room, where each egg is tested by the aid of electric light. After stamping with the society's mark, packing for export completes the operation, the boxes employed being some 20 in. in width by 79 in. in length and 9 in. in depth. Each box, which is non-returnable, is made of light pine, and holds 1440 eggs. The eggs are packed in layers of bright rye straw or, in some cases, with wood wool, there being in all four layers of eggs in each case. It is flattering to the Danes, but not satisfactory to the trade, that other eggs sometimes masquerade as Danish, judging from complaints uttered from time to time.

Russian Eggs.—In point of quantity the Russian eggs are of greatest importance on the British market; but, as a comparison of the numbers and values quoted above will show, the quality is usually but secondary. However, the egg exportation has developed into very great proportions, and may still grow. Riga is the principal port of export, though the eggs shipped thence are not gathered from the Baltic Provinces or from any of the neighbouring governments. The real egg-producing region, from which supplies are drawn for the foreign markets, starts at Tchernigoff in the southwest and sweeps round in a curve towards Kursk, Kharkoff, Voronejh, Tamboff, Saratoff, Penza, Samara, Simbirsk, Nijni-Novgorod, Kazan, and ends at Viatka, but the more prolific districts are those of Voronejh, Tamboff, the Volga, and Kazan, while a large trade appears to be developing at Viatka. Eggs are also obtainable in Siberia, and at a cheap rate, but their quality, a consul states, is not to be depended upon. The manipulation of the egg business in Russia has been worked up to a high degree of perfection, and the agents of the firms in this trade are legion. Every available district has been tapped, the only areas that have not, as yet, been exploited, being those without adequate means of communication.

New-laid Eggs.—Wherever he is fortunate enough to procure them fairly regularly, new-laid eggs are the grocer's stand-by. The perfectly fresh egg is an item of food which all customers appreciate and are willing to pay for, and of which most are competent judges. The special feature of the new-laid egg is the creamy appearance of the white when cooked. Of external criteria, size is of course the chief; and it is probable that selling by weight will come to be more generally practised. Cleanliness is also taken into account, and also colour, many purchasers fancying that the darker the colour the richer is the egg. As regards freshness, whilst, of course, an egg cannot be too fresh, it is somewhat unreasonable to say an egg is not perfectly fresh and new-laid when a few days old. As Professor Long has remarked: "There is no greater fallacy than to suppose that unless an egg is laid a day only before its consumption it is not fresh. A fresh egg is all we need, whether it be laid to-day or six days ago." With the quick trains of to-day, given proper organization, Irish eggs ought to be perfectly fresh always on the British breakfast table, and even Danish, which take forty or fifty hours to reach the British ports. The great point is the proper and prompt collection and transport of the eggs from pen to table. But at present there is great uncertainty about this. The tradesman, therefore, cannot be too careful, and in particular he should guard against being victimized by stored eggs. In summer eggs are from 30 to 60 per cent cheaper on the market than in winter, and new-laids retailing in summer at ten a shilling may cost 2½*d.* or 3*d.* apiece in the scarce time; hence the temptation to store and to sell stored as new is very patent.

Testing.—The tiny air-space at the end of an egg becomes larger as the egg grows older. Very speedily after an egg is laid the contents of the shell begin to lose in bulk, and even when the pores are artificially stopped up to prevent evaporation there is shrinkage. In the earlier stages this is more generally seen in an enlargement of the air-space, and therefore, in testing, one of the first points to look for is the size of the air-space, at first very small, so that a sixpence would quite cover it. When the air-space is easily distinguished, and covers a greater area than indicated, the 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 (writes an expert) 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.

Measuring Freshness.—A method practised in the markets of Paris is the following. About 6 oz. 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 oz. 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. In Saxony a plan of testing by the "tilt" of the egg in water is used. The absolutely fresh egg sinks and remains horizontal. Staleness enlarges the air-space and makes that end of the egg lighter, so that it rises, and the egg tilts upwards. 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 aging egg, an *age-ometer* is thus formed, by means of which the age of an egg can be ascertained, it is said, to within a day.

Candling.—This means examining eggs by looking at them in the dark, or in a box, against the strong light of a lamp. Without special apparatus it is done in a room with a single bright light, holding each egg between the eye and the light. A fresh egg appears unclouded and almost translucent; a bad one is dark, and if incubation has begun there is a dark spot, the size of which is in proportion to the age. In one form of apparatus an electric lamp is so fixed that the operator's eyes are over it as he sits, enclosed in a black cloth like a photographer at his camera. A continuous band, slightly sloping, carries the eggs in a single line across the lamp, the rays of which enable the tester to detect at once black, spotted, watery, or greenish eggs. The bad ones he tips into a shoot to be carried away, while the others pass along to a tray.

Grading.—An egg-grading table consists of an inclined plane of glass, across which are standard bars which can be set at any given weight per 100 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. Amongst egg-producers two methods are commonly employed: one, by using a board in which three holes have been cut the shape of an egg, but varying in size. The eggs that pass through one hole are one size, those through another the second size, while those that pass through the third are the largest. In Denmark the usual method of grading, as already explained, is by hand, but this requires a great deal of experience, as the differences are so slight.

Storage and Preserving.—Fresh eggs should be kept in a dry, cool place, free from any odour which would be capable of impairing their flavour. Eggs have a tendency to absorb any strong odour. As an instance of this, it was noticed by some official experimenters in America that on one occasion some eggs had a very asphalty smell; on enquiry it was found that they had been stored near a yard that had been newly asphalted.

With regard to **preserving eggs**, the British Board of Agriculture states that the best results are obtained from the use for this purpose of (1) lime-water and (2) water-glass. For these two methods the Board's instructions are as follows:—

"*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 4 parts by measure of finely slaked lime with 20 parts of water, and afterwards adding 1 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 2 or 3 in. 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 5 or 10 times its bulk of pure water, according to the strength. Experiments in America have shown that a 3-per-cent solution (*i.e.* 3 parts of water-glass to 97 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."

Most experts now appear to give the preference to water-glass. The United States Government Department of Agriculture states that "the water-glass offered for sale is sometimes very alkaline; such material should not be used, as the eggs 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."

Thoroughly cleaned barrels or tubs, or for small quantities crocks of glazed earthenware, are suitable as receptacles for eggs in water-glass. A galvanized-iron bucket of 3-gallon size will hold about 250 eggs, to cover which about 5 quarts of diluted glass-water will be required. A 36-gallon paraffin-cask, well burnt out to remove all smell, will hold some 3000 eggs in water-glass. Some people recommend large jars such as chemists and drysalters use, or, for a small quantity, large jam jars.

The best months for preserving, in Great Britain, are found to be March, April, May, and June, as summer eggs do not keep nearly so well as those laid before the hot days. A gentleman who wrote on the subject in the *Journal of Agricultural Science* in 1907 said he had examined large numbers of eggs preserved in water-glass and had specially experimented with lots to discover the time they would keep. For the small experimental lots the eggs were carefully selected and packed, and not a single egg of these was ever found bad or tainted. In the ordinary trade lots, which were preserved in large tubs, a few unsaleable eggs were always found, but seldom a really bad decomposed egg, and there was every reason to believe that the presence of any such was due to the inclusion of old and tainted eggs among those originally sent in from the country to the grocer who preserved them. In 1905, out of 384 dozen preserved between April and June, and sold between October and December, 5 dozen, or 1·3 per cent, were bad, the great majority being broken or cracked. The eggs, which had been preserved in water-glass for about six months, tasted and smelt like well-kept eggs a few days old—in fact, exactly as when they were put into the water-glass. Even when four years old the eggs had no unpleasant taste or smell, and the white coagulated in the usual manner in cooking.

Retailing Eggs.—Eggs should be unpacked, counted, and candled as received. Cold-stored eggs sometimes show a contraction and the whites and the yolks are "wobbly", while preserved eggs can often be recognized by the feel and general appearance of the shells, which are rough and generally "chalky". Cracks should be wiped and placed on a clean dish ticketed with a special price. When unpacking, if possible, grade the eggs into small, medium, and large (if not already done), and, having ascertained the quantity of each, fix the selling-price of each. In fixing the price do not omit to reckon on the invoice price the cost of bringing the eggs to the shop door, also allow for loss in shortage, breakage in handling, and cost of bags. Thus in one instance the necessary addition of various items brought up an invoice price of 6*s.* 3*d.* to 6*s.* 11¾*d.* These, sold at 9½*d.* per dozen, showed a nominal profit of 11 per cent, or, at 15 for 1*s.*, 12¼ per cent, from which 10 per cent had to be deducted for working expenses. The plan of selling eggs at so much per dozen, instead of so many for a shilling, commends itself to many retailers, as eggs are usually sold by the 120, and dividing the cost of 120 by 10 gives the cost of a dozen. Note that eggs which have been stored require quick sale.

Chapter XVI.—CANNED GOODS

A very large trade is now done in canned goods, in which for our present purpose may be included the following classes:—

1. Condensed milk.
2. Tinned meats.
3. Tinned fish.
4. Essences, extracts, pastes, &c.
5. Canned vegetables and fruit.

Condensed Milk.—Of this article as sold in tins there are four distinct classes, namely: (1) condensed whole milk, sweetened; (2) condensed whole milk, unsweetened; (3) condensed machine-skimmed milk, sweetened; (4) condensed machine-skimmed milk, unsweetened. Milk is also condensed into milk powder or milk flour.

The manufacture of condensed milk is carried on upon a large scale in Switzerland, Ireland, and elsewhere. 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 cans and soldered up. The unsweetened milk is manufactured in a similar way with one or two further processes. The fresh milk is in some cases 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.

Sweetened condensed milk sometimes contains as much as 40 per cent of added sugar. To dilute it sufficiently for use, therefore, a large quantity of water has to be added, and the resultant mixture is consequently poor in the chief nutritive substances—fat or cream, proteids, &c. The Milk Committee (Report, 1901) reported to Parliament in strong terms that to prevent danger to the health of the community, owing to the feeding of children on such milk as diluted, official limits of quality for condensed milk were desirable. They were 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". They made a formal recommendation to the Board of Agriculture to fix a standard, but up to the present this has not been done in the United Kingdom. In the United States the following has been laid down:—

"*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* 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.).

In 1902 the Clerkenwell magistrate imposed upon a defendant a penalty for selling "condensed milk" containing over 44 per cent of cane sugar, holding that the purchaser was prejudiced by being supplied with a mixture of milk and sugar when milk was asked for. The Sale of Food and Drugs Act, 1899, lays down that the importer of

"condensed separated or skimmed milk, except in tins or other receptacles which bear a label whereon the words 'machine-skimmed milk' or 'skimmed milk', as the case may require, are printed in large and legible type",

incurs thereby a penalty of £20 for first offence, £50 for second, and £100 for third. The 11th section of the Act states:—

"Every tin or other receptacle containing condensed separated or skimmed milk must bear a label clearly visible to the purchaser on which the words 'machine-skimmed milk' or 'skimmed milk', as the case may require, are printed in large and legible type, and if any person sells or exposes or offers for sale condensed separated or skimmed milk, in contravention of this section, he shall be liable, on summary conviction, to a fine not exceeding ten pounds".

Condensed milk should be **stored** in a cool place. The tins when full should not show any bulging, and when emptied, the metal inside ought not to appear at all discoloured.

Potted cream is put up for sale by grocers with the aid of borax or boric acid as preservative. The preservative 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** or **Devonshire 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. **Cream** (now obtained on the large scale by the centrifugal separator) 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.

Tinned Meats.—These meats, in which a very large trade is now done all over the world, include beef, mutton, tongues, game, poultry, &c., in great variety. The principle applied is to destroy the germs in the meat itself by heat, and then to enclose it from the germs in the air. All ordinary cases of meat turning bad are due to the action of micro-organisms in the air. These bacteria produce amongst other things the *ptomaines*, which are 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, formalin, 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 meats, &c., 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.

"**Blown" tins** are amongst the commonest results produced by imperfect canning. Gases, such as carbonic acid and hydrogen, are formed by the putrefactive action and 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.

"**Corned" beef**, which we may mention by way of specimen of canned meats, according to one method is boned and cured for several days with 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, and the tins are finished off as in the other case.

Mutton is put up in much the same way as beef. In one process the raw mutton is freed from bone and filled into the tins, an excess of about 4 oz. being allowed for a 2-lb. tin, 8 oz. 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 three 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 for a few days in a mixture of salt, sugar, and saltpetre, 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. **Lambs' tongues** (which includes also sheep's in trade usage), after being washed to remove the slime, are cured for eighteen days in brine, then "shrunk" or blanched for half an hour, and then placed in cans ready for "processing". This consists in placing them in a retort or a calcium bath and subjecting them to heat either under pressure or not for a fixed period, after which they are "boiled off", the vents being previously stopped up.

Tinned Fish.—Salmon, lobsters, and sardines are the chief fish tinned or canned, but there are a number of others, including anchovies, sprats, herrings, pilchards, and so on.

Of *salmon*, the chief sources of supply are the United States and Canada, the principal ports from which canned salmon is shipped being Astoria, Puget Sound, New Westminster, San Francisco, Seattle, Vancouver, and Victoria. In Alaska, Oregon, on the Fraser River, &c., there are many salmon canneries, and during the season millions of tins are turned out daily. "Fish-wheels" with traps of wire-netting are placed where the current is rapid, and revolving by the action of the water, 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 5 tons of salmon daily. The best fish as regards quality is reputed to be the "Chinook" salmon of the Columbia River; next comes the silver or "King" salmon, and next the "Sockeye". 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". 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 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 exported. 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*.

The *lobsters* canned come chiefly from Nova Scotia, Newfoundland, New Brunswick, and Maine. 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 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. Care is required in packing, or lobster is liable to acquire a disagreeable flavour.

France is the home of the *sardine-canning* industry, the Brittany coast being the most renowned haunt of the fish, although it is also taken along the Spanish, Portuguese, and Italian coasts, and as far away as India. Nantes is the chief seat of the trade. The sardine is very similar to the pilchard, the theory being that the latter is in reality a full-grown sardine. For ordinary sardines the fishing season lasts from early summer to October; in the winter a large size is caught. The sardines are salted and dried, then cooked either in oil or dry steam, the oil giving the best quality, though a slower process. The fish are packed by women, either in tins or glass boxes, and fresh olive oil (sometimes cotton-seed oil is used by packers) is poured in, and sometimes, for the superior kinds, a little spicing of pepper, cloves, and thyme or bay-leaf. In the steam process trays of fish are run into a steam chamber, which is then fastened up, and in about a minute and a half the dry steam cooks the medium-sized fish sufficiently for them to be canned, covered with oil, sealed up, and sterilized by the ordinary process. A kind of sardine is largely packed in Maine; the season there opens officially in May, but practically not till July. Portuguese sardines are packed all the year round. French new-season's sardines usually reach England about the end of June or a little later. The ideal-sized fish runs 20 to 24 to the 18-oz. tin, and 10 to 12 to the quarter tin.

The *anchovy* is a small delicate fish, 4 to 6 in. long, caught on the French Atlantic coast and in the Mediterranean, the finest being caught near Leghorn in May, June, and July. Small sardines and sprats are very often 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 Great Britain in kegs and are then bottled in brine. They are also packed in oil. American anchovies or "moss bunkers" are preserved in oil.

Extracts, Pastes, &c.—Meat extract was first described in 1801 by a chemist named Proust, but the manufacture owes its introduction to the German chemist Liebig, who described and recommended it in 1847. The first factory was erected at Fray Bentos, in Uruguay. The industry is now carried on largely in Australia, Texas, and elsewhere, as well as in South America—anywhere, in fact, where cattle are plentiful, as on the pampas.

In manufacturing *beef extract* the lean of the meat is minced finely, then mixed with water into a paste, and this subjected to great pressure in a hydraulic press. The meat juices are forced out with the water, and the liquid is then boiled 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.

It may be added that under a decision by the High Court of Justice the term *Liebig's Extract* is public property, and does not necessarily mean the extract made by the company of that name. The extracts and essences are useful alimentary preparations, but their nutritive properties are often very much over-rated.

Meat pastes are prepared by mixing the meat (such as ham and tongue) 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 preserved 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". *Anchovy paste* is commonly 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. For *shrimp paste* the boiled and shelled shrimps are pounded 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.

Caviare is preserved fishes' roe, and is chiefly made in Russia, especially in Astrakhan, where the sturgeon in various forms is plentiful. The finest quality of caviare is made from the roe of the sterlet, but the largest quantity is made from the roe of the "belooga", or red fish. 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 in. by 20 in., are packed in barrels containing up to 1000 lb. 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 to spread it on hot toast with a squeeze of lemon and a pinch of Nepaul pepper.

Pâté de foie gras, for which Strasburg is famous, is goose liver packed in tin boxes and filled in with the trimmings of the liver or pork finely hashed, melted fat, lard, or suet being poured over, and sometimes flavoured with truffles, &c.

Canned Vegetables and Fruit.—Appert's process of sterilizing by heat and sealing air-tight at the same time is largely used for the preservation of vegetables as well as fruit—green peas, asparagus, artichokes, pears, pineapple, &c. 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.

With regard to the use of copper for *greening* tinned peas and other vegetables, the British Committee on the Use of Preservatives in 1901 recommended prohibition, but this was not given legal force. One member of the Committee (Dr. Tunnicliffe) dissented, recommending that instead of prohibition it should be made compulsory to declare the presence of copper, and that the amount be restricted to $\frac{1}{2}$ grain of metallic copper per pound of the vegetables.

Handling Tinned Goods.—With practically all tinned goods the rule for consumers should be that when the tins are opened the contents should be turned out at once on to a clean dish, and, if put aside, kept covered. No fish that has been taken out and mixed with vinegar should ever be put back into a tin, as the acid of the vinegar may dissolve the lead from the solder, or the metal of the tin itself, and thus lead to metallic poisoning. This turning out, of course, is not so essential with fish in oil, such as sardines. The chief substance used for antiseptic purposes in potted goods is boron preservative. In the United Kingdom no specific limit has yet been laid down for boric acid. In 1901 the Committee on Preservatives in Food recommended the prohibition of formalin as a preservative in foods and drinks, and the limitation of salicyclic acid to 1 grain per pound or per pint, its presence to be declared. In foods the presence of boric acid may be detected by the fact that it turns a piece of blue litmus paper to a reddish colour. With regard to tins, it may be mentioned that by the United States Meat Inspection Law it is required that the words "U.S. Inspected and Passed" be plainly stamped on each box or tin of canned meats. The retailer should periodically inspect his stock and remove everything doubtful. In the wholesale trade all blown, washy, doubtful, collapsed, and cracked-solder tins are thrown out of a parcel when being examined, and are allowed for in full. For such tins returned by the retailer within a reasonable period the wholesale dealers are usually quite willing to make an allowance.

Chapter XVII.—OILS

Burning oils, oils for mixing, and edible oils are the oils handled more or less by those grocers who are also oilmen, or by oilmen solely. Before speaking of these in their order we may refer to another way of classifying oils.

Fatty oils are such as linseed oil, cotton-seed oil, almond oil, rape oil, olive oil, castor oil, fish oil, whale oil, and lard oil. Owing to their chemical composition they are also termed "liquid fats" to distinguish them from "solid fats", *i.e.* those fats which are solid at the ordinary temperature in cool climates, although they may be liquid in their places of origin—such as palm oil, coconut oil, and palm-kernel oil. The fatty oils and fats consist chemically of carbon, hydrogen, and oxygen.

Hydrocarbons are another class of oils which are found in the earth, or derived by distilling bituminous shales or coal—such as petroleum oils, shale oils, and coal-tar oils. These oils consist of carbon and hydrogen only.

Roughly speaking, carbon is coal, while hydrogen and oxygen form water. We might therefore say that in Nature's alchemy coal and water have been united to form the oils, and when all three of their chemical constituents are united they form the fatty oils, while when the carbon and hydrogen only are united and the oxygen set free, the result is the mineral oils. This is not a scientifically exact statement of the combinations, but may assist the memory of the non-scientific reader.

Then there is another class of oils called **vegetable oils**, such as turpentine and the essential oils used in perfumery.

Again, the chemist speaks of **waxes**, which may be either liquid, as sperm oil, or solid, as bees' wax or spermaceti. Mineral waxes are such as paraffin wax, or ceresin, *i.e.* ozokerite wax, which are related to the hydrocarbons, being derived like them from petroleum or shale, and differing only from the paraffin oils and shale oils in that they are solid at the ordinary temperature.

The industries in which fatty oils and fats are employed are as follows: (1) The industry of burning and lubricating oils; (2) the paint and varnish industries; (3) the industry of edible oils and fats; (4) soap manufacture; (5) candle manufacture. The use of fat for candles is decreasing, like that of fatty oils for burning and lubricating.

Burning and Lubricating Oils.—The introduction of mineral oil has largely reduced the use for these purposes of the oils derived from animal and vegetable sources. Rape oil is still largely used on the British railways for burning purposes; in the United States lard oil is similarly used. Most of the lubricating oils now used are either pure mineral oils or mineral oils in admixture with fatty oils. Those fatty oils which have remained in steady use for lubricating are castor oil and sperm oil, the latter being used especially for light machinery, such as spindles in the textile industry.

Of the mineral oils, *i.e.* petroleum, &c., the bulk of the world's supplies are obtained from the United States and Russia, which together contribute about 93 per cent of the total production. Of the few petroleum fields as yet discovered within the British Empire, those of Canada, Burma, and Assam are the chief, though they are of merely local importance. There is still a large production in Great Britain of the parallel products obtained from bituminous shale by destructive distillation, the Scottish shale-oil industry employing over three thousand miners underground and fully five hundred persons on the surface, besides those engaged in distilling and refining the oil. The former prosperity of the Scottish shale-oil industry has been prejudicially affected by the competition of the imported products, but is assisted by the fact that Great Britain itself is one of the largest consumers of petroleum products, including burning oils for illuminating purposes, lubricating oils, solid paraffin for candle-making, and spirit for motor cars. More than nine-tenths of the American oil is yielded by two great oil-fields, the Appalachian and the Lima-Indiana; and of the total output of nearly 70,000,000 barrels of crude petroleum per annum Ohio furnishes some 20,000,000, and Pennsylvania and West Virginia 18,000,000 each. In Russia the chief oil-producing district is that of Baku, on the Apsheron Peninsula, near the Caspian Sea, while another field is the Grozni, in the Terek district, 500 miles north of Baku. Petroleum occurs in all the chief geological formations, but chiefly in the Silurian and Carboniferous (both in America; the Carboniferous only, in Russia). The Scottish oil shales occur in the calciferous sandstone below the coal measures, and only in the district lying between Edinburgh and Glasgow.

Oils for Mixing.—The chief "drying" oils are Linseed, Hemp-seed, Poppy-seed, Niger-seed, Walnut, Chinese wood, and some whale oils. For the paint and varnish industries the drying oil *par excellence* is linseed oil. Enormous quantities of linseed—four or five million pounds' worth in a single year—are imported by the United Kingdom from East India, Russia, the Argentine, and Canada. The oil obtained is consumed to a great extent in the United Kingdom itself, in the paint and varnish industries for which Great Britain is famous. "Oxidized" linseed oil is also used in the manufacture of linoleum. Turpentine and rosin are other vegetable products of importance in this class.

Edible Oils.—Of these olive oil is the chief. Others of importance are cotton-seed oil, maize oil, coconut oil, sunflower oil, sesamé oil, and arachis oil, besides castor oil, cod-liver oil, almond oil, and others, with which the chemist is mainly concerned.

Fixed Oils and others.—As the term "fixed oils" is often used in the older books on oils it may be mentioned here that these are oils which cannot be distilled without being decomposed, while "volatile" or "essential" oils evaporate. "Drying" oils are those which when exposed to the air in thin layers absorb oxygen from the atmosphere and readily dry to a tough skin. Example: boiled linseed oil. "Non-drying" oils under the same conditions remain moist for a long time, if not permanently, and in any case they thicken and harden only very slowly.

MANUFACTURE AND VARIETIES

The modes in which oils are prepared for use depend upon whether they are of mineral, animal, or vegetable origin.

The **mineral oils** are obtained in two ways: (1) The "rock" oil in a crude state is pumped out of deep wells, or may flow from them spontaneously when once the underground supply has been tapped. (2) The oil shales, which are black, flaky, or slaty masses, are mined and brought to the surface, where they are distilled.

Crude petroleum, as obtained from the wells, is sometimes pale yellow or almost colourless, sometimes dark and heavy-looking, but is more commonly of a greenish colour. It is first passed into a large storage and measuring tank, from which it is led away to the refineries by trunk lines of pipes, which sometimes run through an oil district for a hundred miles or more. The refiner having allowed it to settle and freed it from dirt, distils it in a heated still in order to separate the oil into (1) naphtha, (2) burning oils, (3) lubricating oils, (4) solid paraffins. The naphthas, being most volatile, distil over first, and when the specific gravity of the distillate is at about 0·770 all has been distilled. Next comes over, into another receiver, the burning oil, called *kerosene.* The residuum in the still, on further distillation and repetition after treatment with sulphuric acid and soda, yields first an intermediate or *gas oil*, and then various qualities of lubricating oils, vaseline, and paraffin wax. The naphthas and burning oils are purified with sulphuric acid and caustic soda and then redistilled. The naphtha then yields gasoline (specific gravity 0·642–0·648), petrol or motor spirit (0·680), benzoline or deodorized naphtha (0·700), and benzine (about 0·730). The benzoline can be separated again by redistilling into petroleum spirit and ether of various strengths. The burning oils or kerosene portion is again refined and divided into (*a*) *petroleum oil* or *refined oil*, a pale yellowish coloured article, sold under various names, such as *crystal oil*, *paraffin oil*, &c., and having a specific gravity of 0·796, and a "flash-point" a little above 73° F. by the Abel test; (*b*) *water white* or *high-test* oil, sold as "white rose", &c., which is nearly colourless, and has a specific gravity 0·788, and a flash-point of over 100° F.

The Scottish oil shale is distilled in large iron retorts, yielding under this treatment a distillate consisting of water, ammonia, and a thick, brown, *crude oil.* The ammonia is converted into sulphate of ammonia, and forms an important by-product which is much used as a fertilizer. The *crude oil* is redistilled, purified by treatment with sulphuric acid and caustic soda, and again distilled, being in this last operation separated into three fractions, which are severally known as *green naphtha*, *twice-run light oil*, and *green oil.* On again purifying and redistilling the first two of these fractions, the green naphtha yields *gasoline* and *naphtha* (*shale-spirit*); the light oil gives burning oils and gas oil; whilst the green oil, on cooling down and pressing, yields *blue oil* and a residual cake of *paraffin scale*; the *blue oil* being further separated by distillation into *mineral colza* and light, medium, and heavy lubricating oils. The shales yield about 30 gallons of oil to the ton, and the crude oil gives about 5 per cent of shale spirit (gasoline and naphtha), 40 per cent of burning and gas oils, 20 per cent of lubricants, and 10 of solid paraffins. The *burning oils* are those ordinarily known as *paraffin oil*, *petroline*, *crystal oil*, &c. They generally have a specific gravity of about 0·810, and a flash-point of approximately 145° F. The *paraffin scale* is either put on the market as such, or else is further refined into *hard* and *soft paraffin.*

Cylinder oils are thick oils with a specific gravity ranging from 0·875 to 0·905, and are contained in the residuum left after separating the naphthas and kerosene from certain varieties of crude American petroleum. At a certain consistency this product is passed repeatedly through charcoal for purification into vaseline and petroleum jelly, while spindle oils are those lighter lubricating oils which are obtained during the preparation of the cylinder oils, distilling over before the latter.

With the Russian oils of Baku, the residuum after distilling off the burning oils is not used for manufacturing high-class lubricating oils, like the American, but is burned as liquid fuel; it is called *astatki*. This constitutes about one-half of the crude oil; the other moiety yields 30 to 40 per cent of kerosene or burning oil, 5 to 20 per cent of *solar oil*, and about 5 per cent of benzine. The ordinary Russian lamp oil, such as *Star and Crescent* or *Syringa*, is from the kerosene. It has a specific gravity of about 0·825 and a flash-point of about 85° F.; while the special high-test oil known as *Testefas* has a specific gravity of 0·823 and flashes at 100° F. Solar oil or pyro-naphtha, which is also a good illuminant, has a specific gravity of about 0·865, and its flash-point is about 250° F.—a good deal above the boiling-point of water.

Roumanian petroleum (kerosene) as imported has a specific gravity about 0·810, and its flash-point is about 74° F. The crude oil is rather of the American than the Baku type.

Flash-point is the temperature at which oil vapour will "flash" or ignite under certain conditions which the law prescribes. When this temperature under the defined conditions is below 73° F., that is to say, when the oil vapour flashes at 72° F., the oil so tested comes under the Petroleum Acts, and can only be sold under strict regulations as laid down by the Acts. The flash-point testing apparatus prescribed by the Acts is that known as the *Abel*, and the test is the *close test.* The instrument consists of a metal oil-cup covered with a sliding lid. Oil is poured in up to a mark, and the bulb of a thermometer is placed in it. The lid is then slid back, and uncovers a small aperture in the top of the oil-cup, and by the same movement it also deflects a tiny gas-jet into the aperture. The oil, being gradually heated by a suitable arrangement, gives off an increasing amount of vapour which mixes with the air in the upper part of the cup, until, eventually, the mixture will ignite or "flash" when the little gas jet is lowered into it. The temperature to which the oil has to be heated before this occurs, as recorded by the thermometer whose bulb is in the oil, is the flash-point of the oil.

An *open test* is also used by oil-refiners as a rough guide in some cases. The oil is then contained in an open vessel, and the flash-point is about 15° higher than would be given by the close test. This is because oil gives off vapour at any temperature, and the more confined the space the sooner the mixture of vapour and air flashes.

The **vegetable oils** from seeds, such as linseed or olives, are obtained by pressing the seeds either cold or hot, the *cold-drawn* being best-flavoured and preferred when the oil is to be used for food. A better yield is obtained from the seed by extraction with a solvent such as carbon disulphide, benzol, or petroleum ether, instead of using pressure. In this method the finely ground raw material is treated with the solvent, which dissolves the oil out almost completely. The solution is then run off, and the solvent distilled away for future use, leaving the oil behind. Forms of extraction apparatus are used in which the operations are largely automatic, and the method has been applied to a rather considerable extent on the Continent. But the greater yield is almost counterbalanced by the fact that the residual meal, being less rich in fat, has lower value as cattle food than the oil-cake left by the pressure method. A combination of the two methods, pressure and extraction with solvents, is extensively used in France and Russia, where large quantities of arachis, hemp, linseed, sesamé, and sunflower oils are produced by this mixed process. In this modification, which is especially used for oils to be employed in connection with foodstuffs, the crushed seeds are first cold-pressed, and the residual cakes are then ground up again and extracted with benzine. The *crude oil* obtained by crushing is afterwards subjected to various refining processes.

Among fish **oils** those known as *whale oils*, and also as *train* or *blubber oils*, are obtained from the blubber of various marine mammals, including the whale, walrus, dolphin, and porpoise. The blubber is cut into strips and small pieces. These are sometimes melted down at once, or are packed in barrels in the ship's hold, where the blubber putrifies and the oil oozes out. These oils clarified are the *unpressed whale oils.* On cooling the oils down to freezing-point solid matter is deposited, and this when pressed yields *pressed whale oil,* the residual cake left being termed *train tallow* or *whale fat.*

The **animal oils** are obtained in various ways from the fats. Lard cooled down to zero and pressed in bags under a hydraulic press yields *lard oil.* The feet of oxen (and sometimes of the sheep, horse, and pig) soaked, cleaned, and boiled yield fat which, when clarified, is *neat's-foot oil.* And so on.

CHARACTERISTICS OF OILS

Olive oil is obtained by pressing the fruit of the olive tree, the beautiful tree which grows so luxuriantly around the shores of the Mediterranean. The ripe fruit, in a wrapping of cotton cloths enclosed in one of horse-hair, is placed in a hydraulic press. For the finest quality the ripe fruit hand-picked is very gently pressed, yielding *Virgin oil.* A higher pressure gives the next quality, or ordinary. The French classify the Virgin oil as *extra*, *superfine*, *fine*, and *courante*; and the Ordinary as *mi-fine*, *ordinaire*, and *mange-able.* The usual trade classification is *cream*, *extra sublime*, *sublime*, *superfine*, *fine*, *good*, and *ordinary.* After the pulp has been pressed for the second time it is treated with hot water and again pressed, yielding oil which is of third grade, and though used for the table is mainly suitable for lubricating fine machinery and burning. The *Provence* and *Aix* oils are accounted the finest, the *Tuscan* next. Olive oil is usually golden yellow or else nearly colourless, though sometimes greenish; and it has a bland pleasant taste. It does not become gummy on exposure to the air, but if left to itself will soon turn rancid. When it stands for any length of time a deposit forms on the bottom of the receptacle, and unless the oil is decanted this will affect the quality. It is therefore usual to decant the oil occasionally, and the decantations are always effected if possible in autumn or spring when the temperature is mild and the weather fine. Olive oil should be stored in a cool, dry, and dark place. It is often adulterated with ground-nut, sesamé, rape, cotton-seed, or poppy oils, fancy names such as *sweet nut*, *union salad*, being used. Unless certain of its genuineness, British retailers frequently sell oil under the name of **Salad oil** instead of Olive.

Cotton-seed oil, pressed from cotton-seed and largely used for adulterating as well as for legitimate purposes, is a pale-yellow oil free from acid and quite sweet when new, and having a pleasant nutty taste.

Sesamé oil, which also has an agreeable taste, is yellow and odourless. It is made by pressing the seeds of the sesamé plant. A property of this oil is that when hydrochloric acid and sugar are shaken up with the oil the mixture turns red. For this reason, as giving an easily detectible reaction, the oil is used as a "tell-tale" in margarine. The German law and some others compel its use in all margarine manufacture, in order that if such margarine is mixed with butter its presence may be readily detected. In the present day, however, the butter adulterator does not work on this obsolete retail scale.

Arachis oil, obtained from the ground-nut, is also called *ground-nut*, *earth-nut*, and *pea-nut oil*. The first cold-pressed oil is colourless, and has a kidney-bean flavour, not disagreeable. A second cold-pressing yields what is called *butterine oil*, and a third, burning oil.

Hazel-nut oil is pale yellow, clear, rather thick, of mild agreeable flavour, and without smell.

Coconut oil, pressed from the white kernel or from the copra of the common milky coconut, is an oil only in hot climates; in Great Britain it is a fatty or lardy looking substance. When purified it is sold largely as *vegetable butter*.

The above are all edible oils. In **judging** all such oils the chief criterion is naturally the taste, but colour and smell are also noted by the buyer. In tasting, one method is to put the oil on the back of the tongue, another to put a drop on the back of the hand and then taste it. Mr. E. V. Ellis says:—"In tasting oil make certain to get it well on the back of the tongue, where the delicate nerves of taste lie. Some oils will taste very nice at first but have a nasty after-taste, due perhaps to rancidity. In tasting always take plenty of time; never do it in a hurry. The second test is the smell. In smelling an oil never use a narrow-necked bottle, but either a wide-necked one or a dish. It is very important to get a good whiff, the delicate nerves of smell being well up in the nose. It is best to have the oil a little warm, as heat brings out the smell better. For the third test, colour, one must not always expect a new oil to be as pale as an old one. Oils when kept for a long time often get bleached."

Characteristics of Oils for Mixing.—The chief oil in this class, as already remarked, is that of linseed.

Linseed oil is pressed from the seeds of the flax plant *Linum usitatissimum*, linseed being largely imported from Russia, India, and South America to the United Kingdom for use in the manufacture of the oil. Of the Russian seed, two principal qualities are recognized in the trade, *i.e. Baltic* and *Black Sea* seed; and from these are expressed the corresponding *Baltic* and *Black Sea* oils. The oil obtained from the Indian seed is known as *East India oil*, and that from the South American seed as *River Plate oil.* The Baltic oil has generally been considered the best of the Russian and Indian varieties, especially where the drying properties are concerned; this is due to the fact that the other two kinds of seed used invariably to contain more or less foreign seed admixed with them—hemp seed, ravison, and rape in the Black Sea product; mustard, cameline, and rape in the Indian—and these foreign seeds yielded foreign oil when pressed; hence the linseed oil obtained was really a mixture. The Black Sea oil, however, is said to have improved recently in this respect. Cold-pressed linseed oil is golden yellow in colour, the hot-pressed is brownish yellow. **Boiled Oil** is prepared by heating matured raw linseed oil to a temperature of 210°–260° C. (410°–500° F.), either alone or with the addition of *solid driers*; or, alternatively, a newer method is adopted in which *soluble driers* are mixed with the raw oil.

In this latter case the boiled oil may be prepared without heating it at all, or only to a much lower temperature than when solid driers are employed. The chief solid driers are litharge and manganese, acetate or borate; the soluble ones are resinates and linoleates of manganese and lead, dissolved usually in oil of turpentine.

Turpentine, variously called *oil of turpentine*, *spirits of turpentine*, or in trade usage *turps*, is obtained from various species of pine, the best, the American, being derived from the yellow or Georgian pine, *Pinus australis*, the long-leaved pine, of which there was formerly an unbroken forest extending from Southern Virginia through the South Atlantic and Gulf States to Eastern Texas. More than one-half of the original forest has been exhausted, the value of the products of the American industry a few years ago being reckoned at over £4,000,000. In Germany and Russia turpentine is derived from the Scots fir, *Pinus sylvestris*, and in France from *P. Pinaster* and *P. maritima*. In addition to turpentine the industry includes that of resin, or as more commonly spelt in the trade for this special kind *rosin*; also the manufacture of tar and pitch and other by-products. From the wood of the trees crude turpentine exudes in the form of resin dissolved in various liquids called *terpenes*, which latter constitute the oil or spirits of turpentine. In America, holes or "boxes" are cut into the trunks of the trees, a few inches above the ground, during the autumn and winter. The trees are afterwards barked for a yard or so up, and the wood punctured. During the next spring and summer the crude turpentine exudes and collects in the boxes, whence it is later on ladled out into barrels. Subsequently the liquid portion is distilled with water to separate the oily terpenes from the dissolved resin. The steam and turpentine distil over together, the resin remaining behind; but the turpentine in the distillate, being the lighter of the two, floats on the top of the condensed water, and is easily separated from it. Turpentine is readily distinguished by its odour. It is limpid and colourless, and has a pungent and bitter taste. Good commercial turpentine has a specific gravity lying between 0·858 and 0·870, except in the case of Russian, which is often as high as 0·875. Its boiling-point is generally 155° to 156° C., and in the best class of oils at least 85 per cent of the whole distils over below a temperature of 165° C. A good-quality turpentine should only leave a very small quantity of resinous residue when evaporated on a steam bath, old oils giving more than new. Turpentine is sometimes adulterated with mineral oil, and the high price of American has led to the fabrication of various substitutes made from pine products and petroleum, some of which possess very little "drying" power. For use in mixing paints turpentine should be water-white and pure. Mineral oil in it gives a bluish tinge. If a drop of the "turps" be spilt on a sheet of writing-paper it will, if pure, soon evaporate entirely; if not pure, a greasy spot will be left.

Rosin, Oil of Resin, Tar, Oil of Tar, Common Pitch, Brewers' Pitch, &c., are obtained from the same pine. Tar is obtained by the destructive distillation of the wood itself, and the others by a redistillation or combination of the exuding resin and other products. Rosin is the residue left after the oil of turpentine has been drained and distilled away from the crude turpentines and natural balsams exuding as mentioned. The American *strained* and *pale* are the chief British imports of rosin.

Hemp-seed oil is pressed from the seeds of the kind of nut which forms the fruit of *Cannabis sativa.* It is used when fresh for the same alimental purposes as olive oil and fats, and technically for soap-making, burning, and in the preparation of oil colours and varnishes, being a drying oil. It has mildly the characteristic odour and flavour of hemp seed. When fresh it is greenish yellow, afterwards brownish.

Poppy oil or Maw oil, an important industry in Northern France and also in parts of Germany, is used both alimentally and for the manufacture of soap, and as a matrix for colours in oil paint. The edible kind is made from the first pressing of best quality seeds and is white; the technical kind, which is inferior, is red. Andés says the poppy heads are opened when they have reached a certain degree of dryness, and their contents emptied on to a plate of sheet iron, then winnowed, and afterwards ground to meal. This is packed in bags made of ticking and pressed, the oil being caught in tubs, wherein it is left to clarify thoroughly, when it is ready for sale. The best pure white oil has an agreeable flavour.

Walnut oil, or Nut oil, used for oil colours and printing inks, while the fresh, cold-pressed quality is a good edible oil, prepared from walnuts when two or three months old. The seeds, freed from the yellow skin, are pressed first cold and afterwards warm. The cold-pressed oil when fresh is very fluid and almost colourless—a pale greenish yellow. The smell is agreeable and the flavour nutty, until rancidity sets in. Warm-pressed oil has a higher colour and a peculiar sharp taste and smell.

Wood oil, used largely in China and Japan as a natural varnish for woodwork, is pressed from the seeds of *Aleurites cordata*, and when cold-pressed is pale yellow, while the warm-pressed is dark brown.

Sunflower oil, which is sometimes used in place of olive oil alimentally, and of linseed oil for paint, as well as for soap-making, is pressed from the shelled kernels of the sunflower seed. It is a clear light yellow oil, having a mild flavour and agreeable odour.

Palm oil, also called *palm butter* because of its resembling the consistency of butter in temperate climates, is prepared from the fleshy part of the fruit of the Guinea palm and other trees. The finer and softer oils are simply expressed from the fresh fruit. For the harder commercial varieties the nuts are left in covered heaps or ground-holes until they begin to decompose; they are then pounded in mortars to a pulp; this is warmed with water, strained to remove fibre, and then boiled up and the oil skimmed off. The best quality when fresh has a pleasant odour of violets; the inferior and older a more or less rancid smell. At first bright orange in colour, the oil turns dirty white or red on exposure to the air. Lagos oil resembles butter in consistency; Congo oil, tallow.

Chapter XVIII.—PAINTS AND COLOURS

An oil and colourman deals in various dry "colours", fluid "stains", and mixed oil "paints". The common usage is to speak of oil "paints" and water "colours", but the word "colour", as used in trade, is more equivalent to what is called in the dictionary a "pigment". The word "pigment" comes from the Latin *pingo*, "I paint", and means, according to the dictionaries, any substance used by painters and others to impart colours to bodies; but technically there is a difference between pigments and dyes. "Paints" are pigments with the addition of a "vehicle" or "medium". In non-scientific language, a paint consists of colour or pigment ground with oil and ready to be thinned for brush use by the further admixture of turpentine. The oil is commonly linseed oil, and this is the "vehicle". The difference between a pigment and a dye is that, while both are colours, a dye is soluble in its "vehicle", while a pigment is not.

RAW MATERIALS FOR PAINTS

Pigments are obtained by modern chemistry in great variety and in many ways, but those in most general use are practically the same as were used 2000 years ago. The basis of most of our paints is white-lead, and nearly the whole of this is made as the Rhodians made it in the time of Vitruvius. There are various ochres and earths and vegetable pigments still used as in ancient days. But great progress has been made in other directions. Red-lead, a much-used pigment, was made by the Greeks by calcining white-lead; various red paints are now made largely from the oxides of iron. Compounds of zinc, barium, and chromium are also much used as pigments, and these are quite modern, zinc white having been introduced by Courtois, a Dijon manufacturer, in 1782, barium sulphate by Kuhlmann, and chrome yellow by Vauquelin in 1797. Recently a great number of pigments have been made of a mineral substance dyed by aniline or coal-tar dye, and though coal-tar dyes soon fade, they are cheap, and therefore popular. Substitutes for vermilion, the famous red, are largely made in this way. The expensive pigments, such as vermilion and ultramarine, which were formerly extracted from rare minerals, are now made "synthetically" as the chemists say, and on a large scale. Indigo is another well-known colour, of vegetable origin, which is now largely made by the synthetic chemical process. A summary classification of pigments according to origin is as follows:—

Mineral { Natural, such as terre verte.
Artificial, as aureolin.

Organic { Animal, as carmine.
Vegetable, as madder-lake.
Artificial, as alizarin-orange.

Church classifies pigments also according to their chemical composition as below:—

(1) *Elements*: Ivory black, lamp black, charcoal black, Indian ink, graphite (also termed black-lead or plumbago), all of which are carbon or contain that chemical element. There are also metallic pigments, such as gold, silver, and aluminium.

(2) *Oxides*: Zinc white, green oxide of chromium, burnt umber, cobalt blue, cobalt green, cœruleum, Venetian red, light red, Indian red, burnt sienna, and red-lead.

(3) *Sulphides*: Cadmium yellow, king's yellow, antimony red, realgar; also (for convenience) the various forms of ultramarine, blue, red, green, violet, and native.

(4) *Hydrates* or *hydroxides*: Yellow ochre, raw umber, raw sienna, Cappagh brown, emerald oxide of chromium or viridian, and mountain blue.

(5) *Carbonates*: White-lead, green verditer, blue verditer, and whitening.

(6) *Silicates*: Terre verte (green ochre), smalt (blue), and various ochreous earths.

(7) *Chromates*: Chrome yellow, chrome red, &c.

(8) *Various inorganic salts*: Aureolin (sometimes called cobalt yellow), Naples yellow, tungsten green, Nürnberg or manganese violet, cobalt violet, Thenard's blue, baryta white, lead sulphate, and Schweinfurt green.

(9) *Organic compounds*: Verdigris and emerald green (salts of copper), Indian yellow, gamboge, sap green, indigo, Prussian blue, bitumen (or asphalte), bistre, sepia, Vandyck brown (bituminous), Indian lake (from the resinous exudation produced in certain trees by the attacks of *Coccus lacca*); carmine, crimson and purple lake (from the colouring matter obtained from the cochineal insect); rose madder and madder-lake (from the alizarin and allied bodies derived from the root of the madder plant); and yellow lakes (from quercitron bark and Persian and Avignon berries). Also the important class of coal-tar pigments obtained from artificial alizarin and its congeners and derivatives.

Coal-tar Colours.—The colours made from coal tar are more used for such purposes as dyeing cotton and wool than for paints, but some are so used, and the importance of this special industry entitles it to mention. In 1835 a German chemist named Runge isolated from oil of coal tar a substance which produced a blue colour when treated with chloride of lime; this he named *kyanol*. The name *aniline* was given to the substance owing to the fact that in 1840 it was obtained also from indigo, the indigo plant being known as *Indigofera Anil*. Aniline had been first obtained in 1826 by Unnerdorben, who had termed it *crystalline*. Although it was known that brilliant colours could be produced from aniline, no industrial use was made of the knowledge for some years. In 1858 an English chemist, W. H. Perkin (knighted half a century later), made a discovery which completely revolutionized the coal-tar industry, so that tar, once a burden, became one of the chief assets of the gas factories. His discovery was that, by a method which he patented, coal tar could be made to yield a dye. This dye was a purple, since so well known under the name of mauve. Magenta—so called because it was discovered about the date of the battle of Magenta—followed, and afterwards came new combinations and discoveries, until now practically any conceivable shade of colour can be obtained from one or other of the products of coal-tar distillation.

The **Ochres**, chemically oxides of iron, come from Holland, Cornwall, Anglesey, Oxford, and many other places, but perhaps mainly from France—Vaucluse. Around Apt, in Vaucluse, which is the centre of ochre production, the country is dotted with hills of alluvial clay, all more or less rich in ore. Sometimes shafts are sunk, with radiating tunnels to reach the ochre; sometimes it is quarried. The clay is carted to the valley below and there washed; it is flooded with water and the ochre falls into settling-basins. By means of a succession of basins various degrees of fineness are secured. At the end of winter the tanks, or basins, are filled with pure ochre in the form of heavy mud, which, when sufficiently dried as the hot weather advances, is cut into bricks of regular size and completely dried in the sun.

White-lead, chemically described as basic carbonate of lead, is manufactured by various processes, of which the ancient "slack" method, also called the *Dutch process*, is still accounted perhaps the best. In this process sheets of lead are stacked with layers of tan, or acted upon by vinegar until corroded and encrusted with the coating of white-lead. In the chamber process the lead is placed on racks in a closed chamber in which currents of vapour and fumes from acetic acid and carbonic acid act upon it and produce the white-lead. In the dry precipitating process litharge is converted into white-lead; there is also a process by which litharge is dissolved in a hot ammoniacal solution of Rochelle salt (double tartrate of sodium and potassium) and carbonic acid then passed into the solution, whereupon white-lead is precipitated. In 1896 the leading British white-lead manufacturers agreed to discontinue the use of the term "best" as a trade description for admixtures of white-lead; to brand all packages containing white-lead admixtures with the word "Reduced"; and to invoice all white-lead admixtures as "Reduced white-lead". The analysis of a good white-lead shows: lead carbonate, 68·95 per cent; lead hydroxide, 31·05 per cent.

There are various patent "white-leads" which consist of sulphate of lead, barytes, or even zinc oxide.

Barytes, the main adulterant of white-lead in Great Britain, and largely used for mixed paints, is sulphate of barium. *Dutch white* is a mixture of 3 parts of barytes to 1 part of white-lead.

White zinc, also called **Zinc oxide**, is a non-poisonous pigment whiter than white-lead, and with the advantage of being unaffected by gases such as sulphuretted hydrogen, which affect white-lead. When ground in water for water-colours it makes *Chinese white.*

Sulphate of lead, otherwise called *Sublimed lead*, is a pigment much favoured in the United States as a substitute for white-lead, being, it is claimed, unaffected by exposure to air, lasting, and practically non-poisonous. Galena ore or native lead sulphide, when heated to nearly white heat, vaporizes slowly, and the vapours in contact with air burn into lead sulphate; but simply heating a bulk of galena ore to vaporization is not practical. A specially adapted furnace is required. Sublimed lead absorbs a great quantity of oil. It has peculiar properties, and must be treated by paint grinders in a special manner. If ground as a stiff paint with linseed oil it has a tendency to become dry and cake, but by a change in the process of grinding the difficulty is overcome and the paint does not cake.

Zinc white (not white zinc) is a name applied to sulphide of zinc mixed with barium sulphate. *Orr's zinc white* and *Charlton white* are described as consisting of zinc sulphate and zinc oxide with 70 per cent of artificial barytes or barium sulphate.

Freeman's white, according to Professor Church the best substitute yet devised for white-lead as a paint basis, is a mixture of sulphate of lead, zinc oxide, and barytes. It consists essentially of the sulphate of lead (which see above), and the small percentages of white zinc and baryta white which are added are not, it is claimed, to be considered as adulterants, since they greatly increase its "body".

Black pigments chiefly used are *ivory black*, *bone black*, and *lamp black*.

Ivory black is properly the charcoal made by burning ivory, but is frequently counterfeited by calcining bones or by powdering the charcoal of hard woods. It is stated that most of the so-called ivory blacks sold are a fine grade of bone black.

Bone black is made by the slow burning of bones and grinding the charcoal thus produced. In some instances certain bones only are used for special qualities: the skull and shin-bone of the sheep, for instance, are said to be used alone for a certain *drop black* sold in the form of "drops".

Lamp black, which once meant the soot of lamps, is got by burning waste oils, resinous refuse, pitch, tar, &c., and collecting the sooty deposit of the black smoke by placing a piece of gauze or cloth in the chimney. A particular kind is termed *vegetable black*, while *animal black* is got from the smoke of animal products when similarly burnt.

The combustion of petroleum residue is the source of **Carbon black**; and **Gas black**, a pigment of great staining power, is obtained from the gas-works.

Prussian blue is the chief blue used by the paint-grinder, and is made now with sulphuric acid from copperas and yellow prussiate of potash. Its colour is pure dark blue, sometimes with a bronze lustre, sometimes dull; inodorous and insipid; insoluble in water, alcohol, or ether. Its staining strength is so great that quite a small proportion of Prussian blue, mixed with *terra alba* or white earth, gives a good *Brunswick blue*; or with barytes instead of alba gives *Celestial blue.* Prussian blue was discovered in 1704 by Diesbach, a colour manufacturer, quite accidentally.

Ultramarine, which in its genuine state is regarded as the purest of blues, is a very costly colour made from the mineral lapis-lazuli, and is therefore but little used by the paint-grinder, who employs in preference on the score of cheapness the artificial ultramarine made by applying the sulphuret of sodium to the silicates of soda and alumina.

Indigo is of more importance to the dyer than the painter, but is used, mixed with whitening, in making **Distemper**, and mixed with lamp black for silver-grey. The true indigo is derived from the leaves of several species of plants grown in the Indies, Mexico, Egypt, &c., the Ancient Britons' "woad" being a colour of the same nature; but most of the vegetable indigo comes from India, and is obtained from the typical plants of the genus *Indigofera*, with their small blue, white, and purple flowers. The finest comes from Bengal, and is in cubical pieces, light, brittle, of a clean fracture, soft, porous, and of a firm bright colour; when rubbed with a hard substance it looks copper-red, and it does not readily leave a blue mark when drawn across a white surface. A great deal of indigo is now made artificially by German chemists, and is called *synthetic indigo.*

Whitening is made from chalk, which is ground up in mills with water and floated into long tanks, where the heavier sand settles first, while the lighter chalk floats farther on before it is deposited. Alum solution is also sometimes employed to assist the clarifying. From the final settling-pit the chalk thus purified is dug out to be dried in ovens slowly in handy moulds or loaves. Mixed with water or size, it is used for whitening walls and ceilings, and it is one of the ingredients of distemper.

Paris white is the finer kind of whitening, and chemically is almost pure carbonate of lime. The dissolved chalk, as stated above, floats from one water cistern to another. The first precipitation gives *commercial whiting*, the second *gilder's whiting*, the third *extra gilder's whiting*, and the fourth, or finest, *Paris white.* This white is lighter yet more opaque than barytes, with which substance it is a good deal used in the manufacture of cheap paints.

Vermilion in its natural state is cinnabar, found in Spain and elsewhere, but the genuine natural article is now but little seen, having been replaced by artificial vermilion. The best comes from China.

Venetian red, strictly speaking, is a bright-red earth or ochre resembling scarlet chalk, derived, as the name suggests, from Italy. Paled with chalk, it is not infrequently sold as the much scarcer **Armenian Bole**, a substance originally imported from Armenia, which is chemically a silicate of aluminium. It is also counterfeited by mixing whitening, red ochre, and red oxide of iron. On the other hand, the name "Venetian red" is often used for what is popularly known as *Raddle*, or *Reddle*, a bright-red earth found in Cumberland, Yorkshire, Gloucestershire, and Somersetshire, a red chalky sesquioxide of iron or hematite iron ore. Raddle is used by the housewife for colouring her brick floors or stone steps, also by the farmers for marking sheep.

Terra alba or **Gypsum** forms a white pigment, which in some counties is considerably used in paint-making.

Yellow pigments used by paint-grinders are mainly the ochres already mentioned, while others are the chromes, produced from oxides, especially the oxide of iron.

Green pigments are chiefly derived from compounds of copper and chromium, different shades being obtained by admixture. The *Brunswick greens*, obtained by mixing chrome yellow and Prussian blue with the white barytes, are largely used. (Strictly speaking, Brunswick green is a hydrated oxychloride of copper.) *Scheele's green* is arsenite of copper; and arsenic and copper are also contained in *Schweinfurt green*, *Vienna green*, and *Veronese green*. *Emerald green* is oxide of chromium. *Bremen green*, or *Verditer*, is mainly a carbonate of copper. *Verdigris* is a basic acetate of copper which forms on copper when exposed to the action of vinegar on pyroligneous acid. *Saxony green* is an indigo colour. *Hungary green* is a kind of malachite found in Hungary.

Putty is made by mixing whitening with linseed oil, in the proportion of about 22 lb. of oil to 112 lb. of whitening. Pure linseed oil is said to be the only oil that can be safely used for glaziers' putty, although cotton-seed and other oils are sometimes sold as *putty oils.* The raw oil should be used; the boiled dries too quickly. The method adopted is to form the whitening into a heap with a hollow in the middle—something like the crater of a volcano. In this hole put the raw linseed oil, mix together roughly, and complete the mixing process in a grinding-mill. A whiter kind of putty is made for painters' use by adding to the whitening and raw linseed oil a certain quantity of white-lead—say 14 lb. of white-lead to 28 lb. oil and 112 lb. whitening.

Certain dry colours are specially made for distemper work. By mixing together in various proportions the primary colours, red, blue, and yellow, with white, a large variety of different tints can be made. The actual mixing is effected with dry colours; cold water is then added, and, after stirring, the material is ready for use.

Many grocers and oilmen confine themselves to selling paints that are supplied ready mixed in tins, which, of course, are handled with a minimum of inconvenience.

Chapter XIX.—SHOP ROUTINE

Shop management and routine include a number of matters such as buying, stock-keeping, window- and shop-dressing, staff management, stock-taking, weighing, parcelling, and sending out goods, the composition of handbills and other advertisements, the writing of window tickets, knowledge of the descriptions, sizes, and uses of papers and bags used in the trade, and so on. Upon some of these subjects book instruction would be mere tediousness compared with actual practice; such matters may be left to the tyro to learn in the shop itself. We append a few hints on points that can be usefully dealt with here.

Buying.—As a general rule in the grocery trade it is well to keep stocks as short as possible, to avoid loss from shrinkage and deterioration, many of the goods being perishables and subject to evaporation even when their quality is not impaired by keeping. How to buy and when to buy on the best terms are questions of obvious importance to any grocer, and there is a wealth of wisdom in the common trade saying that "goods well bought are half sold". But the art of buying is one in which native shrewdness usually counts for more than book knowledge, when the actual practice of the art is attempted. What buyers can do beforehand is to equip themselves by obtaining all the knowledge they can as to the commodities they intend to buy, by studying the rise and fall of the markets, and by paying attention to the seasons and their effect on the arrival of goods on the one hand, and customers' demands for them on the other.

The student of the market report will soon learn that in a falling market it is usually wise policy to wait and not to overstock, while in a rising market the shrewd and enterprising buyer must make up his mind and act. To secure results it is often necessary for buyers to study quotations and market reports for a long period, until, by comparing the constant see-saw of quotations, the time arrives when prompt action on a rising market spells profit. For instance, a buyer may study the fluctuations in quotations for spices. He observes that Penang nutmegs were bought in, that Singapore were catalogued without reserve and ultimately withdrawn. Here is evidently a profitable "deal" for a smart buyer. Or the grocer observes that Singapore black pepper was dull and bought in, and that cloves sold unreservedly. Now, a knowledge of the article bought in or withdrawn, together with a reference to the stocks held, enables an alert buyer to strike a bargain. Take the tea market. When Indian and Ceylon teas are active and firm, China may be neglected with Monings at 9*d.* to 1*s.* In coffee one description of "colory" is quoted at 70*s.*, and another at 53*s.*, and all the Mocha has been bought in. In other instances buyers will find in competitive offerings there is often a difference of £1 to £2 per cwt. Such examples apply to other sections of the produce markets, and it is certain that in any market the judicious buyer, assisted by the market reporter, can often buy for his firm advantageously. But nowadays many of the smaller shopkeepers are scarcely "buyers" of the goods they retail. The quantities they require are relatively small regarded singly, though in the aggregate they amount to enough to encourage the wholesale house to attend to them properly. The retailer, in the circumstances, goes through the price list, selects his goods, puts his quantities to them, and gives his orders. This can hardly be termed "buying". Still, if a general order be thus given to a good house, the purchaser usually comes off better than by so dividing his small orders as to make it worth no one's while to give them thorough attention.

Buying Memoranda.—A Wants Book, for items of stock running short, and therefore requiring to be bought, is usually kept. A modification described in *The Practical Grocer* is a card index—to be kept in a drawer with a partition running down the middle. The cards are, say, 6 in. by 4, printed thus:

Date.	Quantity Ordered.	Price Quoted.	Firm and Traveller.	Date received.	Remarks.

In the drawer, on one side the partition, cards are to be placed for "goods wanted", and on the other side, cards for keeping a record of stock. In a "wants box", or a book, memoranda are made by the person in charge of items of stock that from time to time are required. When the grocer learns from these memoranda that a certain article is required, he takes one of his cards and writes across the top of it, over the printing, the name of the article, say "Sugar, granulated". The card is then placed in the "goods wanted" side of the drawer. When the time comes for ordering new goods, or the traveller comes in, the grocer sorts out from the cards in this "goods wanted" section those cards which name goods he intends ordering from a particular firm. At the time of ordering he writes the date in the first column; next, the quantity ordered, the price quoted, the firm, and the traveller. He slips a rubber band round all the cards from which he has ordered, and places them back in the right-hand section. When the invoice comes along, he compares the entries on the invoice with the entries he has made on his cards, notes any inaccuracies, and hands the invoice out to be checked against the goods. He then places the cards in the left-hand side of the drawer in strictly alphabetical order, where they are to be kept permanently. When the goods begin to run short again, the store-keeper picks out the cards bearing the names of the goods he requires, and repeats the operation described above. He thus has before him the exact date on which he last ordered, the quantity, price, firm, and any remarks he has been called upon to make. In the course of twelve months, and without any labour beyond what is required for entering up the wants book, he has accumulated cards relating to every line he deals in, and in the course of time secures a permanent record of his transactions. At stock-taking time, if thought desirable, a line may be run across the card as far as it is filled up, and the total quantity of the line in stock marked below.

Overbuying is often a serious pitfall for a beginner. An experienced grocer writes:

"The best advice on this subject that can be given to a young man starting is to avoid as far as possible any house proffering long credit. No matter how small a quantity you have to buy, if you can possibly manage it, go to a first-class house, buy as little as possible, and pay as quickly as possible, especially in the first year of your business life. If you find that you have cash in hand, so that you can pay an account a few days before it is due, pay it. You will find that when, at some time later on, credit is of real and solid advantage to you, this fact will always be considered in your favour. Overbuying is sometimes brought about by a trader listening to young men new to the road, who are over-anxious for orders, and, to obtain them, profess their belief that 'now is the time to buy', as the article is sure to be dearer, and 'to hesitate is to be lost', and so on. In contrast with these young hustlers, steady-going gentlemen of the road may as a rule be depended on. They have a character to lose, and they look forward more to the certainty of obtaining future orders than to snapping up one, with the possibility of its being the last they will get from their customer."

Terms and Conditions of Sale.—When giving a first order to a wholesale firm the grocer buying will, of course, ascertain the terms and conditions of sale, and if the order is given through a traveller a note should be made of these particulars. In the absence of special terms, the conditions as to payment, &c., which a firm prints upon its price lists or invoices, are binding, therefore anything so printed should be carefully noted. For instance, an invoice may bear such a notification as the following:—

"Terms, 28 days, interest charged on overdue accounts. No packages credited until received in good condition. No claims allowed unless made within 7 days from date of invoice."

Some firms do not authorize their travellers to collect accounts; where this is intimated on an invoice, a trader who pays a traveller does so at his own risk.

Trade terms and conditions for various goods bought in bulk are printed in the recognized trade annuals. Ports such as London, Liverpool, and New York have special "conditions" or rules, according to which wholesale trade is conducted.

Business System for Grocer with One Assistant.—In Great Britain—and elsewhere—a large number of retail grocery businesses are carried on by "the man with the single shop"—a grocer who conducts his own shop with the assistance, perhaps, of a single qualified shop-hand and boys. For the guidance of such a grocer the following letter (which appeared in the correspondence columns of *The Grocer* in 1906) contains thoroughly practical hints founded upon long and successful experience:—

"I wish it to be clearly understood that the nature of the business is a good-class family one, and that I am dealing with a turnover of £3500 per year. I do not wish to imply that my methods are suitable for a large business or a ready-money trade.

"A few years ago I had my premises built to my own design. I avoided having a cellar (this I had a reason for), and was particular to have my warehouse connected with the shop, also my office. Being a firm believer in cultivating a counter trade, I am seldom away from the shop; consequently I am able to overlook and supervise all that is going on, to check stock, goods inwards, goods outwards, and so on, while boys, &c., are within observation. Rats *and* mice play when the cat is out o' sight!

"Original packages only are kept in the store. Such goods as jams, biscuits, cocoas, &c., are unpacked, transferred to shop, and packed away in their proper places, goods mostly in demand being kept nearest at hand.

"I have a grocery and a provision counter. Teas, sugars, jams, cocoas, and all sundry goods are kept on the grocery side; provisions, tinned goods, pickles, sauces, &c., on the provision side.

"My shop is not a large one, but large enough for the turnover. A large shop necessitates a lot of walking about, longer time in serving your customers, and more work to keep it thoroughly dusted, clean, and in order. I do not allow my shop to be in a muddle (to use a plain term), whether window-dressing or wrapping stock. I find to allow this makes work; I believe in doing work, not making it. When window-dressing, as the window is cleared goods not required again for that purpose are dusted and put away into their proper places at the time of clearing, and not placed here and there on the counters or in the shop, as I have frequently seen done.

"The rule of my shop (which I have printed) is: 'A place for everything, and everything in its place'. Stock in the store and goods in the shop are conveniently placed, so that there should be no moving this and that to get at something else. The same applies to tools, such as openers, hammers, scoops, knives, saw, cheese-wire, weights, &c.—all have their proper places. You may say these are very small matters, nevertheless they are great time-savers. We are all familiar with that shout, 'Where's the hammer?' or 'the opener', &c. 'So-and-so had it last.' 'Can't be found.' Five, ten minutes wasted searching—business almost at standstill—result, customer kept waiting, and another perhaps unattended to, whereas both might have been served but for the delay.

"*Stock Ready Packed.*—In addition to my sugars, I keep fruit, rice, tapioca, prunes, dates, candles, flour, &c., ready packed. I mention these particular articles as I know it is not customary in some shops to do this.

"*Orders.*—All orders are taken on the duplicate system—put up, checked, and packed *at same time* into baskets or boxes—(note the 'same time'. It is the custom with many firms to check before packing; I don't believe in it—doing work twice)—ready for the boys to take out. This is also an important consideration to ensure quick despatch. You may be engaged when boys come in from a message; if you are, they can take up the goods, and do the message, before you would have an opportunity of attending to them otherwise. Did it ever strike you what an amount of time is wasted in this way? I have noticed so many assistants wait until the boys come in before this is done. The consequence is boys are kept waiting, and, more serious still, customers also. Result, boys are kept at work; cost and trouble of pony and trap saved.

"*Books.*—My duplicate books I regard as my day book. These books are numbered. The amounts (not details) are posted into the ledger, showing number of book and page where details are to be found; hence I am able to turn up the original order quickly if required. Thence into customer's pass book. In some cases details are entered, in others simply 'goods'. An invoice being sent with all goods, it is quite easy for customers to check their books either way. Of course, discretion is needed, as the wishes of the customers have to be taken into consideration. I keep a cash book, and use a check till. Names of customers paying accounts are registered against the amounts paid and entered up every night into cash book. I never allow assistants to receipt an account without stating the day of the month and year when paid. I have seen hours wasted, especially where a customer has been long-winded and irregular in payments, simply through omitting to show the date when payments were made. This can be avoided, and in case of any dispute the entry can easily be referred to without undue loss of time. Counter books, ledger, and cash book are all I use for transacting business with customers.

"For the warehouse an inwards book and an empties book are kept.

"*Office.*—In dealing with invoices the method I adopt is quite simple, and one I have always found to answer my purpose. I keep an invoice file, *goods not to hand.* Also two invoice books indexed A to Z, one credit, one debit. Twice a week I check off my invoices from the inwards book and pass into debit book alphabetically. I keep an eye on invoices and inwards book every morning, and note any irregularities that may occur, such as shortages, &c., and deal with them promptly.

"To instance the advantages of an invoice book:—A traveller calls—say Huntley's; I look in index H debit, invoice found in a moment, no time lost searching down a file or one's pockets. Having paid the traveller and obtained the receipt, I pin the invoice and statement together, and pass into credit book index H. If required again in six months' time, it can quickly be produced.

"Empties returned I enter into a separate book from the railway books. When allowed for I write across the particular lot, in red ink, "Allowed" and the date; the date is most important when discrepancies arise. Railway consignment notes are kept on a file and checked once a week. Price-lists I am likely to require are also filed.

"Once a month, on the Tuesday preceding the 14th and 16th of every month, when accounts usually become due, I go through the invoice book, pin each different firm's invoices together, check same, and discharge my liabilities. Accounts usually collected by travellers are retained until traveller calls, unless delay means loss of discounts. If I am expecting a traveller, I usually have it ready in case I may be busy when he calls; this helps me and saves him a lot of time.

"Telephone kept. Stock taken once a year.

"I keep a banking account and pay all accounts by cheque, excepting very small amounts, which I show in my private cash book."

Routine for Each Day of the Week.—The same practical correspondent describes as follows the routine he adopts for the work of each day of the week:—

"*Monday.*—My assistant opens shop at 8 a.m. prompt. I usually take a walk and attend to office details before going in to business—9.30. Assistant goes for orders. I then thoroughly wash down provision counter, butter block, &c., and put provisions in order, dust round, and attend to counter; boy cleans the scales, &c. This occupies my time until one o'clock, at which time the assistant arrives home. I might say here that I have carefully arranged the round to a certain limit, so that I can depend upon him being home near that time, also to assist us and the boys dealing with the delivery. I then have dinner, during which time he works the orders. Two o'clock he goes to dinner. I continue working the orders and commence despatch, and by six o'clock orders are all out. From 4 to 7.30 I occupy my time posting my books, and give the assistant a hand if necessary; 7.30 close.

"*Tuesday* being a quiet day, I devote the whole of the day to booking and office work, relieving assistant at meal times. I make up customers' pass books and send out. (I would like to mention here that regularity in this has been a very great help to me and appreciated by my customers.) Assistant attends to counters, arranges goods on stands and shelves, dresses window. I have two windows, which are dressed alternately. This may appear a big day's work, but I can assure you it is not when done systematically. I have my windows arranged so that they can be dressed quickly and effectively. Instead of having this work about one and two days as I have known, it is done in a few hours. Of course, I am close at hand in case of emergency.

"*Wednesday.*—Myself and assistant devote the whole day to weighing and packing stock. It is astonishing how much more work can be accomplished when you work with your men. I say work—not dodging about. Having only the one assistant, I look upon this as much my work as it is his, and do not expect him to do impossibilities—viz., my share and his own too. All packing finished before closing.

"*Thursday.*—A short day. I post up and finish all booking up to closing time, thereby avoiding confusion with customers' accounts and delay in dealing with them on Friday and Saturday. Assistant attends to counter and does any necessary sundry work, seeing that paper, bags, string, &c., are all in order and ready for use. Close 2.30.

"*Friday.*—Morning, strict attention to counter and despatching goods by both of us; no sundry work permitted. In the afternoon, when business is not quite so brisk, my assistant goes for orders, arriving home 6.30. Having had tea, we put up those orders. Some are sent same evening, others are packed off ready and despatched early next morning.

"*Saturday.*—Despatch goods left overnight by boys. Having done this, we are free for the day to attend to customers. Evening being rather quiet with us, I do as much posting up as possible, and order such goods as may be required for the early part of the week, until closing time."

Stock-keeping.—Good stock-keeping is a matter of obvious importance in a grocer's business, wherein "perishables" are an item. Method must be strictly observed. To begin with, "Count, gauge, measure, and weigh your goods as received".

For checking goods received a platform scale in good order, and convenient to the receiving door of the store-room, should be used. Of any goods being taken in, one case at least should be opened and the contents checked. If found correct, this case should be weighed and used as a standard for the rest of the consignment of similar goods. The gross and tare of standard lines of goods may be entered in an indexed book kept for the purpose, containing columns for description of package, description of goods, gross, tare, and net weights, and the weights of single packets. By this means incoming or outgoing goods can frequently be checked without having again to open the packages.

To ensure proper care of the goods themselves when in stock, groceries may be arranged in so-called "departments"—not necessarily observed in the warehouse, but merely to divide the work, so that each assistant engaged in the shop may be given charge of certain articles and a certain quantity, just sufficient for him to keep under proper supervision. An Exhibition essayist, whose suggestions were approved by practical men, offers this plan:—

"Rule several large sheets of card into small squares, leaving a margin on the first side for items. Date off the remaining columns at the first day in each week as far as it will go. Every Monday morning each assistant must take his stock-chart and figure the quantity against each item in the stock-column of that date. This is very simple, but immensely important. Take, for example, biscuits, one of the most important commodities that must be constantly fresh and new. Write in the margin the kinds of biscuits kept in stock, and in the first column the maximum number of tins of each kind it is advisable to stock for one week, written in red ink. Now fill in the stock in hand, and make up the weekly wholesale order to the maximum quantity. The list of kinds should be revised monthly, any new kinds added, and maximum stocks cancelled or re-estimated, according to the progress of sale. You can never get stale biscuits this way. The system can be adapted to almost any class of stock with a little judgment, and is particularly useful in that most aggravating of all, the patent-medicine stock. And here let me advise a point: Never order a special patent for a customer, unless well known, without a deposit. The only possible way to keep stock is to have a periodical inspection, and have it recorded and filed. As to dividing up the side into compartments, I make the following suggestions:—

"1. Biscuits, jams, canned fruits, patent medicines.

"2. Cocoas, chocolates, teas, patent foods, extracts of meat, bottled fruits.

"3. Toilet soaps, perfumes, candles, boot and furniture creams, polishes.

"And so on. The warehouseman should supply weekly stocks of rough goods, such as salt, soda, wood, and all kinds of paper, bags, tea and butter prints.

"The extra discount for the larger quantity is often a great temptation. Only bring forward week by week what is required for immediate sale, and keep the bulk well protected. Provisions, because of their perishable nature, automatically demand daily and constant attention, but a weekly stock sheet of eggs, bacon, cheese, lard, hams, should always be taken."

Window-dressing.—In window-dressing the first point is to decide what to show—giving prominence, of course, to goods which are just in season, or which there is a special reason for pushing. Then think by what materials and devices you can make your display effective, and finally arrange in your mind's eye some sort of a plan, with a "colour scheme". Some ideas with regard to windows are—(1) that they should be dressed according to the season; (2) dressing them for special goods which it is desired to push, such as a butter window, a cheese window, an egg window, a currant window, a soap window, a tea window, and so on; (3) having the dressing done by a professional window-dresser; (4) having "demonstrations" in the window, quick men or pretty young women shown actually at work on some interesting operation or other connected with the business, or some process of manufacture of goods sold; (5) showing machinery at work in the window, such as for cleaning currants, roasting coffee, and so on; (6) placing ingenious or attractive working models in the window; (7) arranging the window so as to represent some novel or picturesque scene; (8) decorating the window and setting off the goods with coloured cloths, rich plush or curtain backgrounds, and tastefully arranged groups of electric lights or other illumination; (9) filling the window with articles priced all at one figure—such as a sevenpenny display, a shilling display, a sixpenny-halfpenny show, or even a "popular penny" assortment.

Ticket-writing.—Tickets should be clean, easily read, and of smart if not artistic appearance. As a rule the trade printer turns out smarter work than the amateur, but it is often useful to be able to write a ticket oneself. For ticket-writing "Bristol board" or other special kind of card is used, commonly of royal size (20 in. by 25 in.), which can be cut up as required. A T-square, set square, pair of compasses, flat rule, will be needed; also pencil, pens of different breadths, a few sable brushes or "writing-pencils", a stencil brush, gilder's mop, flat varnish brush and bottle, palette knife, slab or tile for grinding colours, pots and bottles for paints, and a hare's foot for laying on bronze. The special inks used are Japan ticket ink for indoor cards, and waterproof ink for use on cards which will be exposed to the weather. Both may be bought in bottles. For coloured work dry colour should be bought to be ground up as required with gum solution and ox-gall. Gum solution is made of gum arabic and water—in the proportion of 4 oz. to a pint,—the former dissolved by being allowed to stand for two or three days in the bottle, and then strained off through muslin. To mix the colour, having ground it smooth with the knife on the palette or tile, add the gum to make a paste, and after mixing up well with the aid of the palette knife, add a drop or two of ox-gall; to this in the saucer add water to thin out the colour so as to make it workable with the sable brush. Ultramarine, cobalt, vermilion, carmine, crimson lake, emerald green, lemon, orange chrome, purple brown, flake white, and Indian ink are the colours most used, with gold and silver powders, and bronze powders of various tints.

Paper.—With regard to paper used in the grocery trade the following are the sizes of brown papers as recognized in the paper trade:—Casing, 46 in. by 36 in.; Double Imperial, 45 in. by 29 in.; Elephant, 34 in. by 24 in.; Double Four Pound, 31 in. by 21 in.; Imperial Cap, 29 in. by 22 in.; Haven Cap, 26 in. by 21 in.; Bag Cap, 24 in. by 19½ in.; Kent Cap, 21 in. by 18 in. Of printing and other papers the following are some of the sizes:—Post, 19½ in. by 15½ in.; Demy, 22½ in. by 17½ in.; Royal, 25 in. by 20 in.; Super-royal, 27½ in. by 20½ in.; Double Crown, 30 in. by 20 in.; Imperial, 30 in. by 22 in.; Double Post, 31¼ in. by 19¾ in.; Double Demy, 35 in. by 22½ in.; Double Royal, 40 in. by 25 in. A ream contains 480 sheets — 20 quires of 24 sheets each. Test "grease-proof" papers by a little warm grease or a drop of bicycle lamp-oil. "Vegetable parchment" should be waterproof as well as grease-proof.

Shop Rules.—Regulations for shop management are sometimes printed, each employee being required to hold a copy and to give a written assent to same. The following is an example:—

HOURS:

Mondays, Tuesdays, and Wednesdays,
8 a.m. to .
Thursdays, 8 a.m. to .
Fridays, 8 a.m. to .
Saturdays, 8 a.m. to .

MEAL-TIMES:

Dinner: 55 minutes.
Tea: 45 minutes.

A. The above Hours and Meal-times to be subject to the discretion of the Manager. The Meal-times on Thursdays to be reversed, viz.: Dinner, 45 minutes; Tea, 55 minutes.

B. Each Member must pass in his time to the Desk Cashier, the same to be the *actual time when resuming or leaving work*, at Meal-times or any other occasion.

C. No member of the Staff must leave the Premises during business hours without proper permission.

D. The Firm's Clock to be taken as a criterion of the Time.

HOLIDAYS:

Business will be suspended on all Bank Holidays. Assistants to have working days, and Warehousemen, Porters, and Apprentices working days, after first year's service.

DEPARTMENTAL DUTIES:

A. Apprentices and Juniors to deliver parcels as required, and to temporarily fill the place of Warehousemen or Porters in their absence.

B. Junior hands must at all times provide for their absence by appointing a subordinate temporarily to fill their place.

CASH DESK, &c.:

A. All moneys for *Cash Sales* must be paid in forthwith to the Desk Cashier, accompanied by a check for same.

B. All moneys for *Credit Sales* must be paid in forthwith to the Book-keeper, who must supply an Official Receipt for same.

C. The Counterman must always check the change given to him by the Desk Cashier or Book-keeper, and the Cashier must examine each individual check and item of Cash and see that they correspond.

D. Each Counterman must have his own Book of Checks, which must be totalled up by him at the close of each day.

E. The Totals of the several Books must be in agreement with those of the Cashier's record.

F. Immediately after closing, the Cash must be handed over at the Counter to be counted by the Book-keeper or Manager and checked by a Senior Hand, and both must sign the official slip showing the amount, and the Desk Cashier must also sign same. No Member of the Staff must leave the premises until the Desk Cashier has balanced his Cash, except by the permission of the Manager.

G. All discrepancies must be reported by the Book-keeper to the Managing Director weekly, and be duly entered in "Counter Sales Record Book" by Book-keeper.

H. In the absence of the Desk Cashiers the Managers must appoint others to take their place, and *on no account must an Employee pass cash in unchecked by Cashier, or take his own change from the Desk.*

I. The Book-keeper must give the Desk Cashiers, on each Monday morning, the sum of Two Pounds Ten Shillings (£2, 10*s.*) for an I.O.U., and this amount must be refunded on the Saturday evening following, in exchange for the I.O.U.

WAREHOUSE:

All orders to be put up at Warehouse must be entered in Warehouse book before being executed.

ORDERS:

A. All Retail Orders amounting to 1*s.* 6*d.* and upwards must be checked by another hand.

B. All Wholesale Orders must be initialled by both Packer and Checker.

C. All Wholesale Orders must, as far as possible, be executed on other days than Thursdays and Saturdays.

D. Articles must be honestly described to Customers, and no sale must be effected by misrepresentation of any kind whatsoever.

E. Parcels must be securely packed and fully addressed, and the time for delivery must be entered on the Label and the Slate, where needed.

MISCELLANEOUS:

A. Breakages must be reported at once to the Inspector.

B. Any instance of irregularity or improper conduct on the part of any Employee, which may be observed by any Member of the Staff, must be reported at once, and any Member neglecting to do this will be considered equally incriminated in the misdemeanour.

C. Any form of carelessness causing damage, loss, or inconvenience, and any case of untidiness must be reported.

D. No smoking allowed during business hours.

E. The use of improper language strictly prohibited.

F. Any Apprentice or Junior found frequenting public-houses will be liable on the first offence to a heavy fine, and, if repeated, to instant dismissal.

Stock-taking.—Periodical overhauling is desirable for the sake of the stock, as well as absolutely necessary from the point of view of sound finance in the conduct of the business. The following is an example of stock-taking sheets used in the grocery trade:—

STOCK-TAKING FOR THE YEAR ENDED 190

Department .... *Sheet No.* ....

Description.	Number or Quantity in Stock.	Price.		Value of Number or Quantity in Stock.			Remarks.
		Rate.	Per				

In *The Practical Grocer* will be found a detailed example of an actual stock-taking. The principle is easily comprehended, the methods vary according to the circumstances of a grocer and his business staff, and so on. Perhaps (writes an English tradesman in *The Grocer*) a little description of the mode adopted for many years by the writer may be of some value as suggestive to those similarly situated. The writer's business was situated in a country market town, and was of fair but not very large dimensions, the trade being mostly of a "family" nature and the stock being a very varied one; the shop was of moderate size, but the greater bulk of the goods were kept in some spacious warehouses at the back, across a court-yard. An assortment of almost everything was kept in the shop, and its drawers and other fixtures were regularly replenished from the warehouses. It may also be stated that there was just a sufficient, but not a superabundant, number of hands employed, and the whole of the staff had their time fully occupied in the ordinary routine of the business, and could never count on many spare or unappropriated moments. His aim, notwithstanding, was to take stock thoroughly, with as little derangement of the usual duties as possible, and without external aid. With this end in view, his custom was to fix "stock-taking day" long beforehand, always choosing an early-closing day, and at a season which was not the busiest. Parenthetically it may be mentioned that the selection of an early-closing day was not in any way objected to by the employees; on the contrary, it was thankfully accepted as a much better alternative than the plan which prevailed before the adoption of half-holidays—that of doing the work by night. Well, the day being fixed some time in advance, the stock-taking would be held in view, and would be anticipated in the business arrangements. As it would be known that the preparation for "writing down" would be going on for some days previous to the day appointed, the proprietor would try to manage that as far as possible there should be no arrivals of purchased goods within a week prior to it. This would ease the work of the porter as well as of the shop hands, and enable them to devote necessary time to the weighing of goods in anticipation of writing down and to general putting forward. About a week before the appointed day, care having been taken that all the shop fixtures were well filled up from the warehouse stock, either the proprietor himself or a trusted assistant would, accompanied by the porter, make a commencement in the warehouses. Provided with a supply of blank labels cut from old letters or from "white demy", a pot of paste, and a pen and ink, they would make a start, taking each room in order, examining, weighing, counting, or measuring, as the case may be, all the articles in succession. As the net weight, measurement, or count of each package or pile of goods was ascertained, it would be written on one of the labels, which would then be attached to the package or pile. This process had been facilitated by the fact that every cask, box, or other receptacle used for stock had the tare written on it, that being a precaution adopted throughout the premises. A general instruction was given that if any member of the staff had to take away any of the goods which had been weighed off, a memorandum of it should be written on the label, so that on the "writing-down" day a label might perhaps appear thus:—"Pearl tapioca, 3 qr. 18 lb.—9 lb. out", the quantity to be entered being consequently 3 qr. 9 lb. The whole of the stock in the warehouses would be gone through in this way, care being taken to have everything put in perfect order; and should anything, unfortunately, be met with which was out of condition, the word "out" would be written on the label, so that the special attention of the proprietor might be called to it, and it might be valued accordingly. According to this plan, the whole of the goods in the warehouses would be thus marked off before the day for writing down arrived, so that the entire stock might be entered in the book in one day, and complication be prevented. When stock-taking day arrived, the writer, being usually rather an early riser, would repair in good time in the morning—before breakfast, in fact—to the warehouses and commence writing in his stock book. During this work he would usually be accompanied by one of those who had taken part in the "weighing-off", and he would go round the rooms in regular order, having the entries on the labels called over to him, and, of course, having his eye well open to mark the condition and general order of the stock. By sticking well to the work, and with but short intervals for refreshments, this part of the duty would be completed and the whole of the contents of the warehouses entered by mid-day. While it had been going on, a small portion of the shop stock-taking would be carried out by the shop hands if they had time between the necessary counter work; some of the fixtures would be gone through, such as those containing jams, pickles, sauces, candles, &c., by them, and inventories taken on slips of paper, which would afterwards be copied by the writer in his book. Dinner being over and the shop closed—the day, as already intimated, being an early-closing one—all the staff would muster in the shop, and each give his attention to a different portion of it, in accordance with previous arrangement, the porter assisting with the heavier part of the work, such as weighing drawers of sugar, currants, &c., the shopmen going through the smaller drawers, shelves, &c., and the proprietor being at a desk with his book. He had to be a pretty quick writer, for he took down the various items as they were called out to him, or copied off the slips of those who had written them down, taking care that nothing was missed. This went on at a very brisk rate, and when tea-time came that meal was provided on the premises for the entire staff, although most of the members of it were "out-door" hands. A couple or three hours after tea usually completed the process, a general clearing and sweeping-up ensued, and an air of satisfaction at the termination of one more stock-taking day pervaded the place. It may be stated that in entering the stock in the book, the contents of every room or building was recorded separately, both for the convenience of future reference and also in case of partial destruction at any time by accidental fire. With the latter reason in view, too, the precaution was taken always to preserve the stock books in the fire-proof safe. But, although the very important work above indicated had been accomplished, much remained to be done in the form of "office work". The morning after "writing-down day" all the accounts in the ledgers were added up, and a list made of the amounts due. Great care was taken that this should be done promptly, so that everything entered, up to the closing time of stock-taking day, should be included, and the records taken before any debits or credits of the following day were posted. The accounts in the bought ledger were also added up and a list made of them on that day, all invoices having been previously posted up close, and care being taken not to include the invoice of any goods which had not arrived or been taken into stock. The amount of cash in the house and the balance at the bank at the close of stock-taking day would also be noted and entered in the book. All the above details having been promptly dealt with, the rest of the work, which, though onerous, usually devolved on the principal himself, could be done a little more at leisure; at any rate, it was not of pressing necessity to be carried out immediately, to the displacement of other essential work, although the sooner it could reasonably be done the better in every respect. The work now to be dealt with consisted in the pricing and carrying out every article appearing in the stock-taking book. The "Prices Current", the price lists of various manufacturers, and the writer's own books came largely into requisition for this purpose, so that everything might be fairly valued. The aim was that every article should be reckoned at the price which it would cost to replace it at that moment, taking into account carriage (if the goods were not bought "carriage-paid"), and of discount if they were subject to a deduction of that nature. When this was finished the balance-sheet would be prepared thus. On one side would be entered value of stock, amount of book debts (good ones at full, doubtful ones at estimated value), cash in the house, ditto at the bank, and any other assets. On the other side, amounts owing to wholesale firms, money owing for rent, rates, taxes, gas, &c., to date, and other liabilities of any kind. The total of the latter side deducted from that of the former shows the capital in the business, and this balance compared with that of the previous stocktaking reveals what progress has been made during the period.

Chapter XX.—BOOK-KEEPING

Under the bankruptcy laws of most of the leading countries and colonies it is incumbent upon traders to keep proper and sufficient books of account, and in the event of a failure in business neglect to comply with this salutary rule is punished by refusing the debtor's discharge, or even by a term of imprisonment. In the United Kingdom "proper and sufficient" books of account are held to be such as "sufficiently disclose the trader's business transactions and financial position".

The method of book-keeping recommended for a retail grocer is "Double Entry", with such modification as suits the requirements of his business. Double entry means that in addition to keeping a sufficient record of your accounts with your creditors and debtors, you keep also a series of "nominal" accounts whereby all your business transactions are presented in a methodical and complete form, each "debit" having its corresponding "credit", and each "credit" its corresponding "debit".

The special modification suitable for most grocers consists in the use in the shop of what are called "Duplicating" books —counter books which, by the use of carbon sheets, enable two, or sometimes three, copies of a customer's order to be written at once. One copy of the order so duplicated or manifolded is the bill handed to the customer in a cash transaction, or sent with the goods if a credit one; the second copy is retained for the purpose of the book-keeping. In some systems this second copy of the original order or list is made to serve the purpose of a "day book", or even of a "ledger", being so arranged that it can be filed straight away in a book and thus become a page of a "loose-leaf" ledger.

The Books.—The complete state of a business, so far as accounts can show it, is presented in the **Ledger**, and a ledger may consist of one book or of several books, as convenient. But in either case the ledger consists of three different classes of accounts, namely:—

(*a*) *Personal* accounts, dealing with persons or firms, such as customers and merchants;

(*b*) *Real* accounts, dealing with assets or possessions, such as cash, stock, premises, and book debts;

(*c*) *Nominal* or impersonal accounts dealing with the profits or losses of the business, its expenses, depreciation, interest on capital, discount, &c.

Of these three groups of accounts the two last, (*b*) and (*c*), the real and nominal accounts, obviously concern the proprietor of the business in a more private way than do the class of accounts termed "personal" as relating to his buyings and sellings. Therefore the real and nominal accounts are usually kept in a book (or books) separate from the accounts of class (*a*), which is called the **Private Ledger**.

If we look into class (*a*) again we find that the "personal" or firm's accounts comprise two categories:—(*d*) the trader's *suppliers* and (*e*) his *customers*. It is convenient, therefore, to have a ledger for the suppliers, which is called usually a

Bought Ledger, and another for the customers, which is called a **Sales Ledger.**

Thus the Ledger may consist of three separate books:—

(1) The Proprietor's or Private Ledger.
(2) The Bought Ledger for his buyings.
(3) The Sales Ledger for his sellings.

These three ledgers, or ledger-groups of accounts, relating respectively to what we have called Proprietorship, Buyings, and Sellings, should afford a complete view of the business, either with details or in a condensed form. But in each class preliminary or accessory books are used. Thus there is—

(1) a **Cash Book**, to record the details of all cash receipts and payments before they go into the Private Ledger;

(2) a **Purchase Day Book** or **Invoice Book** for the invoices or invoiced details of goods purchased by the trader before the record passes to the Bought Ledger;

(3) a **Sales Book** or **Sales Day Book** to record the details of sales to customers before the record passes to the Sales Ledger.

Then again you may add to your Cash Book a **Petty Cash Book** for minor cash items below a fixed sum; you may supplement your Invoice Book by a **Warehouse Book**, to show particulars of goods received into the warehouse or taken out of stock there; and you may supplement or even replace your Sales Day Book by using the duplicate counter-books already mentioned, or by using a "Small Accounts Keeper" or file of loose leaves.

Definition of Terms.—We proceed to give some further particulars of the forms of account as kept in these several books relating to Goods Bought, Goods Sold, and Proprietorship. To begin with, the tyro may note the following definitions of the terms book-keepers use:—

Posting means transferring items, or their totals, from some preliminary book to a ledger.

Debit means to put down something to an account as owed *by* the personal or other name at the head of the account.

The debit side of an account is on the left-hand and is marked by "Dr.".

Credit is to put down something to an account as received *from* the personal or other name at the head of the account. The credit side of an account is on the right-hand and is marked by "Cr.".

Every transaction involves a *giver* and a *receiver*, that is to say, a *creditor* and a *debtor*. Therefore in book-keeping the invariable rule is—

Debit the Receiver, or the Account that receives.
Credit the Giver, or the Account that gives.

A further rule is—

Debit *Losses*; credit *Gains.*

Ledger folio means the number of the page in the Ledger to which a particular item in one of the subsidiary books has been posted. There is usually a separate column for this figure to be written in on the same line as the item it refers to.

Balance means the difference between one total and another. A customer owes you £100 and pays you £50; this leaves a balance of £50.

Brought forward means to bring from one page to a later one; *carried forward* shows that the item is to be so carried to a later page; *brought down* means brought from one account to another beneath it.

The Books in Detail.—We assume, then, that the retail grocer has provided himself with the following books:—

For Goods Bought:

1. Purchase Day Book or Invoice Book.
2. Bought Ledger.

For Goods Sold:

3. Duplicating Counter Books or Sales Day Book.
4. Sales Ledger.

For Cash Transactions:

5. Counter Cash Book. 6. General Cash Book.

For Proprietor's Accounts:

7. Private Ledger.

Besides these there will be needed, as a matter of course, such extras as files for the invoices and receipts, a dating stamp, pass books, or current-account books, for customers, and the trader's Bank pass book—for it is assumed that our grocer is sufficiently up-to-date and business-like to have a Bank account. Incidentally it may be remarked, too, that a very good rule is to pay all accounts by cheque if over a certain sum, say £2, and to pay all cheques received into your bank. As to customers' pass books, they should be numbered: one plan is to give them the same number as the page of the ledger on which the customer's account appears.

(1) **The Purchase Day Book.**—This book is a record of the receipt of goods as the invoices reach you, and contains particulars from which you can enter up your debts to your suppliers in the Bought Ledger (see No. 2). When goods arrive, first examine them with the invoice and check the figures on the invoice accordingly, marking in red ink any corrections or deductions to be made. Then make an entry of the invoice in the Invoice Book, which may be ruled thus:—

Date.	No. of Invoice.	From whom Purchased.	Article.	Ledger Folio.	Amount.

The invoice itself is numbered and filed in a Shannon or other suitable file. From the Purchase Day Book the entries are posted to the different merchants' accounts in the Bought Ledger, the amounts being placed there on the right-hand or *credit* side to the credit of the supplier. At the end of the month the total of the month's entries in the Purchase Day Book (namely, the total amount of the goods received during the month) is posted to the Purchases Account in the Private Ledger, the amount being there entered on the left or *debit* side.

Note.—At the end of your Purchase Day Book allot a number of pages for *Allowances*, *Returns*, &c., and enter there all particulars as to amounts allowed by the wholesale or other suppliers in respect of damaged goods, returned goods, returned packages, empties, money you pay for carriage of goods that should have been sent to you carriage paid, and so on. Post these items severally to the *debit* of the merchants' accounts in the Bought Ledger; and at the month's end post the total of them to the *credit* of the Purchases Account in the Private Ledger.

(2) **The Bought Ledger.**—This book is ruled with a "Dr." side and a "Cr." side thus:—

Dr. MERCHANT'S NAME AND ADDRESS. *Cr.*

Date.	Payments.	Fol.	£	*s.*	*d.*	Date.	Goods.	Fol.	£	*s.*	*d.*

The Bought Ledger is intended for the personal accounts of the suppliers of goods—usually merchants, manufacturers, or wholesalers. On the left side appear the amounts, posted from the Cash Book, of payments you have made to the merchant and of discounts he has allowed; also the amounts, posted from the Purchase Day Book, of any allowances for returns, &c. On the right side are posted the amounts of the several invoices as entered in the Purchase Day Book—"By Goods" so much.

(3) **Duplicating Counter Books.**—The countermen write in these books particulars of any order given by a customer. The upper sheet is torn out that the order may be executed from it; and these sheets or bills are numbered and placed on files for different journeys. The carbon copies remain in the book, and from them are entered up (usually next morning) the several accounts of the customers in the Sales Ledger. (See No. 4.) A summary of each day's sales is kept at the end of the Counter Book (or in a separate Summary Book), and this totalled at the end of the month gives the amount

of sales to be posted on the *credit* side of a Sales Account in the Private Ledger. It will be seen that the carbon records, which are carefully kept, serve the purpose of a **Sales Day Book**, though sometimes the latter is kept also. In that case it is ruled thus:—

Date.	Customer's Name and Details of Order.	Folio.	Details.			Amount of Order.		
			£	*s.*	*d.*	£	*s.*	*d.*

In the folio column is inserted the page of the Sales Ledger on which the customer's account will be found; the corresponding page of the Sales Day Book itself being put in the Ledger. At the end of the Sales Day Book allow a number of pages for *Allowances*, *Returns*, &c., entering there particulars of any sum to be deducted from the customer's account in respect of returns, breakages, or other allowances. Post these amounts to the *credit* of the several customers' accounts in the Sales Ledger, and at the end of the month post their total to the *debit* of the Sales Account in Private Ledger.

(4) **Sales Ledger.**—Like the Bought Ledger, this book is ruled with a debtor side and a creditor side thus:—

Dr. CUSTOMER'S NAME AND ADDRESS. *Cr.*

Date.	To Goods.	Fol.	£	*s.*	*d.*	Date.	By Cash and Discount.	Fol.	£	*s.*	*d.*

The personal accounts of all customers buying goods on credit appear in this Ledger, on the debit side being posted the amounts of goods supplied as shown by the Duplicate Counter Books, and on the credit side, posted from the Cash Book, the amounts of cash received from the customer and discounts you allow to him; also, posted from the Sales Day Book, the amounts of any allowances you make to the customer in respect of returns, &c.

(5) **Counter Cash Book.**—This is a rough Cash Book in which to enter, on the left or receipts side, all items of cash received and the total of cash sales each day (from the check till if one be used, which is advisable), while on the right or payments side are entered all items of cash paid away. It may be ruled thus:—

Receipts.					Payments.				
Date.	Name and Particulars.	£	*s.*	*d.*	Date.	Name and Particulars.	£	*s.*	*d.*

At the end of the day all the items should be copied into the General Cash Book (see No. 6). A **Petty Cash Book** should also be kept, the petty cashier being started at the commencement of each week with a small round sum, and a cheque drawn each week for the actual sum disbursed as shown in the Petty Cash Book. This book may be an ordinary memorandum book, ruled with a column on the left for the sum which is allotted for the week's petty expenses of every kind, and other columns for payments such as cash purchases, carriage, postages and telegrams, and sundry payments.

(6) **The General Cash Book.**—This Cash Book is now very often a somewhat elaborately ruled book, so arranged as to dissect the items of cash and classify them according to their character. The example on p. 316 is such a form of ruling.

Assuming that the first of these forms is used, enter each day in the first money column on the left all amounts received for cash sales (or check-till total); in the second, all discounts allowed to customers; in the third, all receipts for credit accounts, &c.; in the fourth, all moneys paid into the bank.

Date.	Particulars.	Fo.	Cash Sales.	Discount.	Credit Sales, &c.	Bank.	Date.	Particulars.	Fo.	Cash Purchases.	Discount.	Sundry Payments.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.				£ s. d.	£ s. d.	£ s. d.

Of the more elaborate forms of Cash Book the following is an example:—

RECEIPTS (LEFT-HAND SIDE OF BOOK)

Date.	Particulars.	Folio.	Customers' Accounts.		Cash Sales.	CASH.	BANK.
			Discount and Allowances.	Cash.			
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.

PAYMENTS (RIGHT-HAND SIDE OF BOOK)

Date.	Particulars.	Voucher No.	CASH.	BANK.	ANALYSIS OF EXPENDITURE.											
					Bought Book A/cs.		Cash Purchases.	Trade Expenses.	Wages.	Horse-keep and Expenses.	Rent, Rates, Insurance, Gas and Water.	Drawings.	Other Accounts.		
					Fo.	Amount.							Name of Account.	Fo.	Amount.
			£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.			£ s. d.

Enter likewise in the first money column on the right hand all cheques you pay for cash purchases; in the second, all discounts allowed to yourself on the goods you purchase; and in the third, all cheques you pay for purchases made on credit or other payments.

With regard to posting, the *entries on the left* are posted—first column, total monthly to credit of the Sales Account in Private Ledger; second column, items to the credit of the respective accounts of customers in the Sales Ledger, and the total monthly to debit of Discount Account in Private Ledger; third column, daily to the respective accounts of customers in the Sales Ledger. The *entries on the right* are posted—first column, monthly total to the debit of Purchases Account in the Private Ledger; second column, items daily to the debit of the respective merchants' accounts in the Bought Ledger, and total monthly to credit of Discount Account in the Private Ledger; third column, items daily to the respective accounts in the Bought Ledger or to Petty Cash Account.

(7) **Private Ledger.**—The Private Ledger as we here term it is sometimes called the General Ledger, certain accounts in it being kept apart and called the Private Ledger section of it. The accounts included in this book are—

Private Accounts	Nominal Accounts
Capital Account.	Credit Sales.
Drawings Account.	Cash Sales.
Fixtures and Fittings.	Purchases.
Horses, Carts, and Harness.	Trade Expenses.
Stock-in-Trade.	Discounts and Allowances.
Income Tax.	Bad Debts.
Salaries and Wages.	Horse-keep and Stable Expenses.
Rent, Rates, and Taxes.	Insurance, Gas, and Water.
Trading Account.	Bank Interest and Commission.
Profit and Loss Account.	&c. &c.

The Nominal accounts are practically summaries of the various items of expenditure comprised in the Trading Account, and are obtained by postings from the various books already named. Any other accounts required by the nature of the business or the solicitude of the proprietor may be added by extracting the necessary items from the various books of original entry. The following are specimens of accounts as kept in the Private Ledger:—

91 Trade Expenses. 91

19 .			Fol.	£	s.	d.	19 .			Fol.	£	s.	d.
July	31	To Sundries	61	3	3	4	July	31	By Transferred to Trading a/c	100	19	8	4
"	7	" Wages	61	5	18	0							
"	"	" Carriages	61	2	2	6							
"	"	" Repairs	61	8	4	6							
				19	8	4					19	8	4

92 Rent, Taxes, &c. 92

19 .			Fol.	£	s.	d.	19 .			Fol.	£	s.	d.
July	7	To Rent and Taxes	61	12	0	0	July	31	By Balance to Trading a/c	100	13	5	0
"	"	Gas	61	1	5	0							
				13	5	0					13	5	0

93 Fixtures and Fittings. 93

19 .			Fol.	£	s.	d.	19 .			Fol.	£	s.	d.
July	1	To Balance	102	150	0	0	July	31	By Depreciation	100	1	5	0
									" Balance c/d.		148	15	0
				150	0	0					150	0	0
"	31	" Balance b/d.	103	148	15	0							

Assuming that the various accounts are kept posted up, the Private Ledger enables a trader at any time to reckon up the progress of his business, and on making up his books he should be able to discover, for a given period to date, the following totals:—

The goods he has purchased.
Merchants' allowances to himself.
The goods he has sold for cash.
The goods he has sold on credit.
His allowances to customers.
His creditors.
His debtors.
His working expenses.
His own cash drawings.
The cash he has at bank and in hand.

From these particulars and by "taking stock"; that is, valuing everything he has got, he is enabled to prepare a complete and exact statement of his position, and to know how his business stands.

The Annual Review.—The stock-taking process which we have already explained is a part of what should be an annual review in every business—if not, indeed, a more frequent review. The other necessary part of this operation is the making out of three special accounts, namely—

The Trading Account.
The Profit and Loss Account.
The Balance Sheet.

For this purpose lists are required of (1) Stock-in-trade as taken, (2) Creditors, (3) Debtors; also the values of the trader's fixtures and fittings, horses, carts, and harness, and the amount of his balance at the bank and cash in hand. The ledger accounts are cast and the balance of each taken out. Bad debts must be written off; doubtful debts allowed for. A certain amount of the value of fixtures, fittings, &c., should be written off for depreciation.

The **Trading Account** is made out in the following form:—

50 *Dr.* TRADING ACCOUNT. *Cr.* 50

1907.		Fol.	£	s.	d.	1907.		Fol.	£	s.	d.
Jan. 1	To Stock at date		220	7	6	Dec. 31	By Credit sales		1050	4	5
Dec. 31	" Goods purchased		3109	3	4		" Cash sales		2450	4	8
							" Returns, &c.		15	0	0
			3329	10	10		" Stock at date		295	4	10
	" Gross profit carried down		481	3	1						
			3810	13	11				3810	13	11
1907.			£	s.	d.	1907.			£	s.	d.
Dec. 31	To Salaries and wages...		61	12	0	Dec. 31	By Gross profit brought down		481	3	1
	" Trade expenses		39	8	4		" Discounts, &c.		4	9	8
	" Rent and taxes		43	5	0						
	" Bad debts		4	5	9						
	" Discounts, &c..........		5	6	8						
	" Depreciation		13	5	0						
			167	2	9						
	" Balance, net profit...		318	10	0						
			485	12	9				485	12	9

In the folio columns shown are entered as usual the Ledger folios where the various accounts are to be found. It will be seen that the gross profit, £481, 3*s.* 1*d.*, is the amount of the difference between the selling and the buying prices of the stock, before expenses are deducted. In the lower part of the account discounts are added on the one side, and on the other are added together the totals of the various working expenses, &c., the balance of "net" profit shown being £318, 10*s.* A **Profit and Loss** account can now be set out as below:—

Dr. PROFIT AND LOSS ACCOUNT. *Cr.*

1907.		Fol.	£	s.	d.	1907.		Fol.	£	s.	d.
Dec. 31	To Income Tax.......		7	18	0	Dec. 31	By Bal., being net profit bro. from Trad. a/c.	50	318	10	0
	" Bal. transmitted to Cap. a/c..		314	12	0		" Bank Int.		4	0	0
			322	10	0				322	10	0

The balance of profit, £314, 12*s.*, is placed to the debit side of the Capital Account in the Private Ledger. Finally the Balance Sheet, to show in a succinct form what the trader possesses and what he owes, is drawn up as below:—

BALANCE SHEET, Dec. 31, 1907

LIABILITIES.	£	s.	d.	ASSETS.	£	s.	d.
Creditors, per list..........	120	0	0	£ s. d.			
Accruing expenses:—				Fixtures, fittings, &c. 98 5 0			
Rates, gas, water, &c.....	18	0	0	*Less* depreciation 8 5 0	90	0	0
Capital account:—				Horses, carts, &c. 55 0 0			
£ s. d.				*Less* depreciation 5 0 0	50	0	0
As at Jan. 1, 1907 632 3 0				Stock and stores	319	0	0
Add profit for year 314 12 0				Book debts 190 0 0			
				Less doubtful.... 5 0 0	185	0	0
946 15 0				Payments in advance:—			
Less drawings....156 0 0	790	15	0	Rates, gas, water, &c.....	2	15	0
				Cash at Bank 278 0 0			
				" in Hand....... 4 0 0	282	0	0
	928	15	0		928	15	0

It is hardly necessary to say that the figures above given are quite fictitious and not to be taken as a guide separately;

but as they stand the reader will observe that they show that the trader, besides drawing out £3 a week during the year for his household expenses, has increased his capital since the previous stock-taking by £159, 12*s.*

Opening Books.—Having now mastered the principles of correct book-keeping, and the character of the several books, the student will find it well to try to follow the actual routine of book-keeping, beginning with the opening of the books on starting a new business. For this purpose an object-lesson will probably be better than elaborate directions, which often confuse a reader. In most of the grocers' technical classes oral instruction is given; where this cannot be obtained a tyro is recommended to procure the assistance of a qualified friend who already keeps the books of a grocery or provision business. The following example of the method of opening books is from an excellent lecture prepared for (and courteously placed at the editor's disposal by) the Midland Council of Grocers' Associations by Mr. Arthur S. Coxon, A.S.A.A., incorporated accountant, of Smethwick:—

ACCOUNTS OF JOHN SMITH, GROCER AND PROVISION MERCHANT.

On July 1st John Smith commenced business as a Grocer and Provision Merchant by purchasing the business of Thomas Rice for £200, one-half cash down and the other half in one month on the security of his own and his wife's note of hand. He took over all the Assets of the business, including the Book Debts and Liabilities, as follows, viz.:—

ASSETS

	£	*s.*	*d.*
BOOK DEBTS, viz.:—Thomas Jones, £10; Mrs. Meek, £5; Mr. Black, £25; Owit & Co., £50; Wm. Robinson, £10—Total, £100, valued at	75	0	0
Stock in Trade (cost price £125) valued at	100	0	0
Fixtures, Fittings, Scales, Utensils, &c.	100	0	0
Goodwill	50	0	0
Total	325	0	0

LIABILITIES

	£	s.	d.
SUNDRY CREDITORS, viz.:—Raynor & Sons, £10; Goodwin & Co., £15, 15s.; R. M'Call, £4; Reckitt & Co., £2; Hart & Sons, £25; Gas Account (due 9th July), £1, 10s.; Rates (one quarter), £2; Green & Black, £10; Tinned Goods Co., Ltd., £13; Pure Jam Manufacturing Co., £10; Grocers' Supply Association, £31, 15s.—Total	125	0	0
Balance (excess of Assets over Liabilities), being Purchase Money	200	0	0

He obtained a 21 years' lease of the premises (which included dwelling-house attached) terminable at 7 or 14 years, at his option, at a rental of £30 per annum, payable monthly. The following were his transactions for the month of July:—

			£	s.	d.
July	1.	Paid into Bank	200	0	0
		" Thomas Rice one-half Purchase Money by cheque	100	0	0
		Insured Stock and Fixtures and paid premium ...	0	5	0
"	2.	Cash Sales	20	0	0
		Personal Drawings for month	5	0	0
"	4.	Sold Mrs. Meek goods as per Bill	2	0	0
		Paid Cash into Bank	10	0	0
		Thomas Jones paid on a/c	5	0	0
		Paid Solicitor's Expenses	2	2	0
"	5.	Sold Owit & Co. goods as per Bill	10	0	0
		Owit & Co. paid on a/c	5	0	0
"	6.	Bought of Grocers' Supply Association	15	0	0
		Paid Goodwin & Co. (discount allowed by them 15s.) by cheque	15	0	0
"	9.	Paid Gas Bill (less discount 1s.)	1	9	0
		Cash Sales for week	50	0	0
		Paid Grocers' Supply Association on a/c by cheque ...	30	0	0
"	11.	" Reckitt & Co.	2	0	0
		" into Bank	55	0	0
		Bought of Reckitt & Co.	2	10	0
"	12.	Sold Mr. Black goods as per Bill	17	10	0
		Received of Mr. Black, cheque (less discount 12s. 6d.)	24	7	6
		Paid into Bank	24	7	6
"	15.	Bought of Tinned Goods Co., Ltd.	5	0	0
		" " R. M'Call	2	10	0
"	16.	Sold Thomas Jones goods as per Bill	2	0	0
		Cash Sales for week	50	0	0
"	18.	Paid into Bank	50	0	0

		£	s.	d.
July 19.	Received Demand Note for Rates	4	0	0
" 20.	Thomas Jones paid	5	0	0
" 21.	Sold Thomas Jones goods as per Bill...	3	0	0
	Paid Raynor & Sons (less discount 10*s.*) by cheque ...	9	10	0
	Bought of Raynor & Sons	15	0	0
" 22.	" " R. M'Call	3	0	0
	Paid R. M'Call	5	0	0
	Bought of Grocers' Supply Association	50	0	0
" 23.	Cash Sales for week	55	0	0
" 25.	Paid into Bank	50	0	0
	Bought of Goodwin & Co.	50	0	0
	" " Raynor & Sons	45	0	0
" 27.	Mrs. Meek paid on a/c	3	0	0
" 29.	Paid Hart & Sons by cheque	25	0	0
	Bought of Hart & Sons	30	0	0
	" " Grain Milling Co.	25	0	0
	Borrowed from wife	100	0	0
" 30.	Paid into Bank	100	0	0
	Cash Sales for week	60	0	0
	Goods supplied to house for month (as per Memo. Book)	2	10	0
	Paid Rates	4	0	0
	" Rent	2	10	0
	" Thomas Rice in settlement of Purchase Money	100	0	0
	Sundry Expenses for month as per Memo. Book ...	1	0	0
	Paid Hart & Sons by cheque	30	0	0
	Bought of Hart & Sons	50	0	0
	Paid Grocers' Supply Association (less discount £2, 8*s.*) by cheque	64	7	0
	Bought of Grocers' Supply Association	20	0	0

The Stock on hand at the end of the month was £185, 15*s.* 6*d.* at cost price.

These particulars being supplied, the books are opened thus:—

Sales Day Book (for Credit Sales)

1907.		Fol.	£	s.	d.
July 2	Mrs. Meek—Goods as per Bill	2	2	0	0
" 5	Owit & Co. " "	4	10	0	0
" 12	Mr. Black " "	3	17	10	0
" 16	Thos. Jones " "	1	2	0	0
" 21	Thos. Jones " "	1	3	0	0
" 30	John Smith—Goods to house, per Memo. Book	12	2	10	0
			37	0	0

Note.—The full details of the Bills must be entered up in this book in practice, though omitted here for brevity.

Invoice or Purchase Day Book (for Goods Bought)

1907.			Folio.	£	s.	d.
July 6	Grocers' Supply Association (It is usual to enter details.)	Goods as per Invoice	9	15	0	0
" 11	Reckitt & Co.	"	4	2	10	0
" 15	Tinned Goods Co., Ltd.	"	7	5	0	0
	R. M'Call	"	3	2	10	0
" 19	District Council Rates		11	4	0	0
" 21	Raynor & Sons	Goods as per Invoice	1	15	0	0
" 22	R. M'Call	"	3	3	0	0
	Grocers' Supply Association	"	9	50	0	0
" 29	Hart & Sons	"	5	30	0	0
	Grain Milling Co.	"	10	25	0	0
" 31	Hart & Sons	"	5	50	0	0
	Grocers' Supply Association	"	9	20	0	0
" 25	Goodwin & Co.	"	2	50	0	0
	Raynor & Sons	"	1	45	0	0
				317	0	0
	Goods Purchased		p.l. 16	313	0	0
	Rates		9	4	0	0
				317	0	0

CASH

(In practice the pages of Receipts

Dr. RECEIPTS.

1907.		Folio.	£	s.	d.
July 1	To John Smith Capital..................	p.l. 3	200	0	0
" 2	" Cash Sales..............................	14	20	0	0
" 4	" Thomas Jones on a/c.................	s.l. 1	5	0	0
" 5	" Owit & Co. on a/c....................	5	5	0	0
" 9	" Cash Sales for Week................	p.l. 14	50	0	0
" 12	" Black .... Discount 12*s.* 6*d.*	s.l. 3	24	7	6
" 16	" Cash Sales for Week................	p.l. 14	50	0	0
" 20	" Thos. Jones..............................	1	5	0	0
" 21	" Mrs. Meek on a/c......................	2	3	0	0
" 23	" Cash Sales for Week................	p.l. 14	55	0	0
" 29	" " "	"	60	0	0
" 30	" Mrs. Smith (loan)	15	100	0	0
	£0 12 6	p.l. 17	577	7	6
Aug. 1	To Balance, being Cash in Hand brought forward		64	14	0

BOOK

and Payments would face each other)

PAYMENTS. *Cr.*

1907.		Folio.	Cash Paid. £	s.	d.	Cheques on Bank. £	s.	d.
July 1	By Bank	p.l. 10	200	0	0			
	" Thos. Rice (one-half Purchase Money)	2				100	0	0
	" Insurance Premium	11	0	5	0			
" 2	" Drawings	12	5	0	0			
" 4	" Bank	10	10	0	0			
	" Solicitor's Expenses	13	2	2	0			
" 6	" Goodwin & Co. 15*s.*	b.l. 2				15	0	0
" 9	" Gas 1*s.*	12	1	9	0			
	" Grocers' Supply Association on a/c	9				30	0	0
" 11	" Reckitt & Co.	4	2	0	0			
	" Bank	p.l. 10	55	0	0			
" 12	" Bank (Black's Cheque)		24	7	6			
" 18	" Bank	10	50	0	0			
" 21	" Raynor & Sons 10*s.*	b.l. 1				9	10	0
" 22	" R. M'Call	3	5	0	0			
" 25	" Bank	p.l. 10	50	0	0			
" 29	" Hart & Sons	b.l. 5				25	0	0
" 30	" Bank (Mrs. Smith)	p.l. 10	100	0	0			
	" Thos. Rice (in Settlement of Purchase Money)	p.l. 2				100	0	0
	" Rates	b.l. 11	4	0	0			
	" Rent	p.l. 9	2	10	0			
	" Sundry Expenses	13	1	0	0			
	" Hart & Sons	b.l. 5				30	0	0
	" Grocers' Supply Association 48*s.*	9				64	7	0
	" Balance, being Cash in Hand carried forward		64	14	0			
	p.l. 17 £3 14 0		577	7	6	373	17	0
						p.l. 10		

SALES LEDGER

1 *Dr.* THOMAS JONES. *Cr.* 1

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 1	To Balance for.	1	10	0	0	July 4	By Cash on a/c.	1	5	0	0
" 16	" Goods	1	2	0	0	" 20	" "	1	5	0	0
" 21	" "	1	3	0	0	" 31	" Bal. car. for.		5	0	0
			15	0	0				15	0	0
" 31	" Bal. bro. for.		5	0	0						

2 *Dr.* MRS. MEEK. *Cr.* 2

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 1	To Balance for.	1	5	0	0	July 27	By Cash on a/c.	1	3	0	0
" 4	" Goods	1	2	0	0	" 31	" Bal. car. for.		4	0	0
			7	0	0				7	0	0
" 31	" Bal. bro. for.		4	0	0						

3 *Dr.* MR. BLACK. *Cr.* 3

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 1	To Balance for.	1	25	0	0	July 12	By Cash	1	24	7	6
							" Discount ...	1		12	6
" 12	" Goods	1	17	10	0						

4 *Dr.* OWIT & CO. *Cr.* 4

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 1	To Balance for.	1	50	0	0	July 5	By Cash on a/c.	1	5	0	0
" 5	" Goods	1	10	0	0	" 31	" Bal. car. for.		55	0	0
			60	0	0				60	0	0
" 31	" Bal. bro. for.		55	0	0						

5 *Dr.* WILLIAM ROBINSON. *Cr.* 5

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 1	To Balance for.	1	10	0	0						

BOUGHT LEDGER

1 *Dr.* RAYNOR & SONS. *Cr.* 1

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 21	To Cash	1	9	10	0	July 1	By Bal. transf.	1	10	0	0
" "	" Discount....	1		10	0						
						" 21	" Goods.......	1	15	0	0
						" 25	" "	1	45	0	0
									60	0	0

2 *Dr.* GOODWIN & CO. *Cr.* 2

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 6	To Cash	1	15	0	0	July 1	By Balance for.	1	15	15	0
" "	" Discount....	1		15	0						
						" "					
							" Goods.......	1	50	0	0

3 *Dr.* ROBERT M'CALL. *Cr.* 3

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 22	To Cash	1	5	0	0	July 1	By Balance for.	1	4	0	0
" 31	" Bal. car. for.		4	10	0	" 15	" Goods........	1	2	10	0
						" 22	" "	1	3	0	0
			9	10	0				9	10	0
						" 31	" Bal. bro. for.		4	10	0

4 *Dr.* RECKITT & Co. *Cr.* 4.

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 11	To Cash.........	1	2	0	0	July 1	By Balance for.	1	2	0	0
	" Bal. car. for.		2	10	0	" 11	" Goods.........	1	2	10	0
			4	10	0				4	10	0
						" 31	" Bal. bro. for.		2	10	0

5 *Dr.* HART & SONS. *Cr.* 5

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 29	To Cash	1	25	0	0	July 1	By Balance for.	1	25	0	0
" 31	"	1	30	0	0	" 29	" Goods	1	30	0	0
			55	0	0				55	0	0
						" 31	" Goods	1	50	0	0

6 *Dr.* GREEN & BLACK. *Cr.* 6

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
						July 1	By Bal. transf..	1	10	0	0

7 *Dr.* TINNED GOODS CO. LIMITED. *Cr.* 7

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
						July 1	By Balance for.	1	13	0	0
						" 15	" Goods	1	5	0	0
									18	0	0

8 *Dr.* PURE JAM MANUFACTURING CO. *Cr.* 8

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
						July 1	By Balance for.	1	10	0	0

9 *Dr.* GROCERS' SUPPLY ASSOCIATION *Cr.* 9

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 9	To Cash on a/c.	1	30	0	0	July 1	By Balance for.	1	31	15	0
" 31	" "	1	64	7	0	" 6	" Goods........	1	15	0	0
"	" Discount....	1	2	8	0	" 22	" "	1	50	0	0
			96	15	0				96	15	0
							" Goods........	1	20	0	0

10 *Dr.* GRAIN MILLING CO. *Cr.* 10

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
						July 29	By Goods	1	25	0	0

11 *Dr.* DISTRICT COUNCIL. *Cr.* 11

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 30	To Cash.........	1	4	0	0	July 19	By Rates........	1	4	0	0

12 *Dr.* DISTRICT GAS CO. *Cr.* 12

1907.		Fo.	£	s.	d.	1907.		Fo.	£	s.	d.
July 9	To Cash.........	1	1	9	0	July 1	By Gas, for.....	1	1	10	0
"	" Discount....	1	0	1	0						

PRIVATE LEDGER

Balance Sheet, 1st July, 1907

(Being Liabilities and Assets as taken over from Thomas Rice)

1 *Dr.* *Cr.* 1

1907.	Liabilities.	B. L.	£	s.	d.	1907.	Assets.	B. L.	£	s.	d.
July						July					
1	Sund. Cred., viz.:					1	Sundry Debtors (Bk. debts), viz.:				
	Raynor & Sons	1	10	0	0						
	Goodwin & Co.	2	15	15	0		Thomas Jones.	1	10	0	0
	R. M'Call	3	4	0	0		Mrs. Meek	2	5	0	0
	Reckitt & Co. .	4	2	0	0		Mrs. Black	3	25	0	0
	Hart & Sons ...	5	25	0	0		Owit & Co.. ...	4	50	0	0
	Green & Black	6	10	0	0		Mrs. Robinson	6	10	0	0
	Tinned Goods Co. Limited.	7	13	0	0				100	0	0
	Pure Jam Man. Co.	8	10	0	0		*Less* allowed by Thomas Rice to cover bad debts	PT. 7	25	0	0
	Grocers' Supply Association..	9	31	15	0						
	Gas Account...	12	1	10	0				75	0	0
	Rates (allowed)	PT. 9	2	0	0		Stock in Trade (*Cost pr.* £125)	4	100	0	0
			125	0	0		Fixtures, Fittings, Utensils, &c.	5	100	0	0
	Balance, being Purchase Price (Capital) for....	PT. 2	200	0	0		Goodwill	6	50	0	0
			325	0	0				325	0	0

2 *Dr.* Thomas Rice. *Cr.* 2

1907.		Fol.	£	s.	d.	1907.		Fol.	£	s.	d.
July						July					
1	To Cash	1	100	0	0	1	By Pur. Price of Business ...	1	200	0	0
30	" "	1	100	0	0						

3 *Dr.* John Smith—Capital Account. *Cr.* 3

1907.		Fol.	£	s.	d.	1907.		Fol.	£	s.	d.
July						July					
						1	By Cash	1	200	0	0

4 *Dr.* STOCK-IN-TRADE. *Cr.* 4

1907.		P.L.	£	s.	d.	1907.		P.L.	£	s.	d.
July 1	To Stock taken over at cost price............	1	125	0	0	July					
	Less allowed by Thos. Rice....	1	25	0	0						
		1	100	0	0						

5 *Dr.* FIXTURES, FITTINGS, &c. *Cr.* 5

1907.		P.L.	£	s.	d.	1907.		P.L.	£	s.	d.
July 1	To Purchase Pr.	1	100	0	0	July					

6 *Dr.* GOODWILL. *Cr.* 6

1907.		P.L.	£	s.	d.	1907.		P.L.	£	s.	d.
July 1	To Purchase Pr.	1	50	0	0	July					

7 *Dr.* BAD DEBTS. *Cr.* 7

1907.		PT.	£	s.	d.	1907.		PT.	£	s.	d.
July						July 1	By Amount allowed by T. Rice............	1	25	0	0

9 *Dr.* RENT, RATES, AND TAXES. *Cr.* 9

1907.		C. B.	£	s.	d.	1907.		PT.	£	s.	d.
July 30	To Cash (Rent)	1	2	10	0	July 1	By Amount allowed by T. Rice for quarter's Rates.....	1	2	0	0
"	" Rates as per Invoice Bk.	1	4	0	0						

10 *Dr.* PERFECT BANK LIMITED. *Cr.* **10**

1907. July		Fol.	£	s.	d.	1907. July		Fol.	£	s.	d.
1	To Cash	1	200	0	0	31	By Sundries as per Cash Book	1	373	17	0
4	" "	1	10	0	0	"	" Bal. car. for.		115	10	6
11	" "	1	55	0	0						
18	" "	1	50	0	0						
21	" "	1	24	7	6						
25	" "	1	50	0	0						
30	" "	1	100	0	0						
			489	7	6				489	7	6
31	" Bal. bro. for.		115	10	6						

11 *Dr.* INSURANCE. *Cr.* **11**

1907. July		Fol.	£	s.	d.	1907. July		Fol.	£	s.	d.
1	To Cash	1	0	5	0						

12 *Dr.* JOHN SMITH—DRAWINGS ACCOUNT. *Cr.* **12**

1907. July		Fol.	£	s.	d.	1907. July		Fol.	£	s.	d.
2	To Cash..........	1	5	0	0						
30	" Goods........	1	2	10	0						
			7	10	0						

13 *Dr.* SUNDRY EXPENSES. *Cr.* **13**

1907. July		Fol.	£	s.	d.	1907. July		Fol.	£	s.	d.
4	To Solicitor's Charges Cash	1	2	2	0						
31	" Cash Sundries	1	1	0	0						
			3	2	0						

14 *Dr.* SALES ACCOUNT. *Cr.* 14

1907. July		Fol.	£	s.	d.	1907. July		Fol.	£	s.	d.
						2	By Cash	1	20	0	0
						9	" "	1	50	0	0
						16	" "	1	50	0	0
						20	" "	1	55	0	0
						30	" "	1	60	0	0
						"	" Sundries as per Day Book	1	37	0	0
									272	0	0

15 *Dr.* MRS. SMITH—LOAN ACCOUNT. *Cr.* 15

1907. July		Fol.	£	s.	d.	1907. July		Fol.	£	s.	d.
						29	By Cash	1	100	0	0

16 *Dr.* PURCHASES ACCOUNT. *Cr.* 16

1907.		Fol.	£	s.	d.	1907.		Fol.	£	s.	d.
July 30	To Sundries as per Invoice Book	1	313	0	0						

17 *Dr.* DISCOUNTS. *Cr.* 17

1907.		Fol.	£	s.	d.	1907.		Fol.	£	s.	d.
July 30	To Sundries as per Cash Book	1	0	12	6	July 31	By Sundries as per Cash Book	1	3	14	0

JOHN SMITH

Trial Balance, 30th July, 1907

Fol.		Dr. £	Dr. s.	Dr. d.	Cr. £	Cr. s.	Cr. d.
	Sales Ledger						
1	Thomas Jones	5	0	0			
2	Mrs. Meek	4	0	0			
3	Mr. Black	17	10	0			
4	Owit & Co.	55	0	0			
5	Wm. Robinson	10	0	0			
		91	10	0			
	Bought Ledger						
1	Raynor & Sons				60	0	0
2	Goodwin & Co.				50	0	0
3	R. M'Call				4	10	0
4	Reckitt & Co.				2	10	0
5	Hart & Sons				50	0	0
6	Green & Black				10	0	0
7	Tinned Goods Co. Ltd.				18	0	0
8	Pure Jam Manufacturing Co.				10	0	0
9	Grocers' Supply Association				20	0	0
10	Grain Milling Co.				25	0	0
					250	0	0
	Private Ledger						
3	John Smith—Capital Account				200	0	0
4	Stock in Trade	100	0	0			
5	Fixtures, Fittings, &c.	100	0	0			
6	Goodwill	50	0	0			
7	Bad Debts				25	0	0
9	Rent, Rates, and Taxes	4	10	0			
10	Perfect Bank, Limited	115	10	6			
11	Insurance	0	5	0			
12	John Smith—Drawings Account ...	7	10	0			
13	Sundry Expenses	3	2	0			
14	Sales Account				272	0	0
15	Mrs. Smith—Loan Account				100	0	0
16	Purchases Accounts	313	0	0			
17	Discounts	0	12	6	3	14	0
	Cash Book Balance	64	14	0			
		850	14	0	850	14	0

JOHN SMITH

Dr. Profit and Loss Account for Month ending 30th July, 1907. *Cr.*

	£	s.	d.	£	s.	d.	%		£	s.	d.	£	s.	d.
To Goods Purchased...........	313	0	0					By Cash Sales	235	0	0			
Less Discounts received	3	14	0	309	6	0	93	" Credit Sales	37	0	0			
" Balance, being gross profit									272	0	0			
carried forward				22	17	0	7	*Less* Discounts allowed...		12	6	271	7	6
								" Stock on hand at end	160	15	6			
								Less Stock at beginning .	100	0	0	60	15	6
				332	3	0	100					332	3	0
To Expenses, viz.:														
Rent and Rates...........	4	10	0											
Insurance....................	0	5	0					By Balance, being gross profit						
Sundry Expenses	3	2	0	7	17	0	$2\frac{1}{2}$	brought forward				22	17	0
" Balance, being net profit...				15	0	0	$4\frac{1}{2}$							
				22	17	0	7					22	17	0

Balance Sheet, 30th July, 1907

Liabilities.	£	s.	d.	£	s.	d.	Assets.	£	s.	d.	£	s.	d.
Sundry Creditors				250	0	0	Sundry Debtors...............	91	10	0			
Mrs. Smith Loan Account....				100	0	0	*Deduct* Reserve for Bad						
John Smith Capital Account							Debts	25	0	0	66	10	0
(amount paid in) as at 1st							Stock in Trade				160	15	6
July, 1907	200	0	0				Fixtures, fittings, &c.........				100	0	0
Deduct Drawings	7	10	0				Goodwill				50	0	0
	192	10	0				Cash at Bank	115	10	6			
Add Profit for month	15	0	0	207	10	0	" in Hand	64	14	0	180	4	6
				557	10	0					557	10	0

For large businesses there are various methods (see *The Practical Grocer*) of analysing the accounts by dividing the stock into departments, so that important articles may be watched separately.

Receipts and Invoices.—It goes without saying that all receipts should be carefully filed. Some traders keep duplicate receipt books with counterfoils printed thus:—

....	Received of John Smith
Cash............... £.........	the sum of £.........
Discount........... £.........	
Returns............ £.........	Dis............
Ledger Folio......	Signed..............................

In paying an account the left-hand (counterfoil) is filled up with particulars and numbered thus:—

Blank & Co.			(1529)	Received of John Smith	(1529)
Cash...............	£5	0	0	the sum of £.........	
Discount.........	0	2	6		
Returns...........	0	10	0	Dis............	
Ledger Folio (2).				Signed..............................	

The right-hand portion, numbered to correspond with the counterfoil, is torn off and affixed to the statement, and this when returned with the signature of Messrs. Blank and Co. is filed.

A simple method of filing invoices is to use a case of cards, the size of the average invoice, two cards for each month. Upon one card paste a calendar for the month, with a piece of red tape stuck beneath it. This card is placed face downward in the box or case. As invoices arrive and are dealt with, blue-pencil the date and number (consecutive) in the top right-hand corner of each, and place the invoice face downward in the box on the top of the card, or the preceding invoice already there. At the end of the month add the second card, tie up the bundle with the tape, and remove the packet—the month's invoices complete—to a shelf as if it were a book. Receipts may be treated in the same manner.

The Bank.—The trader will as soon as possible take a sum of money—cheques, coin, or any other form—to a bank and open a current account by depositing this cash with the banker, who in return will hand him a book of blank cheques and a Pass Book. This pass book is for the purpose of entering, on the left-hand pages, all moneys paid in to the bank, and on the right-hand pages all cheques drawn by the owner of the account. The blank cheques are commonly in a form similar to this:—

London, ... 190

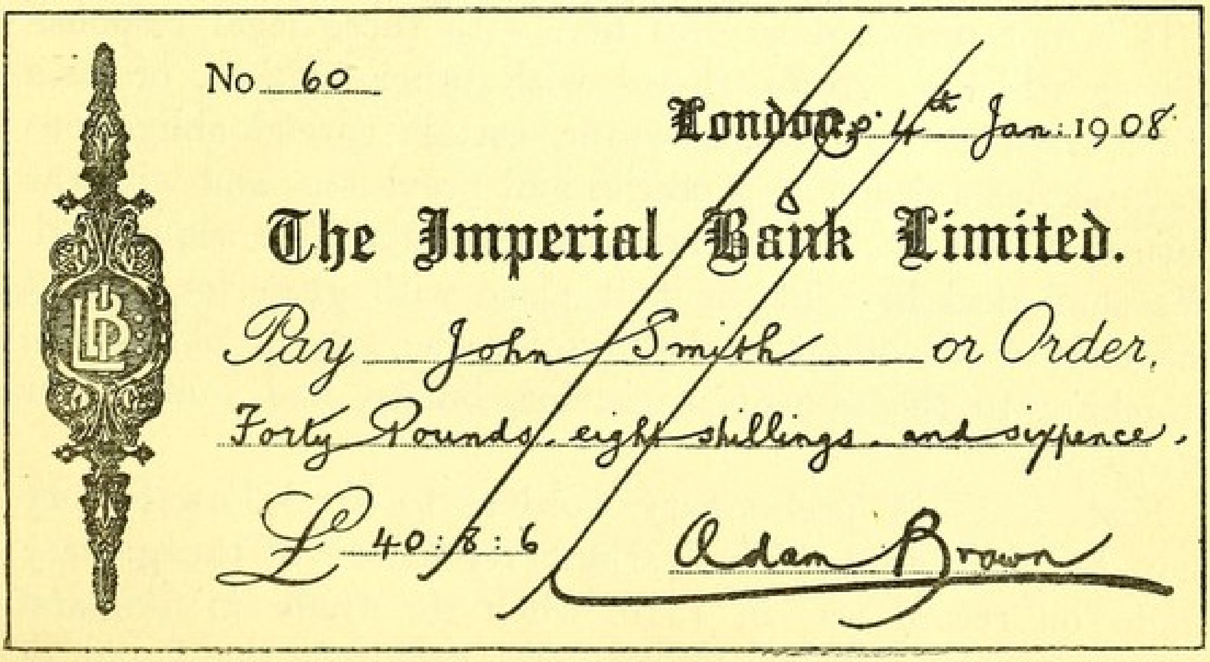
Consolidated Bank, Exchange Street, E.C.

Pay .... or Order

....

£ : : ....

To fill up one of these cheques the owner of the cheque book writes after "London" the date, after "Pay" the name of the person he wishes to pay, after "Order" the amount he wishes to pay, in words; after "£" the sum he wishes to pay, in figures; and he finally writes his own signature in the right-hand corner at the bottom. Suppose he makes out the cheque to John Smith, the cheque thus filled up is an "open cheque" payable to John Smith or any other person John Smith may appoint. If our trader wishes his cheque to be paid to any person who presents it to the bank, he will cross out the word "order" and write "bearer". If he wishes to send the cheque by post, and to prevent the money getting into the hands of the wrong person, the cheque may be crossed by drawing two straight lines across it, thus:—



No 60

London, 4th Jan: 1908

The Imperial Bank Limited.

Pay John Smith or Order,

Forty Pounds, eight shillings and sixpence.

£ 40:8:6 Adam Brown

This makes the cheque a "crossed cheque", and it can only be paid through a banker; that is, if John Smith has not a banking account he must get someone who has to cash it for him—a safeguard to some small extent against the cheque being cashed by the wrong person. If Mr. Brown knows that John Smith has a banking account he may make the matter more secure by writing within the two cross lines the name of Smith's bank, when the cheque can only be paid through that bank. Another way of effecting security is to write within the cross lines

Not negotiable
Account payee

which means that Mr. Smith must not transfer the cheque to any other person, but pay it into his bank, where it will be placed to the account of himself, the "payee".

Cheques which the trader himself receives should be crossed by him (if not already crossed) and paid into his bank as early as possible.

Chapter XXI.—LAW

It is not proposed to deal here with those legal responsibilities which a grocer shares with other citizens, or with other traders. He has, however, certain special obligations and risks as a dealer in groceries and provisions, and with the nature of these it is very necessary he should be acquainted. We shall deal here in the first place with groceries, and at the end of the chapter shall notice the special obligations attaching to the sale of margarine, butter, and some other provisions.

Historical.—A preliminary word as to Food Law history may be of interest. The earliest regulation of the grocery trade on record was in 1316, when the trade in England was strictly supervised by its own "guild"—the Guild of

Pepperers or Spicers. This Guild in the year mentioned issued the following order:—

"'No one of the trade or other person in his name for him, shall mix any manner of wares—that is to say, shall put old things with new, or new things with old—by reason whereof the good thing may be impaired by the old . . . nor yet things of one price or of one sort, with other things of another sort . . .' with regulations against the altering of bales so that the outside appeared better than the bulk inside."

Without tracing the subject in the interval, we may note that the adulteration of food reached a scandalous pitch in the earlier part of the nineteenth century, and in the earlier 'fifties a series of reports in the London *Lancet*, consisting largely of condemnatory analyses of samples, with the names and full addresses of the vendors, attracted so much attention that Parliament appointed a Select Committee on the Adulteration of Food. This Committee's report led to the first general Act against Food Adulteration, passed in 1860. Being of a permissive nature, it failed in its object, but subsequently Acts were passed in 1872 and 1875, which, with the subsidiary Acts of 1879 and 1899, are still in force. Acts on similar lines have been passed by the United States, the British Colonies, and the different countries of Europe. In these are generally forbidden—

The sale of any article of food, drink, or medicine containing any ingredient injurious to health.

The sale of any adulterated food, drink, or drug.

Wilfully mixing with any article of food or drink any ingredient or poisonous ingredient to adulterate the same for sale.

Wilfully mixing any ingredient with any drug to adulterate the same for sale.

The sale of any article of food, drink, or any drug, knowing the same to have been mixed with other substances fraudulently to increase its weight or bulk, unless such admixture be declared at the time of sale.

Licenses.—No license is required for the sale of groceries in the United Kingdom, so far as shops are concerned. With regard to hawking, the British law is that a license is not required for selling *victuals* (the other exceptions are fish, fruit, and coal). Tea, for instance, not being regarded as a victual, cannot be sold from a van without a hawker's license. Baking-powder has also been held by the courts not to be a food.

Sale of Food Acts.—For the grocer in the United Kingdom the important laws are the group comprising the Sale of Food and Drugs Acts, 1875, 1879, and 1899 (the special Act of 1887 relates to margarine), and the Butter and Margarine Act of 1907. The word "food" is defined in these Acts as including, for their purpose, "every article used for food or drink by man, other than drugs or water, and any article which ordinarily enters into or is used in the composition or preparation of human food, and shall also include flavouring matters and condiments". This very wide definition brings under the Acts practically everything a grocer sells, unless it be aerated waters; and, supplemented as these Acts are by the Merchandise Marks Act (which see below), there is very little of a grocer's business that is not under efficient legal control in the public interest.

The following (for clearness we omit the penalties) are the sections of the Food and Drugs Act of 1875, which explain what is forbidden:—

"3. No person shall mix, colour, stain, or powder, or order or permit any other person to mix, colour, stain, or powder any article of food with any ingredient or material *so as to render the article injurious to health*, with intent that the same may be sold in that state, and no person shall sell any such article so mixed, coloured, stained, or powdered. . . .

"4. No person shall, except for the purpose of compounding as hereinafter described, mix, colour, stain, or powder, or order or permit any other person to mix, colour, stain, or powder, any drug with any ingredient or material *so as to affect injuriously the quality or potency of such drug*, with intent that the same may be sold in that state, and no person shall sell any such drug so mixed, coloured, stained, or powdered. . . .

"5. Provided that no person shall be liable to be convicted under either of the two last foregoing sections of this Act in respect of the sale of any article of food, or of any drug, if he shows to the satisfaction of the justice or court before whom he is charged that he did not know of the article of food or drug sold by him being so mixed, coloured, stained, or powdered, as in either of those sections mentioned, and that he could not with reasonable diligence have obtained that knowledge.

"6. No person shall sell to the prejudice of the purchaser any article of food or any drug which is *not of the nature, substance, and quality of the article demanded* by such purchaser. . . . Provided that an offence shall not be deemed to be committed under this section in the following cases; that is to say—

"(1) Where any matter or ingredient not injurious to health has been added to the food or drug because the same is required for the production or preparation thereof as an article of commerce, in a state fit for carriage or consumption and not fraudulently to increase the bulk, weight, or measure of the food or drug, or conceal the inferior quality thereof;

"(2) Where the drug or food is a proprietary medicine, or is the subject of a patent in force, and is supplied in the state required by the specification of the patent;

"(3) Where the food or drug is compounded as in this Act mentioned;

"(4) Where the food or drug is unavoidably mixed with some extraneous matter in the process of collection or preparation.

"7. No person shall sell any compound article of food or compounded drug which is not composed of ingredients in accordance with the demand of the purchaser [applies mainly to dispensing chemists].

"8. Provided that no person shall be guilty of any such offence as aforesaid in respect of the sale of an article of food or a drug mixed with any matter or ingredient not injurious to health, and not intended fraudulently to increase its bulk, weight, or measure, or conceal its inferior quality, *if at the time of delivering such article or drug he shall supply to the person receiving the same a notice, by a label* distinctly and legibly written or printed on or with the article or drug, to the effect *that the same is mixed.* [This label is further dealt with in the Act of 1899; see *post.*]

"9. No person shall with the intent that the same may be sold in its altered state without notice, abstract from an article of food any part of it so as *to affect injuriously its quality, substance, or nature,* and no person shall sell any article so altered without making disclosure of the alteration. . . .

"[Section 27 adds: 'And every person who shall wilfully give a label with any article sold by him which shall falsely describe the article sold, shall be guilty of an offence under this Act and be liable', &c.]"

The foregoing enactments of 1875 have been extended by the subsequent Acts. The Act of 1879 says:—

"2. In any prosecution under the provisions of the principal Act for selling to the prejudice of the purchaser any article of food or any drug which is not of the nature, substance, and quality of the article demanded by such purchaser, it shall be no defence to any such prosecution to allege that the purchaser, having bought only for analysis, was not prejudiced by such sale. Neither shall it be a good defence to prove that the article of food or drug in question, though defective in nature, or in substance, or in quality, was not defective in all three respects."

"Mixed" Goods.—It will be seen that the most important of these sections is No. 6. The penalty for transgressing this section is for a first offence £20, and the Act of 1899 increases this penalty for second or third offences. With regard to the exceptions allowed, the questions that usually arise are whether the matter or ingredient added to an article is (1) injurious to health; if not (2), is it commercially necessary, or (3) is it intended fraudulently to increase the bulk. Then, if it is not injurious to health, nor intended fraudulently to increase the bulk, the admixture (say of chicory with coffee) is rendered legal by Section 8, provided the article is labelled distinctly and legibly to the effect that it is *mixed.* What is a "distinct and legible" label for such a mixture is defined by the Act of 1899, which says:—

"12. The label referred to in Section 8 of the Sale of Food and Drugs Act, 1875, shall not be deemed to be distinctly and legibly written or printed within the meaning of that section unless it is so written or printed that the notice of mixture given by the label is not obscured by other matter on the label. Provided that nothing in this enactment shall hinder or affect the use of any registered trade-mark, or of any label which has been continuously in use for at least seven years before the commencement of this Act; but the Comptroller-General of Patents, Designs, and Trade-Marks shall not register any trade-mark purporting to describe a mixture unless it complies with the requirements of this enactment."

The question of whether addition has been made "fraudulently to increase the bulk" appears to be within the discretion of magistrates; but in the case of Otter *v.* Edgley, in 1893, where magistrates convicted a defendant for selling as "French coffee" a mixture of 40 per cent coffee and 60 per cent chicory, the judges held on appeal that no offence had been committed, as French coffee was well known not to be pure coffee, and it had been duly labelled. In another case, Attfield *v.* Taylor, the court held that when Epps's cocoa had been asked for and sold, the packet being labelled "Prepared Cocoa", with the ingredients stated, no offence had been committed.

The trader has therefore the protection of the law in selling "mixed" goods if he makes to the purchaser a proper disclosure, it having been held (Sandys *v.* Small, 1878) that "where the seller of an article brings to the purchaser's knowledge the fact that the article sold to him is not of the nature, substance, or quality of the article he demands, the sale is not to the prejudice of the purchaser"; and if a proper notice is given with the article sold that such article is adulterated, that notice is a good defence to any prosecution under Sections 6, 7, or 9 of the Act, unless it is proved that the article was adulterated for the purpose of fraudulently increasing its bulk. But suppose it has been so adulterated? In that case it will be well for the retailer if he can produce a

Warranty from the Supplier.—This is provided for by the following section of the Act of 1875:—

"25. If the defendant in any prosecution under this Act prove to the satisfaction of the justices or court that he had purchased the article in question as the same in nature, substance, and quality as that demanded of him by the prosecutor, and with a *written* warranty to that effect, that he had no reason to believe at the time when he sold it that the article was otherwise, and that he sold it in the same state as when he purchased it, he shall be discharged from the prosecution, but shall be liable to pay the costs incurred by the prosecutor, unless he shall have given due notice to him that he will rely on the above defence."

The Act of 1899 says further:—

"20.—(1) A warranty or invoice shall not be available as a defence to any proceeding under the Sale of Food and Drugs Act unless the defendant has, within seven days after service of the summons, sent to the purchaser a copy of such warranty or invoice, with a written notice that he intends to rely on the warranty or invoice, and specifying the name and address of the person from whom he received it, and has also sent a like notice of his intention to such person. (2) The person by whom such warranty or invoice is alleged to have been given shall be entitled to appear at the hearing and to give evidence, and the court may, if it thinks fit, adjourn the hearing to enable him to do so. (3) A warranty or invoice given by a person resident *outside the United Kingdom* shall not be available as a defence to any proceeding under the Sale of Food and Drugs Acts, unless the defendant proves that he had taken reasonable steps to ascertain and did in fact believe in the accuracy of the statement contained in the warranty or invoice. (4) Where the defendant is a servant of the person who purchased the article under a warranty or invoice he shall, subject to the provisions of this section, be entitled to rely on Section 25 of the Sale of Food and Drugs Act, 1875, and Section 7 of the Margarine Act, 1887, in the same way as his employer or master would have been entitled to do if he had been the defendant, provided that the servant further proves that he had no reason to believe that the article was otherwise than that demanded by the prosecutor."

The next question with which the retailer has to concern himself then, in view of the importance of having a proper and sufficient warranty, is—

What is a Warranty?—In the case of Hawkins *v.* Williams (1895) an invoice on which were written the words "Guaranteed pure", with the seller's initials, was held to be a warranty. Mr. Justice Wright, in a case which came before him, observed that "what is wanted is some express individual representation from the seller to the buyer, forming part of the contract itself, and in writing". Lord Coleridge, C.J., in Harris *v.* May, said: "A person wishing to make himself perfectly safe in respect of the sale of a specific article, must show that he had a proper specific warranty in writing in respect of that article from the vendor".

Therefore, on all invoices of articles respecting which any question of purity may arise, the retailer's safeguard is to see that the words appear: "All goods named in this invoice are guaranteed genuine", followed by the signature or initials of the firm supplying the same; and the invoice must name the goods properly, such as "Demerara sugar", "white pepper" (not merely "white"), and so on. Note carefully, also, what the sections above say as to selling in the same condition and belief of purity; also, when summoned, the necessity of notifying the giver of the warranty, and sending to the prosecutor within seven days a written notice with a copy of the warranty and the name and address of the giver.

The Acts provide against forged and **false warranties**, substitution, and so on:

"27. Any person who shall forge, or shall utter, knowing it to be forged for the purposes of this Act, any certificate or any writing purporting to contain a warranty, shall be guilty of a misdemeanour and be punishable on conviction by imprisonment for a term of not exceeding two years, with hard labour;

"Every person who shall wilfully apply to an article of food, or a drug, in any proceedings under this Act, a certificate or warranty given in relation to any other article, or drug, shall be guilty of an offence under this Act, and be liable to a penalty not exceeding twenty pounds;

"And every person who shall wilfully give a label with any article sold by him which shall falsely describe the article sold shall be guilty of an offence under this Act, and be liable to a penalty not exceeding twenty pounds;"

whilst the Act of 1899 adds, in the sixth sub-section of Section 20:

"(6.) Every person who, in respect of an article of food or drug sold by him as principal or agent, gives to the purchaser a false warranty in writing, shall be liable on summary conviction, for the first offence, to a fine not exceeding twenty pounds; for the second offence, to a fine not exceeding fifty pounds; and for any subsequent offence to a fine not exceeding one hundred pounds, unless he proves to the satisfaction of the court that when he gave the warranty he had reason to believe that the statements or descriptions contained therein were true".

If a trader is convicted under the Act of having sold an adulterated article, and can prove that he bought that article as what he sold it for, and did not alter its condition, he has his remedy against the person (wholesale dealer, for example) who supplied him, and can recover from him the fine paid, costs, and damages. This is provided for by Section 28 of the Act of 1875.

Sampling for Analysis.—Retailers have to be careful not to refuse to sell to an inspector, and not wilfully to obstruct or impede or try to bribe any inspector or other officer in the course of his duties under the Sale of Food and Drugs Acts. There is a protective point in a clause in the Act as to selling samples, which states that "where any article of food or drug is exposed for sale in an unopened tin or packet duly labelled, no person shall be required to sell it except in the unopened tin or packet in which it is contained". When an inspector purchases a sample for analysis he is required by law to notify to the seller his intention to have the sample analysed by the public analyst. He is also required by law to divide the article into three parts, "to be then and there separated, and each part to be marked and sealed or fastened up in such manner as its nature will permit". If *asked to do so*, he must also deliver one of the three parts to the seller or his agent.

The retailer or his assistant should therefore be very careful to notice what an inspector says and does when this rather unpleasant process of sampling takes place; and as a rule his best course will be, if a grocers' association exists in his town, to communicate at once with the secretary.

The **assistant** may be prosecuted under Section 6 of the Act of 1875 if the prosecutor sees fit. On the other hand, the Act of 1899 gives the assistant the right to fall back upon a warranty in the same way as his employer. In some shops a summary of the Acts is exhibited. But as the employer is himself responsible he cannot be too strict in seeing that those he employs carry out the law, or too careful that they understand it; and he should, moreover, assure himself that the general system pursued in his shop facilitates the proper observance.

Merchandise Marks Act.—This British Act of 1887, amended in 1891, penalizes any person who forges or falsely applies a trade-mark, or *applies any false description to goods.* This has been held to cover not only such a false description as "Wiltshire" applied to Canadian bacon, but the case of describing on a packet or an invoice a pound of tea and paper as "a pound of tea". In other words, if the *wrapper* is weighed in so that tea and wrapper weigh but a pound, there must be less than a pound of tea, and to describe it as a "pound of tea" is punishable by this Act.

On this point of **weighing paper with goods**, the Weights and Measures Act is also sometimes invoked against grocers in the United Kingdom. It has been held to be legal to sell sugar weighed in paper, provided the purchaser does not object and does not provide anything in which to wrap it. Also it has been held legal to sell tea weighing a certain weight with the package, providing the customer is told what she is getting. But note that in weighing up goods it is illegal to make your scales unjust by altering them even for convenience, *e.g.* you must not put a bag under the scale in weighing up tea or sugar. The Federation of Grocers' Association of the United Kingdom issued, in 1905, the following advice to its members:—

"1. If a metal disc is attached to the scale, or any such means is used which has the effect of making the scale weigh unjustly, an offence is committed under Section 25 of the Weights and Measures Act, 1878.

"2. The weighing of paper with goods, providing the paper with the goods is put upon the goods pan of the scale, is not an offence under Section 26 of the Act.

"3. If goods are sold under a written or printed description that they represent a certain weight, and the weight of the article sold (exclusive of the wrapper) is less than that weight, an offence might be committed under the Merchandise Marks Act. Thus, when a half-pound of tea is sold in a wrapper which describes it as a half-pound of tea, but the actual amount of tea contained in the wrapper is less than a half-pound, an offence may be held to be committed under the Act. It is therefore important that when a statement as to the weight of goods is given upon the wrapper, or upon any invoice accompanying the goods, a statement should be made that the weight of the wrapper is included.

"Tea wrappers should bear the additional words: 'This packet is sold as gross weight, including wrapper'; and where invoices are used it is desirable to have a printed statement: 'All goods are sold gross weight, including the wrapper'."

Importance of Obtaining Warranties.—As goods may conceivably be *pure* in the sense of being unadulterated, and yet not be *genuine*—for instance, milk may be deprived of its cream without anything being added—the word "genuine" is preferred to "pure" in warranties. (See "**What is a Warranty?**" *ante.*) In practice it will be found that few firms give warranties unless specially asked for them, but to obtain them is indispensable for the retailer's own protection in selling many articles. The law 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 genuine within the meaning of the Food and Drugs Act, 1875, and all acts amending same".

Precautions in Buying Groceries.—If purchased ready ground, either loose or in tins, *coffee* sold as coffee, and not as coffee and chicory, should be properly guaranteed genuine.

So also should *cocoa*. *Syrup* should be guaranteed free from glucose *Sugar* should be warranted cane if cane is required. *Pepper* and *spices* are often sophisticated, and a specific warranty with every invoice is desirable. *Ginger* is often sold "spent", being, like other spices, sometimes robbed of its strength, so that though it may be "pure", it is not genuine ginger or spice. *Baking powder* must not contain alum. *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, caster sugar, oatmeal, corn flour, arrowroot, chicory, honey, borax, egg powder, 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. All drugs such as *cream of tartar, bicarbonate of soda*, &c., should be warranted genuine within the requirements of the British Pharmacopœia ("B.P."), or else "commercially pure", as the case demands; wholesalers frequently refuse to guarantee such goods, but as they are common subjects of prosecution, retailers are bound to insist upon means of protecting themselves.

Precautions in Selling Groceries.—In selling *mixed goods* it is important to see that they are duly labelled as required by the Sale of Food and Drugs Acts already explained in this chapter. If possible a verbal declaration should also be given. When *coffee* is asked for at a price below that of pure coffee, inform the customer what is the lowest price of pure coffee and the price of a mixture; and if the latter be sold, take care that the label, "This is a mixture of coffee and chicory", &c., is not covered up. Take the same precautions regarding the sale of *cocoa and chocolate powder, mustard condiment*, and similar goods. *Prepared cocoa* should be sold labelled "Chocolate powder—This is sold as a mixture". If the goods are usually sold in a tin or package, do not open a tin for an inspector.

After serving a mixed article, be careful not to return the surplus from scales or scoop to a bin of the pure article. In *sugar* note that "yellow crystals" must be sold as such and not as "Demerara", and that dyed beet crystals must not be passed off as cane. Sugar cannot be safely sold as "Demerara" at all unless it is guaranteed by the wholesale merchant; it is usually safer to sell this class of cane sugar as "West Indian". Customers not infrequently mean pearl tapioca when they ask for *sago;* nevertheless a grocer must not sell *tapioca* as sago. *Golden syrup* being frequently found to contain glucose, the London Grocers' Association in 1899 advised that all such syrup should be sold as "Prepared golden syrup, manufactured from glucose and sugar". *Pepper* was the subject of prosecutions in 1904 respecting undue proportion of husk, and to traders who did not care to take risks, the British Federation of Grocers' Associations recommended the sale merely of "ground pepper", without specifying "black" or "white". The great point to observe is that customers must not be misled into thinking they are getting something —no matter what it may be—which they are not. No honest trader would be a party to deception—even if the customer herself desired it, as customers have sometimes been known to do!—and for the honest trader the law has no terrors. Its stringency, though perhaps occasionally inconvenient to himself, is in reality a blessing, since it saves him from what is the honest man's greatest bugbear, dishonest competition.

The **Sale of Provisions** in the United Kingdom demands an acquaintance with certain special obligations imposed upon dealers in butter, cream, condensed milk, margarine, and cheese, &c. The trader is recommended to study the Acts in detail, and to follow the legal decisions interpreting them, as reviewed from year to year in the recognized diaries issued by the trade newspapers. With regard to **Butter and Margarine**, it may be mentioned briefly that the Margarine Act, 1887, defines "butter" as "the substance usually known as butter, made exclusively from milk or cream, or both, with or without salt or other preservative, and with or without the addition of colouring matter". The Act of 1899 gave to the Board of Agriculture and Fisheries power to make regulations "for determining what deficiency in any of the normal constituents of genuine milk, cream, butter, or cheese, or what addition of extraneous matter or proportion of water, in any sample of milk (including condensed milk), cream, butter, or cheese, shall, for the purposes of the Sale of Food and Drugs Acts, raise a presumption, until the contrary is proved, that the milk, cream, butter, or cheese is not genuine or is injurious to health". The Butter and Margarine Act of 1907 extended this power of making regulations, naming "milk-solids" specially. This Act also gave power to the Local Government Board to make regulations as to the use, or prohibition, of preservatives in butter, margarine, or milk-blended butter. Under one of these regulations butter in the United Kingdom is not allowed to contain more than 16 per cent of water. "Margarine" was defined by the Act of 1907 as meaning—

"any article of food, whether mixed with butter or not, which resembles butter and is not milk-blended butter".

Any such article is only permitted to be sold under special conditions. One of these is that no margarine shall contain more than 10 per cent of butter-fat. Another is that every *package*, whether open or closed, shall be branded or durably marked on the top, bottom, and sides with the word "margarine" in printed capital letters not less than $\frac{3}{4}$ in. square; and if such margarine be exposed for sale by retail, each *parcel* of it so exposed shall bear a label, clearly visible to the purchaser, marked "margarine" in printed capital letters not less than $1\frac{1}{2}$ in. square; and when margarine is retailed it must be handed to the purchaser in a paper wrapper on which the word "margarine" is printed in capital block letters not less than $\frac{1}{2}$ in. long and distinctly legible. The Act of 1899 goes on to say, "and no other printed matter shall appear on the wrapper". The Act of 1907 contains the following further clause on the subject:—

"8. If in any wrapper enclosing margarine, or on any package containing margarine, or on any label attached to a parcel of margarine, or in any advertisement or invoice of margarine a person dealing in margarine describes it by any name other than either "margarine", or a name combining the word "margarine" with a fancy or other descriptive name approved by the Board of Agriculture and Fisheries and printed in type not larger than and in the same colour as the word "margarine", he shall be guilty of an offence under this Act."

Milk-blended butter is a new article first legally recognized by the Act of 1907, which makes various regulations concerning it and its manufacture. It may contain as much as 24 per cent of water (or 8 per cent more than butter), but must be sold—

"under such name or names as may be approved by the Board of Agriculture and Fisheries, and under the conditions applicable to the sale or description of margarine, with the substitution of an approved name for the word "margarine", and with this modification, that, in any case where, in order to comply with those conditions, the article is delivered to the purchaser in a wrapper, there shall, in addition to the approved name, be printed on the wrapper in such manner as the Board approve such description of the article, setting out the percentage of moisture or water contained therein, as may be approved by the Board".

Cheese is defined by the Act of 1899 as the substance usually known as cheese, containing no fat derived otherwise than from milk; and **Margarine Cheese** is defined as any substance, whether compound or otherwise, which is prepared in imitation of cheese, and which contains fat not derived from milk. Margarine cheese has to be sold under conditions similar to those which apply to the sale of margarine, as above explained.

Condensed milk is also the subject of special regulations under these Acts, it being laid down that every tin or other receptacle containing condensed, separated, or skimmed milk shall bear a label, clearly visible to the purchaser, on which the words "machine-skimmed milk" or "skimmed milk", as the case may require, are printed in large and legible type.

Various other laws—such as those dealing with shop hours, the employment of children or "young persons", the compensation of injured workpeople, the prevention of corruption and bribery, the removal of trade refuse, the public health acts, and so on—demand the attention of grocers in the United Kingdom, but as they apply to all traders alike, and not to grocers exclusively, they are not here dealt with. Thanks to the extension of the movement for trade organization, and to the existence of the carefully edited trade papers, a retail trader is usually able to inform himself upon these points without any great difficulty; and he will of course give heed also to any local by-laws which apply to his own particular town or district. By enabling their members to inform themselves and keep themselves abreast of all such matters concerning their trade, the various trade associations have undoubtedly been of the greatest possible service, not only in saving traders from the pitfalls of complicated laws, but in increasing their efficiency as servants of the public.

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