MANUFACTURE OF CONFECTIONERY

A handbook on the manufacture of lozenges, drops, toffees, caramels, bonbons, dragees, candies and medicinal confections with a chapter on the Manufacture of various Indian confections.

WITH 20 ILLUSTRATIONS

BY
AN INDUSTRIALIST.

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INTRODUCTION

THE use of confections among mankind can be traced to very ancient times and even to this day their hold on the people is stronger than ever. These take a great part in the dietary of the Indians and Europeans alike. No dinner is complete without some form of confectionery. It is however curious to note that the manufacture of confection has taken up quite distinct lines of development in India and Europe. In India attempts have been made to prepare cheapest confections made from molasses (*gur*) like *batasa* or *gur patali* (molasses-cake) as well as the most delicious preparations like *sandesh*, *rasagollah*, *mithai*, etc. from sugar, *chhana*, *khoa*, *ghee*, flour, coconut, etc. On the other hand in Europe the most common forms of confections are made from sugar in combination with various ingredients such as flavours, milk, butter, cocoa butter, almonds, pistachios, etc.

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ORIGIN OF CONFECTIONS.

The origin of confections is shrouded in mystery. One thing, however, stands out pre-eminent in all these speculations. The basis of all confections is decidedly sugar which may be either in the raw state, or adequately refined and powdered to a finely divided condition. Raw molasses, in like manner, have also stood as the starting ground in making candies. From very early times when men chanced to manufacture sugar and molasses, their attention was attracted towards the intense sweetness of sugar. They were oppressed by the monotonous taste of it. They were on the lookout

to mellow down the sharp sweetness of sugar by suitable processes. The earliest confections seemed to be modifications of raw molasses or sugar. The first improvement to satisfy the growingly fastidious taste, consisted in boiling the sugar to various degrees of consistency and cooling it down to a uniform mass which could be cut into smaller pieces while still lukewarm. A modification of the process consisted in pulling the plastic mass till a satiny appearance was in evidence and then to cut it into suitable pieces.

Addition of various flavouring and colouring agents then suggested to the manufacturers. These definitely improved the taste of the preparation but they did not rest contented. To further improve the quality and taste of the products incorporation of milk, butter, cocoa butter, *chhana*, etc. into the mass of the boiled sugar became necessary. This not only appealed to popular taste but also added nourishment to the articles. With time various fruit pastes suitably sweetened with sugar came to be used as interiors or fillers.

RANGE OF ARTICLES.

The subject of confectionery encompasses a wide range of articles. The forms which foreign confections take are bonbons, caramels, lozenges, coffee, nougat, chocolate, jams, jellies, etc., etc. The diversity will be made home to a greater degree when a consideration is made of the fact that some of these particular confections may be prepared with various appropriate flavours and in different shades of colours. Indian confections include *Sandesh, Rasagolla, Khaja, Gaja, Sitabhog, Darbesh, Jilapi, Chandrapuli, Hulwa*, etc., etc.

With progress of chemical sciences, sugar boiling has now been studied threadbare and invention of synthetic flavours has lent a new colour to the industry.

At the present day the manufacture of confection of all shades of flavours and for all purposes has been brought to more exactitude than ever and chemists are still working to find out the ideal conditions for preparing the best and most delicious confections.

VARIETIES OF CONFECTIONS.

A broad classification of the confections with the special properties and characteristics follows :—

Bonbons.—These are delicious transparent preparations having a beautifully coloured and luscious centre of fruit. Some of these are simply glazed or varnished for the sake of decoration while others are crystallised in sugar or coated with chocolate, sugar fondant, or coffee fondant. The varnished varieties are generally shaped in the form of cubes but other shapes are also met with. These also go by the name of trocaderos. The coated varieties are of fastidious shapes and all possible colourings. They also carry curls or distinct designs imprinted on the surface. These are sometimes decorated with colours and pipings which when harmoniously blended make excellent imitations of fruits. These are French names of sugar plums.

Caramels.—These are confections composed of cream or condensed milk, butter, sugar and glucose and are variously coloured and flavoured. The cheap varieties are made of fat or coconut fat instead of butter. The most popular flavours are chocolate, vanilla, coffee. Some of the caramels have fresh milk flavour. The caramels are generally soft in consistency and when drying up they are considered to be spoilt. Good caramels do not stick to the teeth.

Candy.—These are light and brilliant confections made by pulling sugar syrup boiled to a thick consistency. These are often known as "satin" goods on

account of their satiny colour. Candies are also made hollow with some strips of clear sugar outside. These are known as *Kadma.*

Comfits.—These usually contain a caraway or some other small seed. The seeds are thrown into a copper pan with a mixture of syrup and starch; heat is applied underneath and the pan is rolled about in such a way that each seed takes its own coating of mixture to the thickness of fried rice.

Conserves.—In confectionery conserves have a quite different meaning from that used in medicines. In pharmacopeia conserves mean preserved herbs, fruits, drugs, etc. beaten with powdered sugar to the consistence of a stiff paste without impairing their properties and characteristics. In confectionery trade conserves are made by casting boiled syrup in plaster moulds representing fish, fruit, animals, chariot, etc. These are hollow in shape and are not only light but also fine and closely grained. These can be coloured and painted as necessary. In India these are commonly known as *maths.*

Chocolate.—It has a peculiar characteristic taste appealing to the youngsters and it dissolves in the mouth. It is so soft that no gritty feel is obtained on the palate and teeth. It is a paste from the roasted seeds of cocao or cocoa. Strictly speaking, the term chocolate is applicable to all genuine preparations of cocoa but it is now generally used to distinguish those which contain sugar and flavouring substances. Chocolate without the addition of flavouring agents are known in the trade as Plain Chocolate. The Spaniards flavour it with vanilla, cloves, and cinnamon, and frequently scent it with musk and ambergris. With these additions it is termed Spanish Chocolate. In general, they add too large a quantity of the last four articles.

The Parisians, on the contrary, use little flavouring, and that principally vanilla. They employ the best kinds of cocoa, and add a considerable quantity of refined sugar. So prepared, it is called French Chocolate.

Drops.—It is another confection having sugar as the principal basis. It differs from lozenges chiefly in the ingredients being combined by the aid of heat. Occasionally they are medicated and moulded by special machines.

Dragees.—These are preparations of blanched almond, pistachio, aniseed, etc. which have been dried, gummed and crystallised and finally polished. Caraway dragees which are very popular among children are added by giving coatings of sugar on caraway seeds and are also known as comfits.

Fondant.—It is a white creamy mass of stiff sugary paste which forms the basis in the manufacture of bonbons and various confectionery. It contains within its mass a quantity of cutting materials which prevent granulation of the sugar syrup.

Jams and *Jellies.*—These are delicious preparations of fruit cooked in sugar syrup. The fruits which have got pectic acid in their composition are liable to jellify and preserves made from them are known as jellies. These are transparent or translucent substances which while warm are fluid or semi-fluid but become stiff on cooling. The jellies owe their flavour, colour and taste to the juice of the fruit and cane sugar. The property of forming the gel is due to the pectin derived from the fruits. It may be noted that the pectin percentage in fruits is highest just before the fruit becomes fully ripe. When equal quantities of fruit juice and sugar are heated together, the pectin gelatinizes the mass on cooling. Jams only differ from jellies in-

asmuch as the former have not got a homogeneous mass as the latter. The name jam is generally applied to fruits preserved by cooking with sugar, without retaining the shape of the fruit. In making jams, slices of fruits are softened and boiled in sugar while in making jellies pulp of fruits is first of all extracted after softening them by heating, if necessary, and is then made into preserves. They form by themselves a separate line of manufacture and hence do not fall properly within the scope of the book. Full details of manufacturing these are given in Indian Pickles, Chutneys and Morabbas, a sister publication.

Lozenges are made of sugar flavoured with banana, lemon, pineapple, peppermint or other essences and coloured to taste. The mixture is worked like a dough without the aid of heat, rolled out flat and thin and stamped into separate lozenges by cutters of various shapes.

Macaroni—This consists of shaped and dried doughs prepared by adding water to semolina, farina, wheat flour. It may contain added salt. In the finished product the moisture content does not exceed 13 per cent. Various shapes of macaroni are known under the distinguishing names, such as spaghetti, vermicelli.

Nougat—This is a sweetmeat of an invariably sticky nature consisting usually of a paste filled with unblanched or blanched chopped almonds or pistachio nuts. These are usually sold in blocks weighing ¼ lb. to 2 lbs. each while smaller nougats going 20 to 40 to the pound are also available. As these are liable to get hard on exposure to air, they are usually put up in waxed paper. Preserved fruit pulps also enter into the composition of some of these nougats.

Preserved Fruits.—Jams and jellies do not retain the flavour of the fruits in general but in preserved

fruits the flavour is sought to be maintained. Here the whole fruits are preserved in sugar syrup.

Pralines.—These are satin goods having paste of almond or pistachio as a filler inside.

Rocks.—These are fancy condies having a core of pulled sugar. The core may either be covered over with clear sugar in its entirety or small coloured stripes of the thickness of little finger all over.

Toffee.—This is another confectionery like caramel containing fat and sugar without the addition of full cream milk or condensed milk. Herein lies the difference between toffees and caramels. High class toffees, however, contain cream and these are then known as creamy toffees.

Troches.—These are medicinal lozenges embodying medicaments. The coating of sugar melts away readily emitting the medicament to be taken in the system.

Vermicelli.—It is otherwise known as macaroni or spaghetti and is made into fine white thread-like rolls from wheat flour or from semolina.

Wafers.—These are flat pieces of confection made from hardboiled and pulled sugar. The better standard of articles contain interior filling. They are of all possible shapes and colours.

CHAPTER II.

RAW INGREDIENTS

THE raw materials for making confectionery may mainly be classified as follows :—

(1) Sugar.
(2) Glucose.
(3) Cream of Tartar, hydrochloric acid, citric acid, etc.
(4) Starch, gum, etc.
(5) Fruits, cocoa beans, almonds, etc.
(6) Flavours.
(7) Butter, cream, etc.
(8) Colours.

As success in manufacture would depend upon the selection of raw materials, a general description of raw materials from the confectioner's point of view will be instructive. Needless to say that the quality of the finished products will depend no less upon the use of the best quality goods.

SUGAR.

The most important ingredient in the manufacture of confectionery is sugar which may be obtained either from cane or from beet. It can be had in the market in various grades and upon their careful and judicious selection depends the success in the confectionery line. It should be noted that the peculiar flavour, taste and feel of the various sweetmeats are not a little due to the use of special grades of sugar and in fact various modifications in the quality of the output are quite possible with different classes of sugar used. Intensity of sweetness also varies with different

grades of sugar. Hence in making confections, the manufacturers should make it a point to make a special study of the grades and properties of sugar.

GRANULATED SUGAR.

Sugar of commerce generally goes by the name of granulated sugar. It is available in anhydrous, bright, monoclinic crystals and has a specific gravity of 1.581 at 15°C. So far as chemical properties are concerned, it is sucrose pure and simple with a small percentage of impurities of metallic bases adhering to the sugar crystals.

Granulated sugar may again be classified under two broad classes, viz., white and brown. It is only the white variety which the confectioners are concerned with. The brown variety gives a very dark coloured syrup which can only produce articles of low quality. The plantation white sugar also yields a brownish syrup, which although not as bad as that obtained from brown sugar requires further refining and docolorisation by passage through special preparations like *pata saola*.

White granulated sugar is generally employed in the manufacture of candies, conserves, pams, jellies, etc. But as the syrups from it get cloudy unless properly treated, this cannot be used where production of bright transparent articles is desired. Hence in making quality goods higher grade of sugar is to be employed.

White sugar which has been doubly refined in the plantation is also available in the market in the form of grains. It is purer than the ordinary granulated sugar and yields a white syrup. It is for this reason that this sugar finds large use among the manufacturers whose aim it is to make really good confections.

CRYSTALLISED SUGAR.

This is another form of sugar much used by the manufacturers in confectionery making. It is made by concentrating ordinary sugar syrup by ebullition when crystals of sugar deposit at the bottom of the cooker. The nature of the crystals formed differs according to the rate at which sugar is boiling. Reference to this will be made later on.

CRUSHED OR ICING SUGAR.

For success in confectionery, the confectioners use a large supply of sugar crushed to a fine powder. Crushing is intended to drive out the water of crystallisation from the grains of sugar for better results. This is done in disintegrators provided with pneumatic separators or in sugar mills in which the crushed sugar is allowed to pass through rocking sieves to receive uniformly finely divided grains. This is also known in commerce as lawn or icing sugar.

COLOURED ICING SUGAR.

Icing sugar in various colours is used for ornamenting candies and specially chocolates. The sugar is first coarsely powdered, the dust is sifted out, and the small lumps are then sorted into three sizes by means of a coarse sieve. The lumps are dyed by shaking them in a suitable vessel, the inside of which is painted with a very thick colouring liquid of the required shade. The vessel is also moved about to prevent the dye from collecting at the bottom. Care must be taken that the sugar does not get damp enough to cling together. Finally, the differently coloured grains obtained as above are mixed together. If desired the sugar can be perfumed by the administration of essential oils or tinctures along with the dye used.

Icing sugar used for decorating confectionery may be prepared as follows :

Steep 8 oz. of gelatine for 12 hours beforehand in 10 lbs. of water, then add 4 oz. alum, and warm in order to dissolve same, but without boiling. Pass through a fine sieve, and put in uncorked bottles. Use this liquid for making icing sugar, with very fine and very white pulverised sugar. The paste should be of light body.

AMORPHOUS SUGAR.

On account of its soft and minute grains this sugar is specially adapted for use in the manufacture of chocolates, toffees, etc. which should feel perfectly non-gritty to the palate. Granulated sugar cannot be employed in these cases. for they would involve grinding for all unusually longer period of time to render the chocolate mass perfectly smooth and non-gritty to the teeth.

This is made by making a super-saturated solution of sugar at a high temperature. The syrup is then allowed to cool down very rapidly and the whole mass is stirred briskly. Mealy crystals minute in form are obtained which will answer the purpose of chocolate makers. This sugar is otherwise known as transformed sugar.

LOAF SUGAR.

This is crystallised or refined bleached sugar which has been run into long moulds resembling loaves and purified from the molasses. It is so called because it is popularly taken with loaves. It is otherwise known as lump sugar or crystal sugar.

SUGAR CANDY.

The purer the sugar solution and the slower the crystallization, the larger the crystals of sugar formed.

The large crystals are then termed sugar candy. Very rapid crystallisation from raw sugar solutions or from solutions of sugar with a relatively large amount of foreign bodies such as salts, gums, etc. is liable to result in a yield of small sugar crystals. In crystallising fondants, fruits, etc. advantage is taken of this power of forming crystals in impure or "semi-cut" sugar solutions.

VANILLINE SUGAR.

In English confections use is often made of vanilline sugar. This is easy to prepare. In fact it is sugar impregnated with the flavour of vanilla.

To prepare this vanilline crystals are dissolved in alcohol at the temperature at 96°F. For one ounce of vanilline 4 oz. of alcohol will be just sufficient. This solution is then to be triturated with ordinary powdered sugar. For facility of incorporation, the solution of vanilline is put in a perfectly clean basin. 13 lbs. of powdered sugar is then rubbed with it. The whole is allowed to dry overnight in the air and then packed into air-tight bottles for future use.

When vanilline syrup is required almost a similar process is followed. 1 lb. of vanilline crystal is dissolved in 4 lbs. of alcohol at about 96°F with constant stirring. In the meantime 200 lbs. of loaf sugar is made into sugar at 30° Beaume. The syrup is then allowed to get cool. When it is cool, add the solution of vanilline previously made and pack into air-tight bottles.

'DOCTOR' IN COMMON USE.

In common parlance of the confectioners, doctors stand for ingredients which retard crystallisation and graining. Addition of 'doctors' to sugar syrup therefore becomes essential when graining or crystallisation is to be avoided. This is also technically known as

cutting the syrup. The proportion of the doctors determines the character of the final product. The chief doctors are:—

(1) Glucose.
(2) Cream of tartar.
(3) Citric acid and tartaric acid.

GLUCOSE.

Among the other ingredients used in confectionery, special mention should be made of glucose which is otherwise known as corn syrup. It is the cheapest ingredient which can be added to the boiling syrup to prevent crystallisation. It is also easy to handle and it is due to this fact that it largely enters into the composition of confections where grainy structure is undesirable.

It may be mentioned that glucose is derived from starch by the action of acid. Starch breaks up into dextrose and dextrin and it is interesting to record that the longer the operation proceeds, the more of dextrose and the less of dextrine are formed. In glucose however an attempt is made to have the two chief ingredients equally divided. When dextrose predominates, the glucose is not of much value to the confectioners, although the brewers will find it quite useful for their purpose. Glucose should not be added in more than sufficient quantity as discolouration then takes place which ends in caramelization.

CREAM OF TARTAR.

Cream of tartar is chemically known as potassium bitartrate and is available in fine powder. It is soluble in boiling water, less soluble in cold water. Heat decomposes into potassium carbonate, carbon and inflammable gases and evolves an odour of burnt sugar. It

should therefore be kept away from fire. Citric and tartaric acids are too common to require any description.

PROPORTION OF DOCTOR USED.

Doctor is the most important ingredient entering into the making of candy. It, in fact, determines the nature and properties of the resulting products. For example, if one boils milk with more sugar and a limited quantity of doctor at a temperature of 240° to 250°F a class of article is produced which among confectioners go by the name of *Fudge*. And if the amount of the " doctor " be further increased, quite a different class of article is obtained. This is known as *Caramel*.

It should be mentioned here that the addition of excessive or insufficient ' doctors ' is to be condemned. Both of them are bad and it should be careful consideration of the confectioners how to arrive at a correct proportion which will yield best of results.

If fondants are under-doctored, there are chances of the centres being soon dried out and thereby becoming hard. Again if chewing pieces are deficient in doctors, they will be found to grain and become short. In a similar manner overdoctoring of hard goods is to be guarded against. This causes sweating and renders the products stale looking.

Again in the case of hard-cooked candies experiments show that the employment of stable doctors is most effective while in the case of low cooked articles strong doctors will be requisitioned.

FLAVOURS.

There are special flavours and tastes attached to each class of confectionery. The manufacturers should therefore make a proper study of the flavours most appealing to the public taste, and to the extent manu-

facturers can find out blendings that will captivate public fancy, their success in business is assured. In fact successful sale of certain confections lies in the superiority of their flavour.

Synthetic flavours are now much in vogue. These imitate fruits and flowers, such as essence of banana. raspberry, pineapple, wintergreen, lemon, orange and ginger. These flavours are sold ready-made in the market.

By far the most important flavour in European confections is that of *vanilla.* It enters in the composition of various products, specially nougats, caramels and chocolates. Usually 12 oz. is sufficient for 100 lbs. of cream centres.

Other flavouring agents are peppermint oil, orange oil, winter green oil, rose water, cinnamon, etc.

Peppermint Oil. It has a very strong flavour. In making candies the manufacturers use only the double distilled oil. Usually 1½ oz. will do for 100 lbs. of cream centres. Orange oil is generally used in conjunction with citric acid. 1½ oz. to 3 oz. is considered sufficient for 100 lbs. of cream centres.

Wintergreen Oil. In using it take care to have the strongest variety only. ¾ oz. will suffice for 100 lbs. of the cream centres. Caramels are also good flavours but no addition is necessary in open pan heating. This may be added in case of vacuum pan boiling.

Again addition of suitable flavours is a factor no less dependable upon the mass to which it is being incorporated. Some flavours quite agree with certain classes of goods while others will disagree. The quantities of flavours to be added are no less a variable factor. For example, confections covered with chocolate need stronger flavour. Again a bitter coating requires more flavouring than when the centre is covered in a sweet coating.

COLOURS.

The confections contain various colouring agents in their mass to make them attractive to view. Usually attempts are made by confectioners to get a colour akin to the fruit or flower whose flavour has been reproduced in the mass of the confectionery.

Colour bases, as may be known to many, may be of vegetable, mineral or synthetic origin. Care should be taken in their selection so that these may be of no deleterious effect on human health. The natural colours such as cochineal, saffron, turmeric, etc., are still in large use among the confectioners but now-a-days the advent of cheap synthetic colours has changed the outlook of the manufacturers. Some synthetic colours find large use in making confections as these are not only easy to handle but also produce finer shades on treatment and are at the same time edible.

Methods of preparing some natural colours follow :—

CARMINE (Red).

Among the colours most liked by the manufacturers mention should be made of carmine. It is even to this day in large application among the candy makers. This is made by dissolving the carmine in just enough quantity of ammonia water and diluting the solution with distilled water to 20 times the weight of carmine.

INDIGO CARMINE (Blue).

Indigo carmine is made as follows :—

Indigo is powdered finely and dried at a temperature lower than 120°C. It is put in a spacious earthen basin and fuming or Nordhausen sulphuric acid is poured slowly with constant stirring while it is still warm. Acid four times the weight of dried indigo

being added, the basin is left covered up for twenty four hours. Sulpho-indigotic acid is hereby formed. The liquid is then diluted to 10 to 12 times its old volume and is allowed to stand for a few days. Insoluble matters settle below and the clear solution is decanted off. It is then treated with potassium carbonate. Carbon dioxide escapes due to the presence of excess of acid in the solution. When no more carbon dioxide evolves, which is indicated by the ceasing of the effervescence, the solution is concentrated and preserved in bottles. The carmine thus formed is deep blue and extremely soluble in water but sometimes insoluble in alcohol or in saline solutions.

To get blue colour dissolve any amount of indigo carmine paste with sufficient water to get the desired strength or shade. Usually dissolve 1 oz. of paste in 20 oz. warm water. Then filter and add 5 % alcohol.

CARAMEL (Dark Brown).

Caramel, a dark-brown substance, obtained by the roasting of all materials containing sugar is much used for colouring. It is made from cane-sugar, by heating it by means of an oil bath to 410°F., as long as aqueous vapour is formed. Stir occasionally with a spatula, dissolve the product into water, and concentrate the solution by evaporation. This gives crude caramel. Pure caramel yielding a brighter colour is obtained as follows :—

Crude caramel is placed on a parchment-paper dialyser. The undecomposed sugar and certain intermediate compounds diffuse out with considerable facility, and what ultimately remains on the dialyser possesses 5 times the colouring power of the original crude caramel, weight for weight.

According to another method add strong alcohol to a filtered aqueous solution of crude caramel until it

ceases to produce a precipitate ; collect the precipitate, which is caramel, on a filter, wash with alcohol, and dry. The product should be dissolved and precipitated 4 or 5 times, or till the mass thrown down, from being plastic at first, becomes pulverulent.

Caramel is manufactured on a large scale from dextrose by making its solution alkaline with soda, evaporating and heating to 220°C. The dark brown mass is poured into tins and allowed to solidify. Sometimes it is sold dissolved in a little water.

It should be borne in mind that a solution containing 10 % of purified caramel is gummy, and forms a tremulous jelly on standing. Evaporated in vacuo, it dries up into a black shining mass soluble in water; but if the solution be evaporated to dryness by the heat of a water bath, the whole matter is rendered insoluble in hot or cold water. A very small proportion of caramel suffices to give a rich sepia tint to water.

GREEN.

Extract green spinach with diluted alcohol and evaporate to paste. Use 1 part paste to 10 parts alcohol and filter—or moisten fine, hacked grass with water and press. Boil the juice and decant the greenish liquid. Press the residue off from the surplus liquid and extract the residue with alcohol. Filter and evaporate. Take up the residue in hot water. The insoluble separating greenish flocky mass is dissolved in hydrochloric acid and finally precipitated with water.

YELLOW.

Saffron	3	oz.
Water	1	qt.
Alcohol	1	„

Macerate several days and filter.

II.

Turmeric (Bruised)	1	oz.
Dilute Alcohol (50-50)	6	,,

Macerate in a closed vessel for 7 days and filter.

RED.

Powdered Cochineal	12	oz.
Potassium Bicarbonate	4	,,
Distilled Water	30	,,
Alcohol	24	,,

Rub the potassium bicarbonate with the cochineal powder. Mix the alcohol and water and add to the powder. Filter, then mix the solution with syrup 120 oz. thoroughly.

ORANGE.

100 oz. of annatto are extracted with 150 oz. of water containing 1½ % potassium carbonate. Evaporate to 60 oz. and add 12 oz. alcohol and filter.

SYNTHETIC FOOD COLOURS.

The synthetic colours are now coming into vogue in the preparation of confections. The chief among them are :—

Red—Erythrosine, Amaranth, Ponceau 3 R, Ponceau SX.

Orange—Orange I.

Green—Guinea Green, Light Green S. F., F.C.F. Green.

Blue—Sodium indigo disulphonate.

Yellow—Tartrazine, Yellow A. B., Yellow O. B., the last two being soluble in oil only.

These may be suitably mixed to produce various shades :—

Egg Shade—Tartrazine 14½ parts, Orange I 1½ parts.

Peach Colour—Ponceau 2 parts, Tartrazine 1 part.

Royal Purple—Amaranth 4 parts, Sodium indigo disulphonate 1 part.

Striping Red—Erythrosine 1 part, Amaranth 3 parts, Ponceau 6 parts.

Chocolate Brown—Sodium indigo disulphonate 7 parts, Amaranth 5 parts, Tartrazine 10 parts, Orange I 3 parts.

Brilliant Red—Amaranth 7 parts, Orange I 1 part.

Pink—Amaranth 30 parts, Sodium indigo disulphonate 1 part.

CHAPTER III.

SUGAR BOILING

SUCCESS in making confectionery articles depends not to a little extent upon the boiling of sugar. In fact knowledge of the behaviour of sugar is essential to the confectioner, for without it no one can expect to attain success in making soft or hard boiled sugar goods such as lozenges, candies, nougats, conserves, etc.

During boiling of sugar, whether granulated or powdered, it undergoes a chemical reaction under certain conditions. Sugar in the chemical technology is known as pure sucrose, although usually impurities of various nature including metallic basis adhere to the sugar. This sucrose is decomposed into dextrose and fructose when it is boiled in water at a high temperature. Traces of inorganic or organic acid or cream of tartar accelerates the reaction. It then passes into the stage of invert sugar.

INVERT SUGAR.

The confectioners should note the difference between refined sugar and invert sugar. Refined sugar when it is boiled in water slowly makes a syrup which on super concentration and subsequent cooling deposits crystals. When the solution is agitated briskly, the crystals are minute and small white, on the other hand when the solution is left undisturbed to settle, the crystals obtained are big and are commonly designed as sugar candy. The art of confectionery consists in preventing this granulation to the requisite degree and instead of getting highly crystalline product at the end

in arriving at a somewhat plastic mass of sugar which can be punched into suitable sizes.

Invert sugar has properties directly opposite to granulated sugar. Contrary to popular opinion it is available in the market in the shape of a plastic mass. It does not occur in crystal form and its presence in ordinary sugar prevents crystallisation or graining. Furthermore, it is intensely hygroscopic and remains in a plastic condition. Hence to prevent granulation of sugar during boiling and subsequent cooling, it is common practice to add invert sugar in proper proportions.

In some cases invert sugar is manufactured within the mass of syrup instead of being introduced from outside. In fact it is produced when continuous boiling at high temperature and under high pressure goes on or when sugar is treated with acids. Hence in ordinary cases during boiling of sugar, a little mild acid is added to the syrup to prevent crystallisation by the generation of invert sugar in the body of the sugar.

CHEMICAL REACTIONS.

Those who are in the know will endorse the fact that sugar can be heated without the addition of water or any other liquid, direct on fire up to 160°C without undergoing any visible change. At 160°C sugar begins to show signs of melting. At this temperature the chemical composition of sugar remains intact but if it be heated for a long time sugar which is nothing but sucrose will suffer decomposition, being broken up into a mixture of dextrose or glucose and laevulose or fructose. The chemical reaction taking place in this case is represented by the following reaction:—

$$\underset{\text{Cane sugar.}}{C_{12}H_{22}O_{11}} + \underset{\text{Water.}}{H_2O} = \underset{\substack{\text{Dextrose}\\ \text{or}\\ \text{Glucose.}}}{C_6H_{12}O_6} + \underset{\substack{\text{Laevulose}\\ \text{or}\\ \text{Fructose.}}}{C_6H_{12}O_6}$$

It may be noted that dextrose is otherwise known as glucose and laevulose as fructose.

If the temperature of the sugar is allowed to go up to 374°C, the sucrose is deprived of its water of crystallization in which it previously melted and comes to a peculiar state known as the caramelised state. At a still higher temperature the sucrose is charred, which phenomenon is known in chemical technology as carbonisation. As a result of this much carbon dioxide gas, formic acid, acetone and furfural are evolved and carbon is left behind in the vessel. If, however, small trace of water be present in sucrose during heating, it will suffer decomposition before reaching the melting point. In fact, the decomposition occurs at the temperature slightly above that of boiling water.

It should further be noted that sucrose is not immune from decomposition even when no acid is added to the syrupy mass. On continuous boiling or with increased temperature it rapidly inverts, i. e., changes into equal proportions of dextrose and laevulose, specially under the combined influence of high pressure and high temperature. Again if live steam be injected into the sucrose solution, this facilitates decomposition even before a temperature of 130°C is attained. The rate at which the decomposition takes place is an important factor to all confectioners. Actually it has been found that the optimum temperature for decomposition of sucrose lies between 110°C to 120°C. In a like manner superheated steam has a decomposing influence on the sucrose solution and breaks it down at 160°C into the same compounds. When the sucrose is raised to 280°C, the sugar is carbonised and carbon dioxide, formic acid, etc. are formed.

SPEED OF REACTION.

The dilute mineral acids, organic acids like tartaric acid, citric acid, etc. and certain acid salts like cream of tartar also have a similar action on sucrose solution. They invert or break down the sugar as before, even when there is no rise in temperature. The action however is more rapid when the solution is heated. Hence whenever inversion is to be avoided, acid solutions should be raked up quickly. The speed at which the inversion takes place in the case of these various ingredients is a variable quantity. Scientists have prepared tables comparing the rate of inversion of sucrose under the action of such chemical as hydrochloric acid. The table is given below for general information:—

Hydrochloric acid	100
Nitric acid	100
Hydrobromic acid	111.40
Sulphuric acid	53.60
Sulphurous acid	30.40
Oxalic acid	18.57
Phosphoric acid	6.21
Tartaric acid	3.08
Citric acid	1.72
Formic acid	1.53
Malic acid	1.27
Lactic acid	1.07
Succinic acid	0.545
Acetic acid	0.400

Confectioners generally use hydrochloric, sulphurous, phosphoric, tartaric and acetic acids leaving hydrobromic acid which is too quick in action and the others which are rather too slow.

BOILING TEMPERATURE OF SUGAR.

Temperature at which sugar boils up differs according to the presence of impurities and invert

sugar, acids, salts, confectioners' glucose, etc. The approximate boiling points are given below :—

Boiling Points of Sucrose Solution of Diff. Concentration.

Per Cent of Sucrose	Temperature °C.
10	100.4
20	100.6
30	101.0
40	101.5
50	102.0
60	103.0
70	106.5
80	112.0
90.8	130.0

Solubility of Sucrose in Water at Different Temperatures.

Tem. °C.	Per Cent. of sucrose	Tem. °C.	Per Cent. of sucrose
0	64.18	34	69.38
2	64.45	36	69.72
4	64.73	38	70.06
6	65.01	40	70.42
8	65.29	42	70.78
10	65.58	44	71.14
12	65.88	46	71.50
14	66.18	48	71.87
16	66.48	50	72.25
18	66.78	52	72.63
20	67.09	54	73.01
22	67.41	56	73.39
24	67.73	58	73.78
26	68.05	60	74.18
28	68.37	62	74.58
30	68.70	64	74.98
32	69.04	66	75.38

Specific Gravities of Sucrose Solutions.

The following table gives the specific gravity of sugar solutions containing a definite per cent of sugar.

Per cent.	Sp. Gravity.	Per cent.	Sp. Gravity.
2	1.00779	36	1.15911
4	1.01570	38	1.16920
6	1.02373	40	1.17934
8	1.03187	42	1.18981
10	1.04014	44	1.20033
12	1.04852	46	1.21100
14	1.05703	48	1.22182
16	1.06566	50	1.23278
18	1.07441	52	1.24390
20	1.08329	54	1.25571
22	1.09231	56	1.26658
24	1.10145	58	1.27816
26	1.11072	60	1.28989
28	1.12013	62	1.30177
30	1.12967	64	1.31381
32	1.13934	66	1.32601
34	1.14915		

DIFFERENT STAGES IN BOILING.

These are 9 essential degrees in boiling sugar, viz. (1) small thread, (2) large thread, (3) little pearl, (4) large pearl, (5) the blow, (6) the feather, (7) ball, (8) crack and (9) caramel.

Thin Syrup.

The first four terms are used to denote the strength of syrups. When a clarified syrup is allowed to boil slowly its strength gradually increases and passes from the stages of small thread, large thread, little pearl to large pearl. To test its strength, dip the tip of your finger in the boiling syrup and on taking it out apply it to the tip of your thumb. When it is seen that on

separating the fingers a small string is drawn out a little distance, about as fine as a hair, which will break and resolve itself on the thumb and finger, the strength of the syrup is technically known as *small thread.*

When the syrup presents thicker and larger strings when treated in the manner described above, the strength is designated as *large thread.*

When the fingers can be extended breaking to nearly the distance the fingers may be opened, the consistency is termed as *little pearl.*

When the finger can be separated from the thumb to the greatest extent before the thread will break, the consistency is known as *large pearl.*

Thick Syrup.

Blow and *feather* are terms used in connection with sugar syrups in the course of crystallization. When the syrup is boiling, a skimmer is dipped into the syrup and after withdrawing from syrup it is shaken over the pan. Air is now blown through the holes. If small bubbles or air bladders are seen on the other side, the consistency of the syrup is known as *blow*; if on the other hand bubbles appear larger and stronger the strength is known as *feather.* When the syrup has acquired this strength, if a sudden jerk be given to throw away the sugar, it will hang from the skimmer in fine long strings.

Crystallising Syrup.

The terms *ball, crack* and *caramel* are used to signify the consistency of syrup graining out on evaporation or on agitation of syrup during evaporation.

The *ball* degree can be ascertained thus. Provide a jug of clean cold water and a round stick. First dip the rod in water, then in syrup and again in water

as speedily as possible. Take off the sugar which adheres to the rod and roll between the finger and thumb in the water. If a ball forms, the strength of the syrup is *ball* degree. If it forms a large ball which may bite hard and adhere to the teeth it is termed *large ball.*

Crack is another term used to signify the nature and character of sugar. To test whether the sugar has acquired this state, slip the sugar off the pike or stick, still holding it in water, then press it between the finger and thumb. If it breaks short and crisp with a slight noise, the sugar is technically termed as *crack.*

If on the other hand on taking off the stick, it assumes a beautiful yellow colour and snaps like glass, the sugar is said to have attained the state of *caramel.*

TEMPERATURE AS A GUIDE IN BOILING.

It may be mentioned here that the temperature of the syrup or sugar is often a good index of the state of the sugar. As a general rule the temperature of syrup when *threads* and *pearls* are formed ranges from 102° to 110°C; signs of *blow* and *feather* appear at temperature of 113°C; the *ball* state is reached at the temperature of 115½°C; *crack* is attained at about 122°C, while *caramel* follows at 127°C.

STEAM PAN.

As boiling of sugar is the first step in confectionery making, this should be conducted with proper care. For boiling, steam pans provided with internal steam coils are employed. Sugar with the proportionate amount of glucose is melted in this pan. This method of heat prevents caramelisation. When the sugar tends to get discoloured on the sides of the pans it may be washed off with water. The solution is boiled till the consistency reaches 36°Be. The syrup is then

filtered through a fine sieve and transferred to the reservoir of the vacuum pan where rapid evaporation takes place at low temperature.

VACUUM MACHINE.

The melted sugar is drawn from the reservoir pan and is forced through a long, serpentine, copper coil, which passes through a steam-chamber maintained at about 50 lbs. pressure. The syrup is boiled in passing through this coil and is discharged into a receiving hopper connected with a jet-condenser in the column of the machine and with a vacuum pump.

The steam is rapidly withdrawn as the hot syrup enters the receiving chamber which is steam-jacketed, and here the concentrated syrup commences to accumulate. As soon as a sufficient quantity has collected it can be discharged into a second hopper or chamber which is also connected with the vacuum pump and condenser, but which can be cut both from the supply and vacuum pump when sufficient sugar-syrup has been allowed to pass in. Air is then admitted to the second chamber, and the sugar-syrup is discharged in such a manner that the vacuum is never broken.

The actual method of procedure is as follows :— Filter the sugar-syrup from the Steam-pans into the reservoir of the Vacuum Plant. Close the vacuum pan hermetically with the closing gear, and start the vacuum pump. Turn off the cock connecting the second and lower chambers with the vacuum pump. When the air has been exhausted from the apparatus, open the suction valve and, with the suction-pipe below the level of the syrup in the reservoir, draw in syrup till the bottom of the first chamber is covered to the depth of about 2 inches. The less the glucose employed, the lower is the vacuum and the higher the steam-pressure required, which latter, however, should be allowed to

create a temperature above 110°C (230°F.). The steam-cock is now opened gradually, and the water-cock of the pump opened at the same time. The operation of boiling should be watched through the peephole to see that the boiling syrup does not rise too high. The vacuum is allowed to continue till about 55° is shown, and the temperature is brought finally to 110°C. The progress of the boiling should be tested before the syrup is allowed to fall into the second chamber, by means of the tester. When the syrup is at the correct point of boiling, the cock connecting the lower chamber with the vacuum pump is opened and, as soon as the vacuum reading is the same in the upper and lower chambers, the handle operating the false bottom of the top chamber can be easily turned and the syrup transferred to the lower chamber, whence it can be removed in the receptacle placed beneath as soon as the bottom of the top chamber has been again closed and after air has been admitted into the lower chamber. The final receptacle is of such a nature that it fits closely, by means of a rubber washer, with the lower chamber so that it is held tight by the vacuum in the latter, or freed when air is admitted.

Vacuum pans allow the use of greatest proportion of glucose with the least action on the sugar, which is of rather hard quality. It is advisable to use 20 p. c. of glucose during boiling to prevent graining during ebullition.

CONTINUOUS COOKER.

More up-to-date cooking machine is the continuous cooker. Here batches may be cooked on the open fire from 260° to 280°F and then finished under vacuum. The great advantage is that the article produced is light in colour.

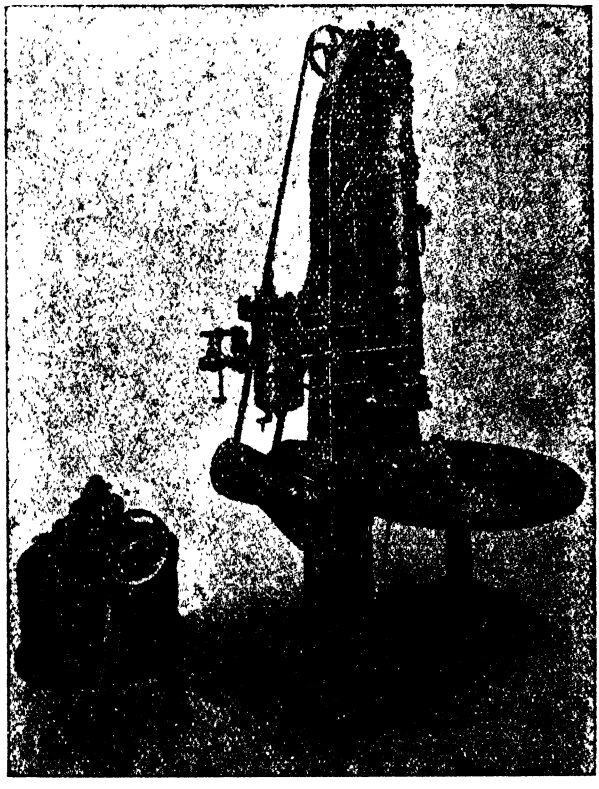


FIG. 1. CONTINUOUS SUGAR COOKER.

[*Ref. page 30*

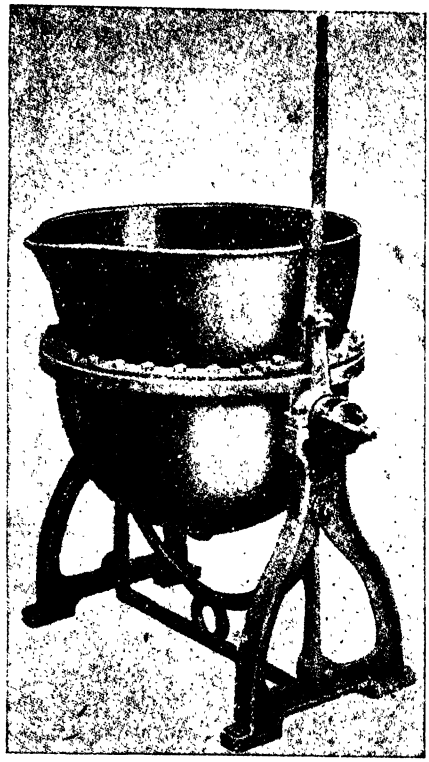


FIG. 2. STEAM JACKETED TILTING PAN.

[*Ref. page 33*

The main part of the machine consists of a steam-jacketed, vertical tube containing a hollow taper-spiral of gun-metal. The syrup is pumped through the machine by a gun-metal pump, the stroke of which is regulated by a slot-link control. By increasing the strokes, the flow of syrup is quickened (or inversely slowed down by decreasing the strokes) whilst the syrup is in actual contact with heat for correspondingly lesser or greater periods of time. In this way the temperature of the issuing sugar-syrup can be readily controlled.

The syrup enters the machine at the top of the spirit and, in a thin film, swirls downwards whilst subjected to the action of the heat from the outer steam-jacket (at about 120 lbs. steam-pressure) and from the inner exhaust-tube. The superfluous moisture is released as vapour as the syrup travels downwards, and at the bottom of the spiral, is a chamber in which flow of syrup is momentarily retarded to allow the vapour to escape through the hollow centre of the spiral to the atmosphere. The cooked syrup passes through a check-valve, over a thermometer on to a revolving cooking-table, whence it can be removed to the drop-rollers when of the correct consistency. As the syrup is in contact with the heat for a period varying only from 8-10 seconds, perfect colour is secured, whilst the intense heat for this short period allows of complete separation of moisture, resulting in absolutely dry boilings.

Descriptions of these machines are taken from *Manufacture of Confectionery* by *Robert Whympher*, to whom our best thanks are due.

CHAPTER IV.

FACTORY EQUIPMENTS

THE following are the principal equipments which a manufacturer must possess for facility of work:—

(1) Furnace.
(2) Boiling Kettles.
(3) Pouring Table.
(4) Juice Extracting Press.
(5) Scientific Instruments.
(6) Machines.

FURNACE.

The construction of the furnace for confectionery making should be made with care. For any defect in construction leads not only to uneven heating but also to numerous troubles during the boiling operations. These furnaces are constructed of fire bricks much in the form of domestic hearths. The size of the furnace depends upon the quantity of sugar to be treated at a time. It is however advisable to erect a series of ovens of moderate size arranged in a row on the same level instead of making a huge oven.

The oven may be of the open or the closed type. In open furnaces the fuel used may be any one of the following, (1) coal or coke, (2) gas and (3) oil. Open furnaces are commendable when some hard boiled goods are to be manufactured. In constructing them care should be exercised that the flame in the oven plays uniformly on all sides of the kettle placed over it. The ashes inside the oven should be swept out and the sides scrupulously cleaned before it is fired.

Open furnace can be used in boiling plain sugar without much inconvenience but when milk, flavours, medicaments are added to the sugar before boiling, open pan is no more suitable. In such cases heating by steam heat or other allied appliances is to be adopted if the best results are to be attained. Specially solutions comprising of gums, starch, or milk require a more careful handling than boiling in the open pan. In general, open furnace is distinctly detrimental to attaining high quality of the resulting products and is a great handicap in the preparation of confections containing milk, gum, starch, etc.

When the syrup is to be heated by steam heat, arrangement should be made for the generation of steam. Boilers having suitable outlets may be used for this purpose and the emitting steam may be made to circulate direct round the jacket of the boiling pan.

On some occasions when moderate heat is required, it is judicious to use a stove having a top plate with a number of perforations through which the heat may be transmitted.

BOILING KETTLES.

The kettles for boiling sugar should be selected carefully. For the manufacture of lozenges, drops and fondants, ordinary drums with vertical sides may be employed. This arrangement eliminates the heating of the sides of the kettles by the direct flame and subsequent caramelisation. The drums may be made of iron and copper and should be provided with handles so that they can be removed from fire without any difficulty.

Obviously, these drums are useless when large masses of syrup are to be boiled at a time. In some cases pans similar to the open soap kettles but smaller in size may be adopted. These may be heated on the

direct fire but generally these kettles are provided with a jacket for the circulation of steam. As the kettles with the charge are often too heavy to be handled, there are arrangements in some factories for tilting up the kettle mechanically.

The shape of the cooking pan is determined by the rapidity or slowness of the cooking operation. When the operation is to be conducted as fast as possible, confectioners make it a practice to use shallow kettles having considerable width. Again when slow cooking is essential, pans of comparatively small diameter and considerable depth will be serviceable.

For success in the manufacturing line, the kettles should be washed and cleaned from time to time. The washings of the more costly or dainty preparations may be used in making fondants for the cheap preparations.

In boiling to secure high class goods use is made of vacuum pans (*p. 29*). Here evaporation takes place quickly under diminished pressure and crystals of bright and transparent appearance are deposited. In recent times continuous cookers (*p. 30*) have come in vogue. This also helps to quicken the cooking operation and the most important advantage from the machine is that the colour of the syrup is white.

POURING TABLE.

The table on which the boiled sugar is poured for cooling is a rather long one about 2 feet in breadth and as high as the ordinary writing tables. These are topped with thick stone or marble plates. The table is divided into a number of compartments by placing heavy steel rods one inch square in cross-section at suitable distances. The compartments are not allowed to be very big. They should be about 2 feet square so that the cooled mass can be handled effectively

before it gets too hard. The length of the table depends upon the number of compartments to be made which would again depend upon the speed at which the confections are made.

DRYING TABLES.

A number of tables of the same height and breadth as the pouring tables are required for handling the prepared dough of syrup. Operatives stand by the sides of these tables and cut the doughs into proper shapes and mould them by machines or by hand.

A number of big tables broader in size with tin plates as covers and having rims all round the sides are required for drying the confections. Lozenge drops are to be spread on these tables to cool and dry when they are made.

SCIENTIFIC INSTRUMENTS.

Manufacturers will also require thermometers, hydrometers, etc., for regulation of temperature and testing of strength of syrup.

MACHINES.

Quite a large number of machines are in use among the manufacturers now-a-days. Formerly confectionery was made on a small scale with hand appliances but recently machines of varied nature have been introduced in the line. Machines are called into requisition for sugar crushing, sifting, boiling, pulling candies, mixing the ingredients, covering of interiors or fillers, moulding, crystallizing, cutting, wrapping, etc., etc. Descriptions of the machines and their manipulations appear in the following chapter and under the subsequent chapters dealing with manufacture of special sorts of articles.

CHAPTER V.

MANIPULATION.

SPECIAL attention should be paid to the various manipulations during the multifarious stages of manufacture. The finished products are liable to show signs of deterioration and inferiority if the manipulations are not carried out in a systematic and careful manner. Finish of the resulting products depends upon correct manipulations and the various processes being conducted in a systematic series to facilitate work.

CRUSHING SUGAR.

On many occasions specially when the resulting product is to be rendered perfectly gritless, the granulated sugar of commerce demands further treatment. The large crystals of sugar when incorporated into chocolate or caramel are prone to make their presence felt. These are, therefore, to be crushed into minute grains before addition. This grinding process not only improves the taste and feel of the confections, but also helps to bring down the grinding operation during the preparation of these confections to the minimum possible.

Special crushing machines, called sugar mills, are made use of in reducing sugar to fine particles. The sugar mills are constructed on the grinding system and enable the crushing operation to be finished without any trouble. There are grinding wheels enclosed in the machine. Sugar is fed through the hopper at the top of the machines. It then passes through a series of

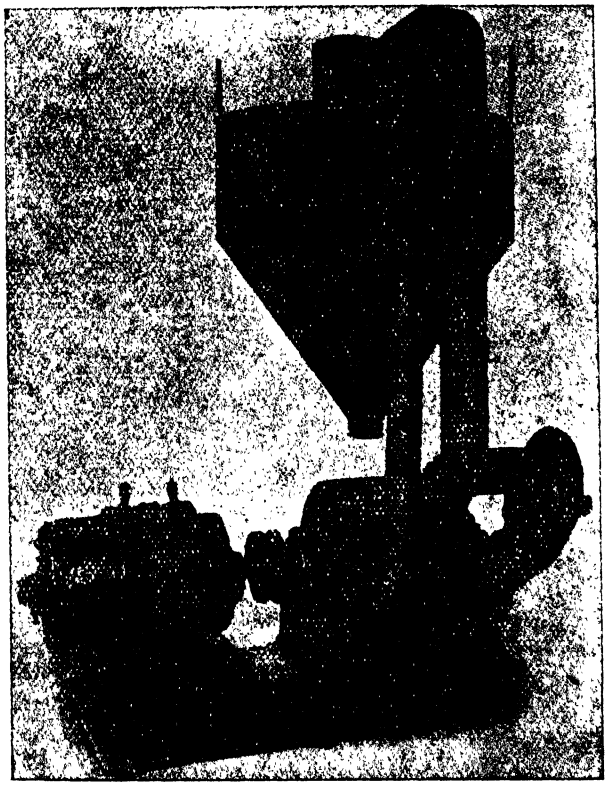


FIG. 3. SUGAR DISINTEGRATOR.

[*Ref. page 36*

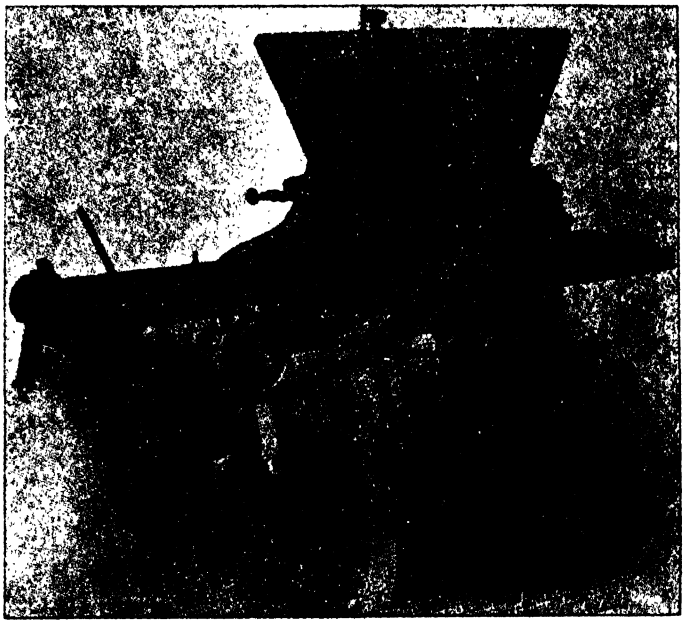


FIG. 4. CONFECTIONERY DEPOSITOR.

M. C. [*Ref. page 43*

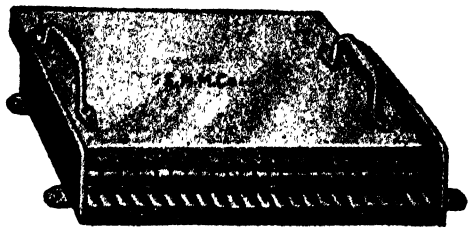


FIG. 5. CHINA BALL MACHINE.

M. C. [*Ref. page 57*

double grinders. Fine particles of sugar emerge from an outlet fitted at the bottom of the machine and is collected below.

For crushing, sugar disintegrators are now-a-days getting into popularity. These are electrically driven and are furnished with pneumatic separators. The action of the machine is automatic and the wastage is short.

SIFTING SUGAR.

During crushing a part of the sugar is rendered into dust. This is to be separated from the fine powders as this is liable to darken the final products which get a bit cloudy. The sifting operation also facilitates the securing of uniformly sized grains of sugar. To separate out the dust, recourse is taken to sugar sifters. Though based on the some principle involving passage of crushed sugar over meshes of very narrow gauges, these are made of various designs. The most ordinary types of sifters are arranged on a slanting position and are capable of being given a rocking motion as well. This quickens the passing of the crushed sugar over the sieves and at the same time disentangles the dust particles which settle or adhere to the sugar crystals. In modern machines there are hoppers which establish connection with internal sieves. These are made of the cylindrical design and are capable of rotation. The sieves consist of fine-meshed silk. Receptacles in the form of discharging hoppers or drawers are fitted into the machine. The sifted sugar is collected in these drawers.

ALMOND GRINDING.

In high class confections use is often made of almond and pistachio ground to a paste. Almond, however, is blanched on a slow fire to develop its characteristic flavour previous to its being ground. The

blanching of the almonds and subsequent peeling off the shell are done automatically with suitable machines. These consist of four rollers arranged in pairs. The machines are equipped with canvas web for the absorption of moisture and husk gatherers. The almonds are fed between the rollers, the distance between them being adjusted by suitable screws. The shells are broken and are winnowed away by revolving fans into the husk-gatherer.

Special machines are requisitioned for grinding the almonds. These consist of granite rollers through which the blanched almonds are passed and ground. The paste may be repassed through the rollers and the rollers may be set close to one another.

COCONUT GRATING.

Grated coconut kernel is required in the manufacture of confectionery. Grating by manual labour is a most tedious operation. In European countries coconuts are grated in machine specially constructed for the purpose. These machines have got adjustable grids through which circular revolving saws of very fine pitch protrude. The hulled coconuts are pressed against these saws which grate out the kernel in a clean condition without crushing out the milk from it. In fact the hulled nuts are fed into the hoppers and the gratings come out from a discharge outlet at the other end.

COLOURING.

It should be the aim of manufacturers whenever any admixture of colour is deemed desirable, to have the colours mixed thoroughly in the body of the confection. A preparation in which the colour is only imperfectly mixed up and appears indistinct or faint at places is unpleasant to view. Such blemishes in

colours are to be avoided as far as possible. For this purpose manufacturers are reluctant to use solid colours in the body of their preparation. They have this properly ground in edge runners or colour grinders and then sifted before they use it in tinting their goods. If it has not been properly ground, little points of vivid colour should appear at intervals with patches of mottled, blotched or streaked appearance here and there.

Special care is to be taken when more than one colour is used to produce the desired colour effect. In such cases due to different solubility of the component parts of the compound colour, the more easily soluble one finds sufficient moisture separated by crystallisation or absorbed from the atmosphere to separate it from the remainder of the mixture, thus giving the lozenges a mottled appearance, blotched or streaked with blue and pink, or blue and yellow, as the case may be.

Colour is often added in the form of liquid or paste. If liquid is to be used it is customary to add as little water as possible to the powder. Where colour is added to hard candy it should always be in paste form.

Liquid Colour Paste.

The colours to be added to the syrup may be in a liquid state. For ready use, the colour after being properly ground is dissolved in the smallest quantity of water or alcohol. But sometimes liquid colours can be kept ready for use for a long time. The method of preparation in this case is as follows:—1¼ oz. of the powdered colour should be dissolved in the smallest quantity of water or alcohol. Mix this solution into a pound of glucose and evaporate the liquid to a very thick paste. Colours thus prepared have these advantages that they mix readily with the boiled sugar, and

very little is needed to colour a large portion of the dough or syrup. These colours are put into separate tin boxes.

CRYSTALLISATION.

It is often required in the confectionery trade to have candies or confections crystallised in sugar. For this purpose the procedure is to boil syrup to *double thread* and skim off the scum. The syrup is further passed through a hair sieve to be free from impurities. The articles to be crystallised are put upon a wire grid which is fitted into a shallow pan. Syrup is poured into this pan to cover the article in the grid. The pan is then put in a rack while the crystallisation is in progress. The manufacturers construct the racks in such a manner that the pan can be inclined slightly when and if necessary. When the crystallisation is complete, the pan is usually put in an inclined position. The great advantage of this is that the surplus syrup after crystallisation can be drained off very easily.

When crystallised goods are to be prepared it is essential to use pure white sugar. The first crop of crystals is finely sharp and bright but on further boiling up of the syrup, the successive deposits of crystals get rather dull.

CONFECTIONERY MOULDING.

In making bonbons, dragees, etc., which are coated in subsequent operations, moulding operations become necessary in some cases for simply settling or solidification. Starch moulds of different fancy shapes and rubber mats having engraved designs on them are generally resorted to in moulding.

STARCH MOULD.

Starch, specially when it is in a perfectly dry and powdery condition, has the property of absorbing

moisture quickly from any substance in touch with it. Being light it is capable of taking any impression that may be stamped upon it. The impression does not get indistinct or blurred, which is another great advantage of starch moulds.

In moulding confectionery the first step is to make starch moulds. For this purpose a tray is filled with dry and powdered starch which may be maize starch. The tray should be perfectly dry and clean and of the dimensions of 32″ × 15½″. The surface of the starch is levelled with a flat board to be perfectly even. Now a number of plaster of paris casts of suitable designs are arranged on a board with gum or wire. The distance between the moulds is regulated according to the consistency of the preparation to be moulded. If the proportion of water in the preparation is high, the distance between the moulds should be rather long. In short the casts should be placed symmetrically on the board in several rows. The board is then placed even with the moulds touching the starch in the tray. Uniform pressure is now exerted on the starch by slightly hammering the board which is then pulled out in a vertical direction very carefully. Unless the board is taken out vertically the starch moulds will get indistinct and the final preparations also will be defective so far as the get-up is concerned. As the operation of giving impressions on the starch is rather tedious and difficult to boot, hand machines have been devised which facilitate this work greatly. The board with the plaster of paris casts is affixed to a vertically sliding frame resembling a letter press. By rotating the screw of the frame, it can be made to descend or ascend in a vertical direction without any lateral pressure. The starch tray is put underneath the frame and the latter comes down with the plaster moulds downwards. When the moulds are on the starch, the top of

the board is hammered lightly and the frame again goes up leaving firm and distinct moulds below. Then the preparation to be moulded is dropped into the moulds from a dropping can and the trays with the drops are carried to a drying room heated to 104°F by steam pipe for setting.

Trays may be placed in racks one above the other leaving small space between and hot dry air is made to circulate in the drying chamber. For perfect drying do not keep any material with moisture in the room. This may add moisture in the rooms and retard the drying operation.

AUTOMATIC MOULDING AND DROPPING.

As the operation of moulding and dropping, which otherwise goes by the name of depositing, is rather taxing, machineries have been put into the market which do the work of printing (*i.e.*, making starch moulds) and depositing at the same time without much trouble. Trays filled with starch are fed into the machine. These are carried under a levelling instrument which smooths the surface of the starch. They then come under the printing frame which gives them the necessary impressions. Hence the trays with moulds pass under a depositor having at its top a steam-jacketed hopper which keeps the depositing material in a pliable condition. Just as one row of moulds are below the corresponding nozzles of the depositing machine, measured quantities of depositing material drop into the moulds and the openings of the nozzles are closed once again. At each stroke of the machine the discharge nozzles can thus fill one complete row of starch moulds.

When the drops have set, the trays are withdrawn from the drying chamber to another chamber commonly known among the confectioners as starch room.

The confections are picked out, sieved and brushed to remove the adhering starch and kept aside for future use.

The starch in the trays is collected. It may be dried and dressed if there are lumps formed in the mass of the starch. For this purpose copper mesh sieves which do not get choked up easily may be employed. The starch can then be re-used.

UP-TO-DATE MACHINES FOR DEPOSITING.

Machines have been fitted in up-to-date confectionery factories in which cleaning the confections and re-filling the trays are done at the same time. The trays with confections in them are emptied into the hopper of this machine. There are double sieves to separate the starch from the confections and brushes to brush off the adhering starch from the confections.

A fan is fitted to the radical arm brush so that air is not blown over the sugar. Starch is also fed into a tray. One advantage of the machine is that starch is not blown all about the room settling on all sorts of articles around and is not wasted at all.

A more automatic machine is the Mogul Type. Trays of uniform size containing confections in starch moulds are fed into the machine. The trays are automatically emptied and the confections rendered absolutely free from starch and deposited in another vessel. The trays originally containing the confection and starch are refilled with starch which is then evenly levelled and printed with different sorts of appropriate moulds. The trays are then carried forward under a depositing machine which deposits the candy into the moulds. Finally the tray comes out with a fresh batch of cast goods ready to be sent to the drying chamber for setting.

Working with this machine is greatly advantageous. There is no floating starch in the room which not only deposits on the articles in the room but also makes working in the room rather deleterious for health.

RUBBER MATS.

As already stated rubber mats are also used on a large scale for moulding candies and confections. These rubber mats contain suitable designs embedded in their body. These mats are mostly found very serviceable when large rounded figures are wanted or when the goods do not require much drying in the drying chamber but can set easily. The action of rubber mats differs from that of starch moulds in principle; while the starch moulds are extremely porous and hygroscopic, the rubber mats are almost non-porous. These simply serve as so many containers or framers. When rapid cooling is desired, cold air or water may be made to circulate under the tray. Process of filling the mats is same as already explained. These can also be emptied easily. Before refilling them it is advisable to dip the moulds in cold water and allow to drain adequately.

COOKING.

Finish of the confectionery depends much upon cooking, which is in fact a process for evaporation of the excess of water in the preparation. It requires no elucidation that presence of excess of water in a preparation fails to give it a firm body and compact texture. Cooking alone can drive away the water. As cooking proceeds, the mixture gets thicker and thicker and experience alone can tell how far the cooking should be carried on.

The speed of cooking is generally regulated by the size of the batch. It has been found by confectioners that quick cooking is preferable to slow cooking at least in certain cases. The latter tends to caramelise the sugar natural to the milk and produces the flavour typical of caramel. Again it should be noted that when cooking is done slowly some acid is formed in the mass of the confection, the sucrose of which is converted into invert sugar. The latter retards the crystallisation operation. Hence where crystallisation is a feature to be attained or welcomed, slow cooking is decidedly derogatory and hence to be avoided. But where grainless substances are required, this may be adopted.

The temperature at which cooking occurs is also an important subject to be studied. When a mass is cooked at a low temperature inversion of sucrose into invert sugar is less and hence in such cases addition of more acid to effect inversion becomes necessary. On the other hand when cooking takes place at a high temperature, inversion is accelerated and the more the mass gets concentrated, the intenser is the inversion. As inversion however requires time for its completion, it is often found that before inversion is complete, cooking comes to an end.

It should also be mentioned that mineral acids produce inversion too rapid to control. It is therefore expedient to use tartaric, citric or acetic acid or cream of tartar.

Dryness and brilliance depend upon the speed with which the process is carried through. These are, however, no less dependent upon the temperature and duration of cooking and the subsequent time of exposure of the cooling drops to the air. In cooking the obvious object of the manufacturers should be to attain brilliancy in colour and a transparency that will not

be lost readily. It has been found on repeated experiments that brilliantly glossy products can be obtained when cooking is done at low temperature on the one hand and the syrup is concentrated very quickly.

CASTING ON TABLE.

When the syrup is boiled to the proper consistency, it is poured on a table for cooling. The table should be preferably made of marble or stone. The surface should be plain for facility of cleaning from time to time. Before the syrup is dropped on it, the top of the table should be scraped and washed with soap water and finally oiled before it is perfectly dry. There should be clean iron rods, heavy in weight, to enclose a square or rectangular space on the table to prevent the syrup from spreading all over. For size of compartments refer to p. 35.

Before the syrup is poured within the enclosed space, a few drops of cold water should be poured on it. The top of the syrup may be similarly sprinkled with cold water.

When the mass gets lukewarm, it should be stirred vigorously from one end to the other with a wooden spatula to work in air. Thereby the mass gets plastic.

GENERAL.

Observe the strictest cleanliness from the very start. While boiling sugar or working the bottle or peeling or coring the fruits, the hands must be well washed; otherwise the article will be contaminated with dirt and germs which will necessarily deteriorate the keeping quality of the finished preparations. Utensils, knives, fans, etc. must be all bright and free from rust. The manufacture should be conducted in a neat and clean dress. Extreme cleanliness should be observed in all matters, however trifling they may be.

CHAPTER VI.

FONDANT.

FONDANT stands for a creamy mass made of sugar and water kept ready at hand by confectioners for future use. It usually contains a quantity of glucose or citric or tartaric acid to prevent crystallization which is usually accompanied by cloudiness. As the mass is likely to set hard on exposure to air, it is stocked in airtight drums.

To prepare the fondant, use is generally made of steam pan or continuous cooker. An open pan may also be employed in certain cases but extra care need be exercised during boiling.

BOILING.

Crystal sugar is boiled with water and glucose. Usual proportions are: crystal sugar 8 lbs., glucose 1 lb. and water 1 quart. Boil to about 240°F, and remove the scum. When open pan or steam pan is resorted to, syrup on getting concentrated deposits minute crystals on the side of the pan. Unless the crystals are eliminated as soon as these are formed, these are likely to separate out and act as so many nucleii on which bigger crystals accumulate. Now the fondant being a syrupy product without any crystals in their mass and perfectly creamy and gritless, the crystals should be scraped off or washed down by addition of water on the sides of the pan from time to time. Unless it is done in a proper manner, the preparation becomes cloudy due to the presence of crystals of sugar.

COOLING.

The syrup is boiled to *thread* or *blown* and the scum formed on the surface is skimmed off. It should be poured on a clean oiled or greased marble table between iron bars while pouring begins from one end, not from side to side. It should be the lookout of the manufacturers that period of cooling is as low as possible. Unless the cooling is quick, bigger and bigger crystals appear in body of the paste, thus frustrating the object for which the fondant is made. For this reason it is advisable to sprinkle some cold water on the table before the syrup is poured on it. When all the syrup is in the frame cold water is again sprinkled on the top of the syrup. Leave the syrup undisturbed and when it cools down to 32.2°C, say after about an hour, remove the bars, and work the mass vigorously backwards and forwards with a wooden spatula working air into it until a white creamy mass is obtained which sets into a stiff paste which can be scraped together into a solid lump.

TEMPERATURE OF BOILING.

The temperature at which the boiling operation is to be conducted is a variable factor dependent upon the purpose for which the fondant is to be used. When fondants are to be moulded by hand boil to 245° to 246°F; when these are to be cast in starch boil to 242°F; when these are meant for dipping and icing purposes boil to 238°F.

When fruit juice is to be added to the fondant, the procedure undergoes slight modification. 14 lbs. of crystal sugar are boiled in 3 pints of water and after about 10 minutes 2 lbs. of glucose is mixed with the syrup. Boiling is done at the temperature of 250°F in an open or a steam pan. When the fondant is almost

ready, fruit juice is incorporated into the mass to thin down the consistency as required for casting.

FONDANTS FOR COVERING BONBONS.

Fondants are often used for covering bonbons, dragees, etc. Their mode of manufacture differs slightly from the general process inasmuch as no glucose is used in this case. 10 lbs. of white sugar is dissolved in 6 lbs. of water and brought to a boil rapidly to *soft ball.* When ready drop on the table to cool as before and beat when lukewarm. When it is desired to be perfectly white, a small quantity of marine blue can be mixed intimately into the fondant.

When the fondant is to be imparted a chocolate flavour, it is usual to mix with the boiling syrup a definite quantity of unsweetened chocolate and vanilla sugar.

PACKING.

Fondant with 25 per cent glucose is made use of in the preparation of bonbons, dragees, and other confections. When properly made and packed, it keeps for a long time and removes the difficulty of boiling small batches of sugar from day to day for use in the factory. It is packed in large tins or clean jars covered with damp cloth.

CHAPTER VII.

DROPS AND LOZENGES.

LOZENGES are much relished by the children on account of their delicious taste and flavour. The demand for these foodstuff is steadily growing and medicinal lozenges also are coming into popular favour. Manufacture of lozenges will form one of the profitable small industries of India. There are already some small factories manufacturing the lozenges in the principal towns but there is still room for many more to enter the field without creating unnecessary competition among themselves.

The capital to be invested for conducting the manufacture on a mediocre scale is not beyond the means of many young men. The only machines required are a number of punching machines with various dies, and these may also be dispensed with if the capital is not forthcoming.

DISTINCTION BETWEEN DROPS AND LOZENGES.

It must be mentioned at the outset that there is considerable misconception regarding the meaning of lozenges. To be technically correct, lozenges are either made by compressing finely powdered sugar with gum, stearine and suitable flavour, or by mixing sugar, gum, water and flavour into a stiff paste and then cutting into pieces of proper size. These are made without the application of heat and when made with heating these are known as drops. In India the articles going by the name of lozenges are made with the aid of heat and are thus more correctly speaking drops.

RAW MATERIALS.

The principal ingredient in the making of drops and lozenges is sugar, which must be crushed and double-refined in case of the latter. The other ingredients are liquid glucose, cream of tartar, colours and flavours, which are available ready-made in the market.

Vegetable colours were once in large use among drop and lozenge makers but these have lately been replaced by cheap edible coal-tar dyes which are not only easy to handle but also yield fine shades of colour.

Flavours for lozenges may be obtained direct from the fruits and drugs. But now-a-days more often than not they are obtained from synthetic sources. Artificial fruit essences like banana essence, pineapple essence, lemon essence, orange essence, rose essence, raspberry essence, strawberry essence are available in the market.

PRELIMINARY OPERATIONS.

To start, it is first of all necessary to reduce double refined sugar to fine powder by pounding the sugar on a stone with a muller; where possible a sugar crusher may be used. Sugar is then passed through a sieve, not too fine, so that fine dust may be eliminated. The use of fine dust in syrup making is to be condemned as this would destroy the beauty of drops and lozenges. Sugar is then put into the iron or copper pan which has been properly cleaned beforehand. It is then moistened with water, which is to be added gradually. Stir the mixture with a ladle all this time and when the sugar falls off from it, the sugar is considered to be sufficiently moistened and no more water should be added into the pan. The pan however should by no means be more than three-quarters filled. It is then put upon the furnace to boil.

COLOUR FOR LOZENGES.

In the meantime get the colours to be added ready. The colours should be in accordance with the flavour to be imitated. For example, when orange lozenges are desired to be made, the colour and flavour should as far as possible correspond to the natural colour and flavour of the orange. The colours before being added to the boiling syrup are reduced to fine powder or paste as described on page 39. The amount of the colour to be added to the syrup would depend upon the shade of colour desired.

BOILING THE SYRUP.

The boiling of the syrup is to be made with the greatest caution. Several things are to be considered to get a mass of the right consistency which alone can yield drops possessing brilliant transparency.

First thing to note is to dissolve the sugar in just sufficient quantity of water. Any excess of water prolongs the boiling operation uselessly. Furthermore in such cases the drops lose in transparency and are likely to get cloudy. The quantity of water that will give the best results, as observed from experience, is equal in weight to the quantity of white sugar taken. In actual practice the sugar is taken in a copper pan and covered over with an equal weight of water. The pan is now placed on the oven and the mixture is stirred with a wooden spatula until it becomes liquid. At this stage it is imperative to add some glucose or cream of tartar or both to obtain transparency in the finished drops.

Addition of correct proportions of glucose or cream of tartar is a deciding factor in the quality of the finished goods. Experience shows that liquid glucose to the extent of 25 per cent of the weight of sugar gives good results. In this case no addition of water is necessary. When liquid glucose is added in smaller

quantities, it is made good by addition of cream of tartar in very small quantities. The glucose may be dispensed with altogether in some cases in favour of cream of tartar but in this case quality of the drops suffers materially. The proportions of sugar, water, glucose and cream of tartar are given below :

	I	II	III
Sugar	10 seers.	10 seers.	10 seers
Water	10 „	10 „	10 „
Glucose	2½ „	1¼ „	nil.
Cream of Tartar	nil.	½ spoonful.	1 spoonful.

Boiling should then be continued till the mixture is of the consistency as to run without spreading too much. The usual tests for this are as follows :—

(1) On boiling it is found that bubbles rise on the surface of the mixture. At first the bubbles grow bigger and bigger in size but after some time these get diminished in size and become smaller and smaller. In fact when the bubbles almost subside the mixture is of the right consistency and is ready to be poured.

(2) Dip a wooden spatula into the boiling mass and after some time take it up and immerse in a bucket of water. When cool, take this out and examine the portion adhering to the stick. If this breaks between the fingers like a thread of glass, with a crack, the syrup is ready for making drops.

(3) Introduce a thermometer into the boiling mass. If it records a temperature of 310° to 320°F, the boiling operation should be stopped.

ADDING THE COLOUR.

Appropriate colours are added to the mass in suitable quantities to produce the desired shade of colour. Only edible dyes, whether of vegetable or synthetic origin, should be used. The dyes should be made in liquid form or paste form to ensure easy incorporation

in the body of the syrupy mass. The chief colours in use are explained on pages 16-20.

CASTING DROPS.

When working on a small scale, without any appliances, the syrup may be allowed to fall drop by drop on a tin plate covered with a thick layer of starch by holding the pan with the left hand and a small rod of iron or copper in the right. In two or three hours the drops become hard and brittle, and are collected and at once put into bottles or tins. The above method is however out of date.

POURING THE SYRUP FOR COOLING.

The melted sugar is poured into a compartment made by arranging the iron bars on the stone table previously cleaned and slightly moistened with oil. The stone should preferably be of clayey nature so that heat is conserved for a long time in the poured mass. Usually the table is 1½ to 2 inches thick. A stone thinner than this is liable to crack while a thicker one will absorb much heat from the poured mass which will then lose plasticity. The syrup is allowed to cool there. This should not, however, be allowed to be cold, for then the sugar will crystallise and cannot be made into drops. Sometimes an oven is placed underneath the table so that the mass may not get cold before handling.

ADDING THE FLAVOUR.

The flavour is to be added at this stage. A few drops of the artificial fruit essences, such as those of banana, pineapple, strawberry, etc., are scattered over the mass. For flavour of orange, add a few drops of oil of neroli, or for banana a few drops of amyl acetate. The flavour is mixed intimately with the mass with the

help of a big pallate knife. Special attention should be paid to attain a flavour that would appeal to the taste of many, for it is almost a truism that the secret of successful sale of drops lies in the peculiarity of the flavour. In some cases a harmonious blending of more than one flavour may be found to catch the market.

BALL DROPS WITHOUT MACHINES.

While still warm the whole mass is made into a number of suitable lumps and well kneaded by hand to make the colour quite uniform. Each of the plastic lumps is then drawn out into a thick thread by an operator and a suitable length is cut out of this by a pair of sharp scissors. The length is then made quite circular by rolling on the second long table slightly oiled. It is then cut into small bits of uniform size with the help of a pair of sharp scissors. As soon as they drop on the table in the shape of small cylinders, another operator begins to roll them on the table with the palm of the hand and transfers them to the next operator who is also entrusted with the rolling of the imperfectly rolled balls. He also transfers the balls to the next man as he receives a fresh supply to be rolled and so on. The pieces generally pass through five to six hands before they can be expected to be quite spherical in shape.

The first operator thus goes on with rolling out the lumps into circular threads and cutting out the rolls into small cylinders in the above manner while the balls are rolled by a band of workers all arranged in a line along the table.

When the balls are thus rolled, they are allowed to cool. For this purpose they are spread on the big tables with borders all round, and there too they are rolled by hand. When cold they are shaken over a

sieve to remove the broken fragments and are bottled up.

SUGAR COATED DROPS.

The drops may be further coated with fine crushed sugar. For this purpose the balls are slightly moistened by handling them with palms moistened with water or some suitable flavour diluted with water. Meanwhile crushed sugar is spread on a tin-plated table which can be given a rocking motion by tilting the sides up. The moistened balls are poured on the layer of sugar and the rocking motion of the table causes the ball drops to roll on the layer of sugar and thus gather a coating of sugar all round. The object can be more conveniently achieved by spreading the sugar in a layer on a clean piece of canvas or hessian and putting the balls to be sugar-coated well scattered on the sugar. The corners of the cloth can be raised up so that the balls may be easily made to roll on the layer of sugar. The balls thus coated with sugar are very much relished and fetch higher prices.

VARIEGATED COLOUR EFFECT.

The final drops can be given a blotched or streaked colouring, if desired, in the following manner. The melted sugar in the compartment, while still warm, is to be specially treated for this purpose. About one-tenth of the mass is separated from the main body with the help of a knife. This is then drawn out in the form of a thick thread and again mixed up. The operation is repeated for a number of times when a quite distinct colour from the main body of the melted sugar will be seen to develop.

The mass is then rolled into a thick circular thread and cut into, say, six equal lengths. These are then arranged laterally leaving some space between each. The remaining mass of sugar is by this time flavoured

and kneaded and flattened out into a size slightly bigger than the space occupied by the six sticks of sugar. The mass is put upon the six threads, and projecting portions are cut out from the sides with a knife. The whole mass is given a slight pressure from the top so that the six threads previously made get attached to the main body of the plastic mass. The plastic mass is then taken up carefully and the formerly cut out projecting portions are put on the upper side. The whole is then rolled up like a scroll of paper with the side streaked with threads up. The mass is then capable of being drawn into threads again. The rest of the process is the same as in making ball drops as explained on page 55.

DROP ROLLERS.

When working on a large scale, or when drops of beautiful designs are wanted, special punching machines are to be taken recourse to. The melted sugar allowed to cool in the compartments is properly flavoured and made up into a number of lumps for easy handling. Each of the lumps are then flattened out to approximately uniform thickness, and the breadth of the sheets made out from the lumps is approximately the same as that of the punching machines which essentially consist of one set of rollers and are usually designed 5 to 7 inches in length and 2¼ to 2½ inches in diameter with the design embossed on both rollers which are again interchangeable. The dies with the desired design are put into operation and the warm and soft sheets are fed into the punching machines. The handles are made to rotate with the hand and as the sheet passes between the rollers bearing the half models of the design, it is at once converted into a batch of symmetrical drops. The upper and lower half of each drop are moulded by the corresponding hollows

of the upper and lower rollers. Sheets of drops come out of the machine which are spread on the big tables and they are allowed to cool. Cold air may be blown over them. Ordinary palm leaf fans may be employed for this purpose. The sheets are then slightly tapped on the table when they break up into pieces and the drops having perfect shape will be obtained. If the pieces do not easily separate owing to the joints in the drop sheets being strong, the pieces are to be cut out by scissors. Finally the drops are sifted to remove the broken pieces and scraps, which however may be re-used.

UTILISING SCRAPS.

The scraps of drops should not be allowed to go to waste. A well-equipped factory uses up its scraps for dark coloured goods. No scraps, however, should be put into any class of hard boiled goods. The scraps in many workshops are put into the next batch of boiling sugar syrup. Used without reboiling, the scraps melt only imperfectly and consequently leave grains in the paste, spoiling the goods completely within a short time.

CUT BALLS.

Cut balls are also made in the above manner more neatly with a pennet cutting or cut ball machine than with hand. The syrup threads are fed into the machine and are obtained as cut balls of desired size by feeding sticks of appropriate size.

LOZENGE MAKING.

In making lozenges without the aid of heat it is usual to take gelatine or gum acacia or targacanth as the vehicle for the lozenges. For this purpose sugar which must be double-refined is pounded fine; gums are dissolved in minimum quantity of water for a day and

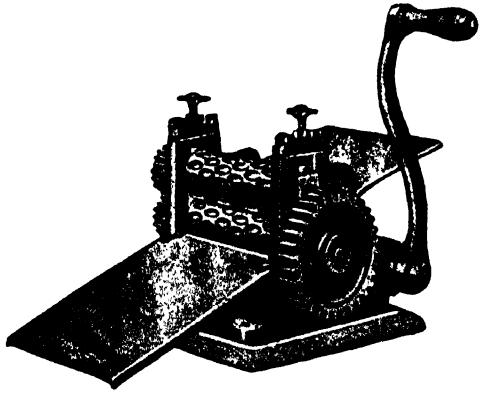


FIG. 6. DROP ROLLERS.

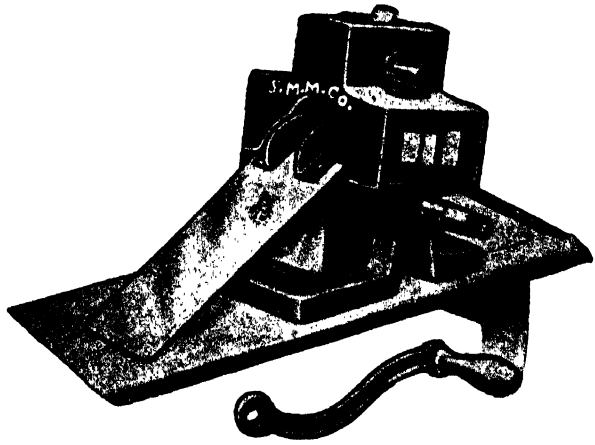


FIG. 7. PENNET CUTTING OR CUT BALL MACHINE.

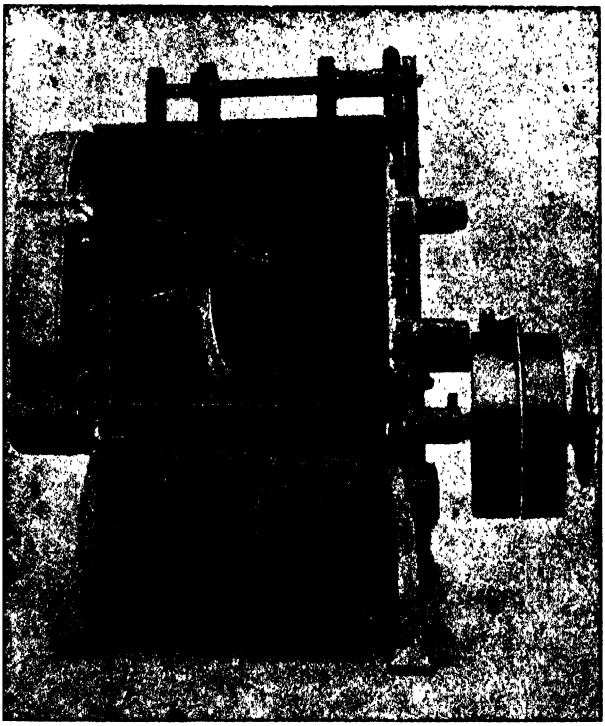


FIG. 8. LOZENGE MIXER.

then passed through a fine sieve and then mixed along with sugar in a kneading and mixing machine; colours and flavours are also finely ground separately and mixed up intimately. In some cases no water is added and the powder is compressed into tablets with the help of tableting machines. In other cases the ingredients are made in the form of a paste with water and made out into lozenges with suitable punching machines. Success in these cases would depend upon the thorough incorporation of the mass. Usually use is made of a lozenge mixer to ensure perfect admixture.

6½-oz. of gelatine is steeped in 6 oz. of cold water for 12 hours beforehand and 10 lbs. warmed glucose into 6 lbs. of boiling water. A paste is thereby formed. Now knead with 190 lbs. of crushed and sifted sugar till perfectly smooth. The paste is then put into the hopper of the depositing machines and the pourings are received upon glazed paper, and then carried upon tins to the drying room kept at 104°F. Keep the lozenges for 12 hours and then take out. Moisten slightly the bottom of the sheets of paper, and remove the lozenges by means of a special blade arranged for this purpose. Return the lozenges again to the drying room to complete the drying.

When depositing machine is not near at hand, the sprup may be cast into irregular drops as explained on page 54.

FRUIT LOZENGES.

These are prepared according to the method given above, the flavouring essences, viz., essences of lemon, orange, citron, raspberry, etc., not being added until the sugar is melted, to avoid as much as possible loss by evaporation. The colouring matter may be any of the transparent pastes usually employed for cakes, jellies, and confectionery. In this way is made the majority of the first class fruit drops.

PEPPERMINT LOZENGES.

Procedure:—Take 28 lbs. of icing sugar, and make a heap of it with a big hole in the centre of the heap, then pour in 4 pints of acacia mucilage, and on that 1 oz. of peppermint oil, working the liquids well together. When sufficiently mixed, stir in the sugar from all round the sides, and make the whole into a stiff paste with as much of the sugar as can be used. If it is too stiff, add more mucilage; if too sticky, more sugar. The paste is now ready to be rolled out. Take about 2 lbs. from the bulk and work it with the hands into a compact square piece, keeping it from sticking to the slab by means of powdered starch. Next roll out a portion of the mass upon the slab with the sides adjusted to a height equal to the thickness of the lozenges desired. Then cut out the lozenges with a punch. While the mass is being rolled, sprinkle it with icing sugar, to prevent it from being stuck. Transfer the lozenges to a tray, expose to dry air for twelve to twenty four hours, and finally place in the drying cupboard until hard.

MINT LOZENGES.

Gum Tragacanth	1	lb.
White Gum in Powder	4	lbs.
Fine Icing Sugar	100	lbs.
Mint Essence	1	lb.
Water	10	lbs.

Procedure:—Dissolve the gum tragacanth in 6 lbs. of pure water for a couple of days, and dissolve the white gum in the remaining 4 lbs. of water. Pass the two dissolved gums separately through a fine sieve, and then mix in the Mixing Machine together with the mint essence and the fine pulverised icing sugar. Whiten well the paste with a solution of marine blue and make it perfectly smooth. Roll into even sheets,

stamp and cut. They should then be put into a drying-room at a low temperature. When they are quite dry, they should be passed quickly through a jet of dry steam in order to give them a smooth and shiny surface.

II.

Procedure:—Melt 60 lbs. of broken sugar in 34 lbs. of pure water and dissolve in a steam pan, letting it boil for a couple of minutes. Then turn off the steam, and add 140 lbs. of granulated sugar, 13 oz. mint essence and ⅓ oz. acetic acid. If the lozenges are to be white, add a solution of marine blue. Heat this paste to a simmer, stirring the while. Paste should be kept warm with a slight steam-pressure.

GROUNDNUT LOZENGES.

Icing Sugar	70	lbs.
Groundnut	8	,,
Pure Water	12	,,
Gum Tragacanth	10	oz.
Vanilline Sugar	½	lb.
White Gum	2	lbs.

Procedure:—Dissolve groundnut paste in the water and use this liquid to dissolve the two gums separately. Add the vanilline sugar when mixing the paste. Colour a deep brown with burnt sugar, and then dry at a low temperature and stamp.

CHOCOLATE LOZENGES.

I.

Chocolate 1 oz. is reduced to a fine powder by scraping and added to powdered white sugar, 1 lb.; then the mixture is made into lozenges as above, care being taken not to heat it for the second time.

II.

Icing Sugar	70	lbs.
Cocoa Powder	8	,,

White Gum	2	lbs.
Pure Water	12	,,
Gum Tragacanth	10	oz.
Vanilline Sugar	5	lbs.

Procedure:—Proceed as above, dissolving the cocoa powder in the 12 lbs. of warm water. The preparation is brownish yellow in colour. Dry at a low temperature.

CACHOU LOZENGES.

Icing Sugar	70	lbs.
White Gum	2	,,
Pure Water	12	,,
Gum Tragacanth	9½	oz.

Procedure:—Flavour with cachou essence to taste. Proceed as with mint lozenges. Colour pale pink. Other flavours, such as lavender, rose, etc. can of course be used.

MEDICINAL LOZENGES.

Medicinal lozenges are small, dry, solid masses, usually of a flattened shape, consisting for the most part of powders incorporated with sugar and mucilage.

They may be prepared from almost any medicine. Most medicinal lozenges are made by the pharmacopoeial process to be described below. Diverse methods are, however, adopted in the confectionery trade. The following process is generally adopted.

Mode of Preparation.

A mucilage of tragacanth is first prepared with cold water and strained. With this the powders including sugar, are thoroughly mixed by rubbing upon a marble slab, and are thus formed into a paste, which is spread out by means of a roller upon the surface of the marble, previously powdered over with a mixture of sugar and starch. The thickness of the mass is

rendered uniform by a frame upon which the ends of the roller rest. The upper surface is now dusted with sugar and starch, and the mass is divided into small cakes by means of a punch. These cakes are placed upon paper, and having been exposed to the air for twelve hours, are carried into a drying room moderately heated. When perfectly dry, they are thrown upon a sieve to separate the sugar and starch and are put in boxes.

The processes for preparation of lozenges as recommended by the British Pharmacopoeia are given below:—

With Simple Basis.

Take five hundred times the quantity of the drug ordered for one lozenge, mix it with 496 grammes of refined sugar and 19.5 grammes of gum acacia, both in fine powder. Make the mixture into a paste with 35 millilitres of mucilage of gum, acacia and sufficient quantity of distilled water, divide into 500 equal lozenges and dry in a hot air chamber at a moderate temperature.

With Fruit Basis.

Take five hundred times the quantity of the drug ordered for one lozenge. Mix with it 6.5 grammes of tragacanth and 26 grammes of refined sugar, both in powder form. Add sufficient of the black-currant paste of commerce to produce 650 grammes, beat into a uniform mass, divide into 500 equal lozenges and dry in a hot air chamber at a moderate temperature.

With Rose Basis.

Take five hundred times the quantity of the drug ordered for one lozenge. Treat it as described under "Preparation with Simple Basis," previously mixing 0.025 c.c. of oil of rose with the refined sugar.

With Tolu Basis.

Take five hundred times the quantity of the drug ordered for one lozenge; dissolve such salts of alkaloids as may be ordered in 10 c.c. of distilled water; mix the solution with 482 grammes of refined sugar and 19.5 grammes of gum acacia, both in fine powder. Incorporate 10 c.c. of tincture of balsam tolu, and any other drugs ordered for the lozenges. Make into a paste with 35.5 c.c. of mucilage of gum acacia and a sufficient quantity of distilled water; divide into 500 equal lozenges and dry in a hot air chamber at a moderate temperature.

ACIDULATED LOZENGES.

A few typical processes of making ordinary tablet and medicinal lozenges follow:—

1. Take citric acid in powder, a drachm; powdered sugar, eight ounces; oil of lemon, twelve minims; mucilage of tragacanth, a sufficient quantity. Form them in the usual manner into troches of twelve grains each. Lozenges are sometimes made by saturating blank lozenges with aromatic spirits.

2. Tartaric acid, ½ oz. dissolved in a very little water is added to each lb. of sugar; with essence of lemon or orange to flavour as desired.

CHAPTER VIII

SATIN GOODS.

IN manufacturing satin goods, the manufacturer should make it a point to use sugar of the first grade. When sugar of inferior quality is employed, the brilliancy and satiny appearance of the preparation deteriorate.

PROCESS.

The first step in the manufacture of satin goods is to cook sugar of the highest quality in an automatic continuous cooker. When the cooker is not available, boiling may be conducted in open pans on open furnace but in this case care should be taken that the sugar does not crystallise and deposit grains on the sides. It is therefore imperative to add a little glucose to the sugar to avoid crystallisation. Experience shows that glucose should be added in the smallest quantity.

During boiling the sugar, the temperature should be regulated. It should not be allowed to go beyond 320°F.

When the syrup has been cooked it should be poured on a marble slab encircled by small rods on all sides. The slab should be oiled a little before pouring the syrup for cooling.

When cooling, the syrup becomes thicker and thicker. At this stage the syrup is prone to grain if not duly cared for. Hence exercise proper care that the mass does not exhibit grainy structure. A little citric acid may be spread over the syrupy mass before proceeding to the next stage where further evaporation of water takes place.

The pasty mass is then worked into a roll which is then to be pulled and drawn on a hook. The ends of the roll are held by the two hands and the string-like roll is swung on the hook. Colour of the roll changes as the drawing proceeds. Care should be taken that the mass is not softened too much after drawing.

When doing business on a large scale, a pulling machine may be resorted to with profit.

When the pulling operation is just complete, knead out the air and pull it again till it is of a dimension to be fed into the press. To roll it into thin threads usual practice is to roll this on a warm but not hot table. If the table is over-heated, sugar is liable to show signs of cracking. The lump should be just sufficiently soft to possess necessary elasticity to impart to it the glaze so much appreciated in these classes of confection.

UP-TO-DATE MACHINES.

Machines called batch rollers have now been invented. These enable a perfect stick of satin goods to be drawn in continuous roll. The machine consists of a steam-heated cylinder which is balanced so that it can be tilted backwards and forwards if desired. In the lower half of the cylinder six tapering rolls revolve, covered with galvanised wire of varying mesh. The touch of a hand lever causes these rolls to spread out like a fan at the feed-end. In this position the machine receives the batch. Another touch on the lever and the rolls close round the batch, pressing it closer and closer by means of the automatic spring action as the work proceeds.

The feed-end of the machine is closed by a disc which, by the spring action, automatically pushes the batch forward. A simple gear device causes the rolls to rotate, first one way and then the other alternately, so that the batch is treated evenly.

When the batch, diminishing in diameter as it travels, reaches the delivery end of the machine it is automatically reduced by gauging rolls to the size desired by the operator. Now put into punches but cut into suitable balls. In indigenous method the still warm balls are dropped on a tray filled with fried white sesamum. The balls are turned over with hand. This makes the sesamum stick to the surface of the confection.

HOLLOW SATIN GOODS.

These goods are made in the same way as satin goods. The only distinction in their case is that they have got some strips of clear sugar outside.

To prepare them boil sugar with water as before and allow to cool on an oiled marble slab between iron rods to prevent running off of syrup. When lukewarm the mass is worked backwards and forwards with a spatula till pasty. Then pull on a wire hook and knead out the air.

The dough of boiled and drawn sugar is wrapped round a large conical stick of hard wood which is kept warm and previously greased with vaseline. Put the whole mass in a batch roller which will enable the manufacturer to draw out uniformly round threads about the thickness of a finger. When about 20 to 24 inches long cut off from the main thread. These sticks can then be fed into the ball making machines which turn them out perfectly regular.

TOFFEE CANDY.

Boil 7 lbs. sugar and 1½ lbs. glucose to 300°F with sufficient water. Add 1 lb. butter. Put the contents on a greased marble slab; let it chill off a little. Now put the toffee on a hook and draw it out till it gets a silvery and white appearance. Cut up into oblong pieces.

CHAPTER IX.

CARAMELS

THE principal ingredients which go into the composition of caramels are sugar, glucose, milk and butter. In cases where glucose is not used, manufacturers as a rule replace it by cream of tartar. The flavours mostly used in these classes of confections are cocoa butter, vanilla essence, lemons, chocolate paste (unsweetened), caramel essence, etc.

Caramels differ from toffees in this respect that while the former are soft-eating sweets having a definite 'chew,' the latter are somewhat harder.

The cheap varieties of caramels do not contain butter and creams. They have simply fat to mellow the consistency of the preparation and flour to give them body and shape.

GENERAL PROCESS.

The general process of manufacture is very easy. Essentially it consists in crushing the sugar in a sugar mill before being boiled. This operation is considered necessary to ensure success and produce caramels that will not feel gritty to the teeth.

The sugar thus crushed is mixed with glucose, cream and vanilla syrup (made from vanilla syrup). The mass is placed in a thoroughly cleaned pan and is then boiled over a not too-sharp fire. The whole is stirred well with a spatula which should preferably be made of wood. Sponge well the sides of the pan and do not allow the coagulated parts of the milk to burn. If unsweetened chocolate is to be added, this should be done when the mass is brought to the ball point. The

chocolate mass however should be thinned into a paste by being melted on a slow fire with the addition of water. Boil until *hard ball* consistency is gained and pour on a marble slab between iron rods. To test if the caramel has been boiled properly, allow a little quantity to dry on cold water. If it breaks with a crack, the boiling is all right and need not be continued. The slab should be properly greased or buttered before the syrup is dropped on it. When half warm, turn the mass up gradually wiping the underside clean and then roll out in thin sheets, cut and wrap.

Mention may be made here that in any caramel the ingredients exist in the form of an emulsion and that the sugar, fats, milks and flours usually employed are not soluble one in the other. Precautions are therefore to be taken that the ingredients do not tend to separate out. The main requirement in order to minimise this tendency is the careful and thorough amalgamation of the various ingredients, both before and during the cooking process.

Nuts are occasionally included in the mass, or they may be afterwards placed on the surface, and there are also varieties in which a honey-comb-like structure is obtained by the use of something very much akin to domestic baking powder.

EQUIPMENTS.

Equipments necessary for the production of caramels may range from a gas-fired pan and a water-cooled pouring plate equipped with a set of cutters to high speed, high pressure, steam mixing pans, elaborate pouring plates with carriers, spreaders and cutters and batch rolling machine coupled to high-speed wrapping machines, the output of each of which may be in the neighbourhood of 400 pieces per minute cut, moulded and wrapped.

BOILING PANS.

In small factories gas-heated steam pans may be employed with satisfactory results. Steam-jacketed pans are preferable to the gas-heated pattern for caramel making, as the danger of burning and local overheating is minimised owing to the more uniform distribution of the heat. Caramel mixings are generally very thick and viscous, so that no natural circulation of the boiling mixture takes place. For this reason caramel pans require the addition of mechanical beaters or stirrers. A common pattern of stirring gear consists of two sets of beaters revolving in opposite directions, and if these are strongly made they are satisfactory. Complicated devices are undesirable as they become clogged with partly cooked materials. They are difficult to clean and result in unnecessary waste of ingredients.

The most satisfactory pan for large production of caramel goods is undoubtedly the fully jacketed steam pan fed from an external boiler, with a steam pressure at the pan of 90 to 160 lbs. per sq. in. The exhaust outlet of the pan should be fitted with a suitable steam trap, capable of dealing with large quantities of condensate, as at the commencement of boiling the rate of condensation is extremely high. The drain-cocks usually fitted to the steam jackets should be opened when steam is first turned on, and as soon as steam begins to issue they should be completely shut off. The steam trap should then be able to take care of the condensing steam without any loss of pressure and consequently temperature, in the steam jacket. The ideal arrangement provides for an independent steam trap to each pan in order to obviate the trouble.

COOLING PLATES.

Cooling plates should be of the solid type of cast iron, i.e., all in one piece with removable side plates

giving access with the water spaces; this type gives freedom from leakages caused by the sudden expansions set up by masses of hot toffee being suddenly placed on them, and it also facilitates the removal of the scale of sludge that will readily form with some types of cooling water.

MIXING, CUTTING AND WRAPPING.

When large masses are to be dealt with at a time, it is desirable to use a pan fitted with beaters and vertical stirrers. The pan should allow of being tilted when the boiling is complete. Finally roll out into sheets and pass them through the cutter knives of the

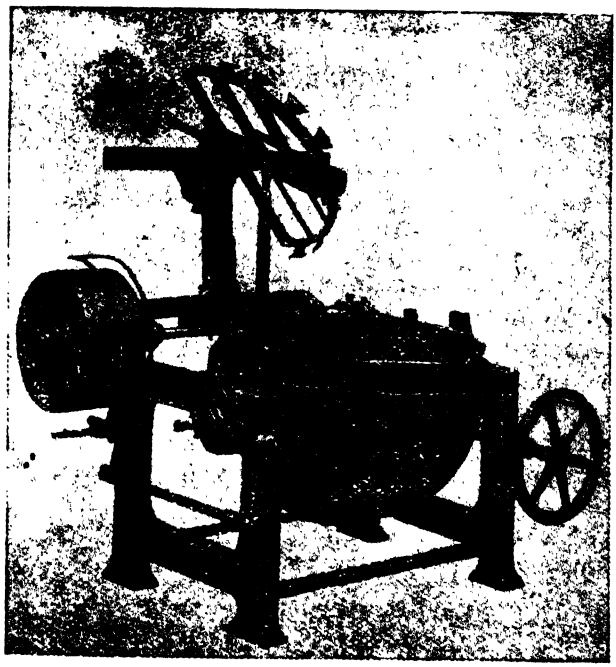


FIG. 9. CARAMEL MIXING MACHINE.

caramel cutting machines. The knives descend in a vertical direction with a shearing action and allow of difference in width and depth of cuts. Usual dimensions for these classes of articles vary from 1½ in. by 1 in. by ½ in. to ⅝ in. by ⅝ in. by ¼ in.

The pieces are then to be wrapped neatly in paper. If not properly attended to, the caramels will present most irregular shapes.

FIG. 10. CARAMEL & TOFFEE CUTTERS.

The wrapping being a tedious and difficult operation, application is made of machines for this purpose. It does the wrapping work quite neatly and quickly.

Machines have also been invented which combine cutting and wrapping operations in one. The caramel mass is fed into these machines where they are conveyed on a travelling band to cutting and wrapping appliances. The goods come out ready to be packed.

CHEAP CARAMELS.

Where butter and cream are not used, it is the usual practice to melt some fat (whether animal fat or coconut fat) and mix it with flour to give it a body. Sugar, glucose and milk are boiled to a crack and to the boiling mass is added the mixture of fat and flour. The caramel is cast as stated before. Following is a good recipe :

Brown sugar	42	lbs.
Glucose	26	,,
Hardened coconut oil	6	,,
Wheat flour	26	,,
Salt	6	,,
Coumarine to taste.		

Procedure:—Melt sugar, glucose and fat. Work in flour and boil to about 280°F.

CLEAR CARAMELS.

Crushed sugar	6½ lbs.
Cocoa Butter	2 oz.
Butter	½ lb.
Cream of Tartar	a pinch.
Condensed Milk	1 qt.
Vanilla Essence	q. s.

Procedure:—Crystallised sugar should be crushed in a sugar mill before use. Bring the crushed sugar, milk and cream of tartar to the boil. Then add the other ingredients one by one and boil up to crack. During boiling stir the whole mass. Pour out on to an oiled slab and when cool mark off.

COCONUT CARAMELS.

I.

Sugar	4 lbs.
Milk	1 qt.
Cocoa Butter	2 oz.
Glucose	1 lb.
Coconut	¾ ,,
Cream of Tartar	a pinch
Condensed Milk	one tin

Procedure:—As for clear caramels or for other Caramels.

CREAM CARAMELS.

I.

Sugar	6 lbs.
Glucose	1 ,,
Fresh Butter	½ lb.
Cream (condensed milk)	1 qt.
Lemons	2

Procedure:—Take 2 lemons of selected quality and bring out the rest by rubbing. Now put in a copper steam pan with 2 oz. sugar and cook upon a gas stove until the solution looks light brown. Now have the remaining sugar dissolved in cream or milk, add glucose and bring to a boil on a stove with constant stirring. Now incorporate caramel flavour already prepared and butter. Allow the whole to boil up. To test if boiling has been made to the proper consistency, drop a little on cold water. If it breaks off with a crack, then the preparation is ready for further treatment. Pour out the preparation on a marble slab properly oiled and surrounded by iron bars. Allow the syrup to cool and mark off into cubes or medium-sized oblong pieces or other shapes as desired. Put in the market in grease-proof paper.

II.

White sugar	27	lbs.
Glucose	27	,,
Full cream sweetened condensed milk	26½	,,
Hardened coconut oil	12½	,,
Butter	7	,,
Salt	2	oz.
Vanillin crystals	3	oz.

Procedure:—Melt carefully and boil quickly to about 250°F stirring well. Add vanillin at the latest possible moment. Caramel should be a very light colour with a soft bite. Cut and wrap without delay.

III.

Brown sugar	23	lbs.
Glucose	23	,,
Full cream sweetened condensed milk	20	,,
Hardened coconut oil	20	,,
Salt	3	oz.
Vanillin crystals	1	,,

Procedure:—Melt sugar, glucose, milk and fat. Add salt and corn flour slowly to avoid lumps forming and boil to about 260°F. Add vanillin at latest possible moment before pouring.

CHOCOLATE NUT CARAMEL.

Granulated sugar	2 cups
Confectioner's glucose	1½ „
Cream	2 „
Butter	1 cup.
Sweet chocolate	3 or 4 oz.
Walnut kernels	1½ cups
Vanilla Extract	2 teaspoonfuls

Procedure:—Take the sugar, glucose, half of the milk and butter in a copper pan and put on a mild fire. Bring to a boil with constant stirring. When the mass continues to boil briskly add the remaining part of the milk. Cook till a temperature of 250°F is attained or boil to a *hard ball*. To test if the proper syrup has been attained or not, drop a little on cold water. If it breaks with a crack, no more heating is necessary. Remove from the fire, add the chocolate and nuts and heat till the chocolate is not melted. Then incorporate the vanilla and beat well. Now have a biscuit pan well oiled or buttered. Spread the caramel on the pan to a thickness of about ¾ inch, when nearly cold, pour and cut into cubes.

CHOCOLATE CARAMEL (Extra Kind).

Cream	3 pints
Fresh Butter	1 lb.
Unsweetened chocolate	1 „
Sugar	2 lbs. 13 oz.
Glucose	2 lbs. 13 „
Vanilla Essence	4 drms.

Procedure:—The chocolate mass is thinned down by addition of water and then cooked to a paste. Usually ½ pint of water will be sufficient for 1 lb. of chocolate mass. To the paste mass add sugar and glucose and continue heating till the whole boils up. Now add cream and cook till *crack* stage is not arrived at. Finally add butter and vanilla essence.

CHOCOLATE CREAM CARAMEL.

Fresh Cream	3 lbs.
Fresh Butter	1 lb. 2 oz.
Unsweetened Chocolate	2 lbs.
Loaf-sugar	3 ,,
Vanilla Syrup	1 lb.
Glucose	12 oz.

Procedure:—Put sugar, glucose, cream, along with the vanilla syrup, into a hand-pan which has been thoroughly cleansed. Boil over a not too-sharp fire, stirring continually with a wooden spatula. Keep the sides of the pan well sponged. When the liquid reaches *ball point* put in the chocolate after first melting it, and then add the butter in pieces gradually; when this is done, boil to *hard ball.* Pour.

FRUIT CARAMELS.

Sugar	2 lbs.
Chopped Walnuts	½ pint.
Glucose	1¼ lb.
Ground Dried Fruit	1 lb.
Butter	2 oz.
Cream (whipping)	2 qt.

Procedure :—Cook sugar, glucose and half of the cream to 238°F. Then add half of rest of the cream and cook to 242°F. Now add the remaining cream, dried fruit, butter and chopped nuts and cook to

248°F. Pour into an oiled pan or upon a slab to cool and harden.

COFFEE CARAMELS.

Sugar	4 lbs.
Glucose	3 lbs.
Cream (40%)	½ gallon.
Coffee	½ gallon.

Procedure:—Cook the above to 238°F. Then add 1 quart sweet cream and cook to about 242°F. Remove from fire.

CHEAP WRAPPED CARAMEL.

Condensed milk	36 lbs.
Glucose	28 ,,
Sugar	4½ ,,
Fat	2½ ,,
Flour	10 ,,
Vanilla	4 oz.

Procedure :—Place sugar, glucose and condensed milk. Cook to *crack*. In the meantime melt down the fat and stir in the flour. Now mix the two together quite intimately and add the vanilla.

WRAPPED CARAMEL.

Condensed milk	35 lbs.
Sugar	15 ,,
Glucose	30 ,,
Coconut, Almonds or Walnuts	6 ,,
Coconut Fat	3 ,,
Flour	5 ,,
Flavour to taste	q. s.

Procedure:—Cook the first three ingredients to *crack* and melt the coconut fat and flavour together. Finally to the first mix the nuts and then the fat and flour mixture.

CHAPTER X.

TOFFEES

TOFFEES are made much in the same way as the caramels, the only difference in this case being that the syrup is boiled to hard crack. The ingredients in the manufacture of toffee are sugar water, cream of tartar, butter, etc. In making cheap preparations butter may be replaced by any other fat but in that case it is advisable to have it previously mixed with flour or milk.

PROCESS OF MANUFACTURE.

The usual process of manufacture consists in boiling sugar with water in a pan heated by steam or gas to the *hard ball* stage. As already mentioned when milk is added to sugar during boiling, the pan should be heated by steam till the syrup attains a *soft ball* stage. The pan is then removed from fire and when the mass becomes cool, butter and other flavouring ingredients are incorporated in the mass. It should be noted that butter should not be added to the boiling sugar because in that case the whole mass is liable to boil over.

As already stated the cooking pan may either be heated by coal, gas or steam. But as the mass is to be allowed to cool after boiling or the pan is to be removed from fire, it is better to arrange heating by gas or steam. In this case gas or steam may be turned off and the contents of the pan may cool on the spot without being transferred from there.

MIXING.

Success is toffee making depends not a little extent on the intimate mixing of the various ingredients. As mixing by hand is both difficult and tedious, manufacturers now employ high speed mixing pans during the

FIG. 11. TOFFEE MIXING MACHINE.

mixing. This type of machine possesses a steam-jacket through which steam may circulate freely. The machine is provided with mixers and beaters which are capable of quick rotation and blend most harmoniously such apparently immiscible ingredients as fat and syrup. Thorough incorporation is only possible with such a machine.

The steam-pan is a strong construction of the ordinary high pressure steam-pan, so well known to every confectioner, slung in such a manner that after the heaters have been raised it can be tilted for the purpose of discharging its contents. The beaters or mixers can be easily raised from the pan to the position shown in Fig. 9 so that they can be cleaned and scraped free from adhering material. Little hinged finger-scrapers touch the sides and continually clear the surface of the pan when the beaters are in position and revolving, and so prevent local burning of the toffee-mixing on the hot surface of the steam-pan. The beaters themselves are driven at high speed, and not only keep the mixing in a continual state of agitation but ensure thorough incorporation of the ingredients and give the lightness which is so desirable in the toffees of to-day.

BOILING AND CASTING.

The well-mixed toffee is then boiled again for some time to ensure more thorough incorporation. After the toffee has been boiled in the steam or gas cooker, it is poured on to the cooling plate where it is allowed to cool off to a certain extent. It is then placed into the Batch Roller which is heated by steam, gas or electricity, so as to keep the toffee at a constant temperature, and this machine is arranged so that during the process of rolling the toffee is formed into tapered shape, the narrowest end being about 2″ in

diameter. This tapering process facilitates the feeding of the toffee into the cutting and wrapping machine, and only one boy is needed to draw the toffee out of the Batch Roller and guide it into the feeding channel of the cutting and wrapping machine. The wrapping materials are drawn automatically from reels as will be observed from the illustration of the toffee making plant and the finished sweets leave the machine by

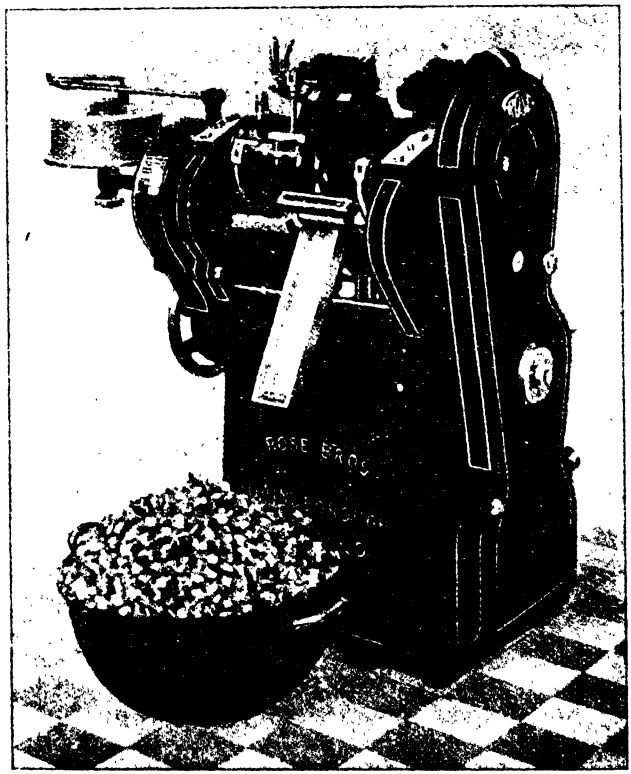
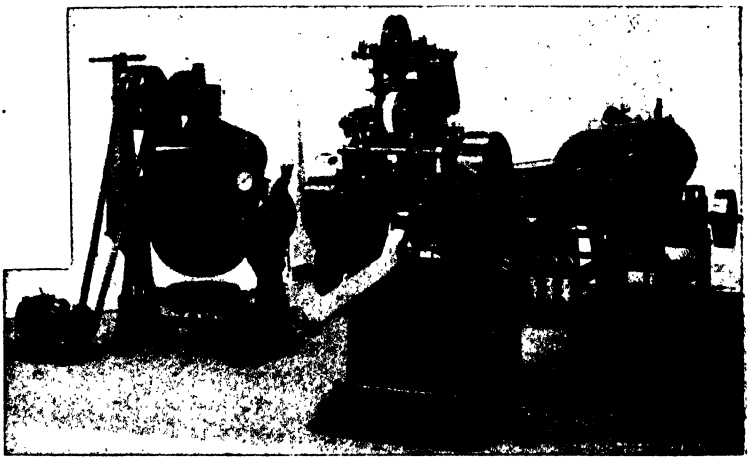


FIG. 12. TOFFEE WRAPPING MACHINE.

means of the curved delivery trough at a speed of 250/280 per minute.

TOFFEE MAKING PLANT.

Fig. 13 shows the layout of the toffee making plant. If the cooker is heated by gas the steam plant is not absolutely necessary, although the common practice is for steam to be used. It is also a good plan to have the steam plant separated from the other machinery, say by means of a partition, although this is not absolutely necessary.



Electric Motor. | Toffee Mixing Pan. | Cutting & Wrapping Machine. | Batch Roller.

FIG. 13. TOFFEE MAKING PLANTS.

When manufacture is done on a small scale the toffees may be cut into regular shape in one machine and then wrapped in another in waxed paper. Now-a-days machines have been invented which carry out both the cutting and wrapping operations easily and

efficiently at the same time. These machines cut and wrap sweets at considerable speed, about 180 units per hour.

SLAB TOFFEES.

Slab toffees in ½ lb. cakes are often made by levelling in toffee on the cooling plates and, when it is partly set, placing upon the slabs frame-like cutters whose weight is sufficient to make the necessary indentations on the surface of the material. The cutters, composed of knife-like strips of steel tinned together after making, are of necessity very fragile. They should be handled with extreme care to avoid burring the edges and causing trouble through the burrs catching in the toffee. A good plan is to keep the cutters in a shallow box, the bottom of which contains pad of felt saturated with oil, as this keeps the edges greased and helps to prevent sticking and it also minimises the risk of damage to the edges. Where cutters are in constant use a spare set should always be available. Should one set become overheated or stuck to a batch, considerable delay will be caused while it is being washed and dried. It is of course important that the drying is thoroughly carried out.

There are several ways in which the cut and wrapped square can be made. In the earlier methods these operations are performed in stages. The toffee is poured on to the cooling plates and is levelled off by a special travelling carriage fitted with slabs. Cutters are also arranged on this carriage to cut the toffee into suitable squares when it is sufficiently set. In a variation of the method, the toffee is cooled on the slabs, and is subsequently reduced to a constant thickness by passing it through steel rollers or brakes. The toffee is then transferred while still soft to cutting or pressing machines for division into squares. The cutting

machine equipped with sets of rotary cutters and the toffee is passed twice under them, its position being turned through a right angle between the two cuts. After cutting the toffees are wrapped with tissue paper of good quality. The operation is efficiently done by wrapping machine.

RECIPES.

A few well tried recipes follow :—

I.

White sugar	4 lbs.
Water	1½ pints
Cream of tartar	¼ oz.
Butter	¾ lb.
Oil of Lemon	q. s.

Procedure :—Sugar is dissolved in water to which cream of tartar is then added. Boil quickly to 305—310°F (hard crack stage) in a steam pan. Turn off the steam and let the mass to get cool to some extent. Then add the remaining ingredients and mix very thoroughly. Butter should be added in a molten condition while quite hot and gradually added to the boiled sugar until the whole is absorbed. Reboil until the butter is well boiled through. Finally pour on cooling table, cut and wrap as already mentioned.

II.

Sugar	2 lbs.
Milk	1 pint
Warm Glucose	6 oz.
Fresh Butter	3 „
Flavourings	q. s.

Procedure:—Boil the first two ingredients in a steam pan taking care to wash off the sides of the pan from time to time. Boiling should not be allowed to proceed beyond the *soft ball* stage (240°F). Then

add the other two ingredients and continue boiling to *hard ball* (265°F). Flavouring agents such as vanilla essence, lemon essence may be mixed thoroughly with the batch. Finally proceed as in (I).

This toffee is known as milk toffee.

III.

Sugar	1 lb. 14 oz.
Cream of tartar	1 pinch
Full cream milk	1 pint
Warm Glucose	6 oz.
Fresh Butter	5 oz.

Procedure:—Boil the first three ingredients to the *soft ball* stage and proceed as in (II).

IV.

Sugar	7 lbs.
Glucose	1½ ,,
Butter	1 lb.
Water	q. s.

Procedure:—Boil sugar, water and glucose to 300°F. Then proceed as in (I).

V.

Sweetened condensed milk	3 lbs.
Full cream milk	1 quart
Sugar	3½ lbs.
Glucose	4 ,,
Vanilla and salt, to flavour	q. s.

Procedure :—Cook to crack all the ingredients together except the last two. Add butter and vanilla essence. Finally cut in large squares.

VI.

Lump sugar	12 lbs.
Glucose	1 lb.
Butter	1½ lbs.

Water	3 pints
Shelled walnuts	2 lbs.
Salt	a pinch.

Procedure:—Boil lump sugar, glucose and water to 300°F and proceed as in (I). The prepared toffee is then poured on well-oiled oblong tins and the top is levelled. Now the halves of walnuts are pressed on the toffee in irregular lines and when nearly cold divisions are marked with a knife.

VII.

Sugar	4 lbs.
Water	3 cupfuls.
Cream of Tartar	½ teaspoonful
Butter	2 oz.

Procedure:—Put the water sugar and cream of tartar into a pan and stir until they boil but no longer. Add the butter after the other comes off the fire, but do not stir it in.

VIII.

White sugar	28 lbs.
Cream of tartar	½ oz.
Water	1 gallon.

Butter flavour to taste.

Procedure:—Dissolve sugar in water, bring to boil, add cream of tartar and boil quickly to 310° to 315°F. Add flavouring essence and pour quickly.

IX.

White sugar	60 lbs.
Glucose	40 ,,

Butter flavour to taste.

Water	1 gallon

Procedure:—Dissolve the sugar in water and boil. Then add the glucose. Now cook to 310°F. Add flavouring essence and pour quickly.

CREAM TOFFEE.

Brown sugar	30½ lbs.
Glucose	28½ ,,
Full cream sweetened Condensed milk	25 ,,
Hardened coconut oil	16 ,,
Salt	9 oz.
Vanillin Crystal	½ ,,

Procedure:—Melt all the ingredients carefully in steam stirring pan, and cook to required degree, usually about 285°F. Add vanillin crystals just before pouring on plates.

TREACLE TOFFEE.

I.

Brown sugar	22 lbs.
Glucose	17 ,,
Full cream sweetened condensed milk	22 ,,
Butter	11 ,,
Black Treacle	22 ,,
Refined molassses	5½ ,,
Salt	½ lb.
Butter essence	½ oz.

Procedure:—Melt the ingredients and boil to about 280°F, stirring well. Characteristic bubbles are noted when cooking is complete.

II.

Brown sugar	30½ lbs.
Glucose	18½ ,,
Black treacle	9½ ,,
Skim sweetened condensed milk	23 ,,
Salt	½ lb.

Procedure:—As above.

CHAPTER XI.

CHOCOLATE.

CHOCOLATE is a paste made from the roasted seeds of the Theobroma cacao, or Cocoa. Strictly speaking, the term chocolate is applicable to all genuine preparations of cocoa, but it is now generally used to distinguish those which contain sugar, and commonly, flavouring substances. Of late years great attention has been paid to the manufacture of chocolate in India. But their output falls far short of the demand. There thus seems to be immense field for making chocolates in India, particularly in the cities and towns, the abodes of numerous children, who seem to have acquired a taste for these goods.

Chocolate is nutritive and wholesome if taken in moderation, but is sometimes apt to disagree with weak stomachs, especially those that are easily affected by oily substances or vegetable food. Aromatics mixed with the richer varieties of chocolate improve the flavour, but render them more stimulant and prone to produce nervous symptoms and brain complaints.

Genuine chocolate dissolves in the mouth without grittiness, and leaves a peculiar sensation of freshness; after boiling it with water the emulsion does not form a jelly when cold, for if it does starch or flour is present. The presence of animal fat may generally be detected by a cheesy or rancid flavour.

INGREDIENTS.

The principal materials that enter into the composition of chocolates are cocoa and sugar; the former

is derived from the fruits of cocoa plant while the latter is refined sugar. For success in the manufacturing line sugar should be previously rendered amorphous by following the directions given on page 11. This operation removes the gritty feel of the chocolate and renders the grinding operation easier and of shorter duration.

The vanilla used in making chocolate is reduced to powder by rubbing it with a little sugar before adding it to the paste.

COCOA.

The cocoa-seed or berry must not be confounded with the cocoanut, which is the fruit of a palm (Cocus nucifera). The cocoa tree is a native of Mexico, and is now more or less extensively grown throughout Central America, Brazil, Peru, Venezuela, Caraccas, Ecuador, Grenada, Demerara, Essequibo, Guayaquil, and Surinam; with some of the West India Islands. foremost among which stands Trinidad. The following is a list of the principal kinds of cocoa:—Caraccas, Surinam, Trinidad, Grenada, Jamaica, Dominica, Guayaquil, Venezuela, Bahia, Brazil, St. Lucia.

The pods containing the seeds are gathered when ripe, and after having lain for a day and a night are opened, and the seeds, which are taken out by hand, are submitted to what is termed the sweating process. They are first placed on a sloping floor or in baskets. so that the chief part of the pulp in which they are enveloped may drain off, and are then shut up in a close box, and left for 24 to 48 hours, according to the season and weather, after which they are turned out in the sun to dry. Upon a nice performance of the sweating process, which may be likened to malting, the value of the cocoa greatly depends. When quite dry the seeds are ready for use.

Cocoa, when unadulterated, forms a wholesome and highly nutritious beverage. Its active principle is theobromine, an alkaloid greatly resembling caffeine, the active principle of coffee and tea. A peculiar concrete oil, called cocoa butter, or, more correctly, butter of cacao, is another important constituent, forming more than half the weight of the seed. The presence of about 2 % of albumen gives to cocoa its nutritive character.

ADULTERATION.

Much of the cheap stuff sold as genuine cocoa is shamefully adulterated with palm kernel shells, crab's eyes, coloured earthy substances as reddle, Venetian red, umber, &c. To some chalk or plaster of Paris are added, for the purpose of increasing the weight and alkali to heighten the colour. Many of the samples consist of sugar and starch, with only sufficient cocoa to impart a flavour. Cocoas containing a moderate amount of arrowroot of other starch must not be considered adulterated articles, for it is impossible to render cocoa soluble, or rather emulsive, without the addition of some diffusible substance.

PRIMITIVE METHOD OF CHOCOLATE MAKING.

The primitive method of preparing chocolate was very simple consisting in roasting the beans in a pot or a shovel to develop their flavour, winnowing in the wind and rubbing the broken shelled beans between stones until quite fine. The curious thing is that on grinding the cacao bean in the heat of a tropical sun a powder is not produced but a paste. This is because half the cacao bean consists of a fat which is liquid at 90°F. The paste is then made into small rolls and put in a cool place to set.

MANUFACTURE ON A SMALL SCALE.

On a small scale the process of chocolate making consists in roasting the beans in an iron kettle over a furnace. The beans are stirred with a ladle to prevent the beans from burning. The beans are then bruised and freed from husks which are then sifted out. The broken pieces of beans are known as nibs. These are also formed during husking and kept separate for future use. The kernels are then found to get nibs which are ground in a mill consisting of stone or metal rollers, which are usually heated either by charcoal fires or by steam, so as to soften or melt the natural fat (cacao or cocoa butter). The warm, smooth paste which passes from the mill is then placed in a mixing mill and incorporated with refined sugar, and usually vanilla or other flavouring substance. The trituration is continued until the whole paste is coverted into an entirely homogeneous mass, which is finally shaped by means of suitable moulds, into various forms, as blocks, loaves, tablets, lozenges, &c.

The chocolate commonly sold in England is prepared from the cake left after the expression of the oil, and this is frequently mixed with the roasted seeds of ground peas and maize or potato flour, to which a sufficient quantity of inferior brown sugar, or treacle and mutton suet is added to make it adhere together. Inferior sweet almonds are also employed in the same way.

STAGES IN MANUFACTURE.

The various stages in the manufacture of chocolate are:—

(1) Cleaning and sorting.
(2) Roasting.
(3) Obtaining pure nibs.
(4) Grinding the nib.

(5) Pressing out the cacao butter.
(6) Obtaining the powder.
(7) Covering chocolate.

SORTING & CLEANING.

The cocoa beans of commerce appear on the market in sacks, and according to the care with which they have been tended during the processes of fermentation and curing, are in a more or less fit state for immediate roasting. They are generally admixed with various impurities and foreign matter. They usually contain free shell, string from the bag, small twigs of dried placenta from the pod, stones, dust, etc. Such odd substances as cowrie shells, crab's eyes, palm kernels are found with the cocoa beans. These impurities must be carefully separated from the beans before these are rendered fit for being subjected to the roasting operation.

In order to remove these impurities the beans are removed by passing through a series of rocking sieves. The separation of the lighter articles is assisted by a strong current of air. The cleaning operation is also done in inclined revolving cylinder of wire gauge along which the beans pass. The cylinder forms a continuous set of sieves of different sized meshes, one sieve allowing only sand to pass, another only small beans or fragments of beans and finally one holding back anything larger than single beans. These machines are provided with magnets to draw out pieces of iron, if any in the beans.

The beans are also to be sorted according to their size to ensure even roasting. This sorting is usually performed with the help of machines available in the market in several types. The underlying principles for all these are the same, that is, the progress of the beans through a series of sieves of varying meshes

which are usually provided with a rocking motion in order that full advantages of their surface may be taken.

The top and first sieve is of a fine mesh, which will allow only very small and shrivelled beans, small pieces of wood, stone and dust, to pass through. The beans, in falling to the next sieve, may be winnowed by a power-driven fan in such a way and direction that hollow beans, pieces of sacking, straw, etc., which are lighter than the smallest desirable bean, are blown into a receptacle leading to the passage where the first sievings are descending to the waste outlet.

The beans must pass over a number of sieves of different meshes, according to the number of grades required, each sieving being led to a separate outlet. Subsequently the grades may be picked over by hand to remove any defective beans or foreign material that may have escaped the sieving.

ROASTING.

The next step in the manufacture of chocolate is roasting, which is very essential for securing the peculiar taste of the chocolate. This develops the aroma of the beans by bringing about changes in the chemical composition of the volatile oils at a high temperature. The roasting operation also brings about changes in the colouring matter of the bean, causes gelatinisation of, or rendering soluble starch granules and modification of tannin and other astrigent matters. The roasting also helps drying of the husk and bean, so that the former can be readily removed and the latter is freed from moisture, the presence of which would hinder the complete mixing of the fatty nibs when crushed and tend to destroy the keeping qualities of the chocolate prepared from the damp nibs.

Roasting is a delicate operation requiring experience and discretion and remains as much an art as a science. For this purpose revolving drums heated either over coke fires or by gas are requisitioned. This ensures constant agitation. Less frequently the heating is effected by a hot blast of air or by having inside the drum a number of pipes containing superheated steam.

The roasting apparatus resembles an ordinary coffee roaster. The bean is fed in through a hopper and is heated by gas in the slowly revolving cylinder. The beans can be heard lightly tumbling one over the other, and the aroma round the roaster increases in fullness as they get hotter and hotter. The temperature which the beans reach in ordinary roasting is not very high, varying round 135°C., and the average period of roasting is about one hour. The period of roasting and the temperature of roasting depends on the results desired. In some cases roasting is allowed to proceed up to the ace of burning while in some cases roasting is not allowed to proceed beyond getting scalded.

After roasting, the shell becomes brittle and quite free from the cotyledons or kernel. The kernel has become glossy and friable and chocolate brown in colour, it crushes readily between the fingers into small angular fragments (the "nibs" of commerce), giving off during the breaking down a rich warm odour of chocolate.

REMOVING THE SHELL.

The removal of the shell, which in the raw condition is tough and adheres to the kernel, is greatly facilitated by roasting. If we place a roasted bean in the palm of the hand and press it with the thumb, the whole cracks up into crisp pieces. It is now quite easy

to blow away the thin pieces of shell because they offer a greater surface to the air and are lighter than the compact little lumps or " nibs " which are left behind.

In order to break down the beans to just the right size, they are passed through two rollers, capable of being set to any required dimension to suit the size of the sample or for purposes of regulating the grade of the nibs. The crushed beans are carried to the top of the machine by an elevator, and are discharged into an inclined cylindrical sieve. Separation of the husk from the nibs is efficiently carried out by fans.

About one per cent. of the cocoa bean fragments consists of germs. These are the dead embryo or radicle of the seed. The complete separation of these germs from the finer cocoa is generally carried out in the germ separator, the essential features of which are explained later on.

The heavier pieces of shell to which some cocoa has remained adhering, and the pieces, which have not passed through any division of the sieve, fall at the end of the machine into a worm conveyor, and are returned to be passed again through the rollers.

The germs are small and rod-shaped, and being hard are generally assumed to be less digestible than the nib. They are separated by being passed through revolving gauze drums, the holes of which are of the same size and shape as the germs, so that the germs pass through whilst the nib is retained. By this process the germs are not separated alone but carry with them the finer particles of nib and shell. This germ mixture, known as " smalls " is dealt with in a special machine, whilst the largest nib and shell are conveyed to the chief winnowing machine. In this machine the mixture is first sorted according to size and then the nib and shell separated from one another. The mixture is passed down long revolving cylindrical sieves

and encounters a larger and larger mesh as it proceeds, and thus becomes sieved into various sizes. The separation of the shell from the nib is now effected by a powerful current of air, the larger nib falling against the current, whilst the shell is carried with it and drops into another compartment.

The pure cocoa nibs now proceed to the blending and thence to the grinding mills.

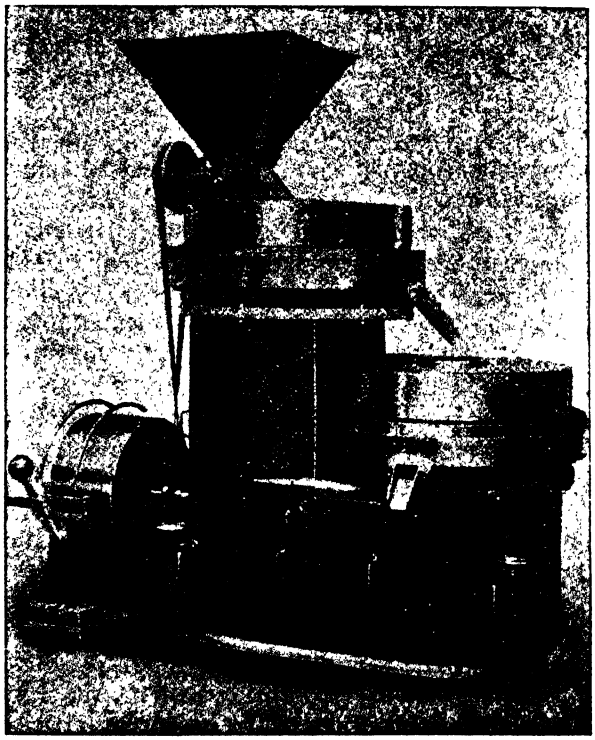


FIG. 14. TWO STONE COCOA MILL.

BLENDING.

The operation is performed to increase the aroma of the product. It is done by judiciously mixing the roasted beans of several countries so as to develop in each its characteristic flavour.

This depends upon individual likes and dislikes of customers. Some useful blends are :

1. Grenada 3 ; Bahia 1 ; Ceylon 1 ; and Para 1.
2. Grenada 3 ; Maranhao 1 ; and Guayaquil 1.
3. Trinidad 1 ; and Para 1.
4. Trinidad 1; Maranhao 1; Guayaquil 1 ; and Para 1.
5. Trinidad 1; and Caracas 1.
6. Samana 1; and Santa Lucia 1.
7. West African 1; and Trinidad 1.

GRINDING THE COCOA NIBS TO PRODUCE MASS.

In this process, by the mere act of grinding, the miracle is performed by converting the brittle fragments of the cocoa bean into a chocolate-coloured fluid. Half of the cocoa beans is fat, and the grinding breaks up the cells and liberates the fat, which at blood heat melts to an oil. Any of the various machines used in the industries for grinding might be used, but a special type of mill has been devised for this purpose.

In this type of mill one grinding stone rotates on a fixed stone. The nibs are fed into a hopper, so as to fall between a pair of revolving stones, which are the highest and first of a series through which the paste will have to run. Owing to the manner in which the grooves are cut in the two surfaces in contact, they move in the opposite directions, and as the one stone revolves on the other, a slicing or shearing action is produced. The friction, due to the slicing and shearing of the nib, keeps the stones hot, and they become sufficiently warm to melt the fat in the ground nib, so

that there oozes from the outer edge of the bottom or fixed stone a more or less viscous liquid or paste. This finely ground nib is known as "mass." It is simply liquefied cocoa bean, and solidifies on cooling to a chocolate-coloured block.

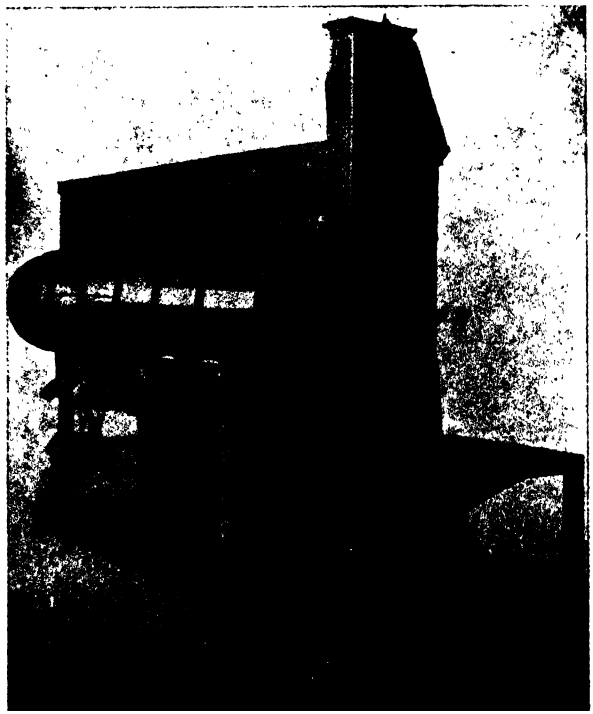


FIG. 15. COCOA MILLING, HUSKING & WINNOWING MACHINE.

This mass may be used for the production of either cocoa or chocolate. When part of the fat is taken away, the residue may be made to yield cocoa. When sugar and cocoa butter are added it yields chocolate.

Thus the two industries are seen to be inter-dependent, the cocoa butter which is pressed out of the mass in the manufacture of cocoa being used up in the production of chocolate.

PREPARATION OF CHOCOLATE PROPER.

The mass so obtained is mixed with the required amount of sugar in a special type of grinding-mixer called a melangeur. This consists of two heavy mill stones which are supported on a granite floor. This floor revolves and causes the stationery mill stones to rotate on their axes, so that although they run rapidly, they make no headway. The material is prevented from accumulating at the sides by curved scrapers, which deflect the stream of material to the part of the revolving floor. Thus the sugar and nib are mixed and crushed. As the mixture usually becomes like dough in consistency, it can be neatly removed from the melangeur with a shovel.

The proportions of the various ingredients used in making plain chocolates follow. But when common chocolates are made, additional materials admixed into the mass of chocolate are besides low grade beans, much husk and a considerable amount of starch.

It may also be mentioned that a certain saving of cocoa butter is effected by rapid amalgamation of the ingredients and use of amorphous sugar.

I.

Caracas	16¼ lbs.
Para	9¼ ,,
Trinidad	18½ ,,
Sugar	55¾ ,,
Vanilla	¼ lb.

II.

Cocoa mass	49 lbs.
Sugar	49 ,,

Cinnamon	1½ lbs.
Vanilla	½ lb.

III.

Cocoa mass	39 lbs.
Sugar	59 ,,
Cinnamon	1½ ,,
Cloves	½ lb.

IV.

Cocoa nibs or mass	33 parts
Cocoa butter	13 ,,
Sugar	53¾ ,,
Flavouring	¼ part

V.

Caracas	18¾ lbs.
Maraguan	18¾ ,,
Hazel-nuts	3¼ ,,
Sugar	59 ,,
Vanilla	¼ lb.

FRENCH CHOCOLATE.

The proportions used for the best description are said to be—2 lbs. of vanilla and 1 lb. of the best refined sugar to every 3 lbs. of the choicest cacao nuts.

SPANISH CHOCOLATE.

The following forms are said to be commonly adopted :

1. Caracas cocoa, 11 lbs.; sugar (white), 3 lbs.; vanilla, 1 oz; cinnamon (cassia), ¼ oz.; cloves, ½ dr.

2. Caracas cocoa, 10 lbs.; sweet almonds, 1 lb.; sugar, 3 lbs.; vanilla, 1¼ oz.

3. Caracas cocoa, 8 lbs.; island cocoa, 2 lbs.; white sugar, 10 lbs.; aromatics, as above.

4. Island cocoa, 7 lbs.; farina, q.s. to absorb the oil. Inferior.

VANILLA CHOCOLATES.

This variety of French or Spanish chocolate is highly flavoured with vanilla. The following proportions have been recommended.

1. Caracas cocoa, 7 lbs.; Mexican vanilla, 1 oz.; cinnamon, ½ oz.; cloves, 3 in number.

2. Best chocolate paste, 21 lbs.; vanilla, 4 oz.; cinnamon, 2 oz.; cloves, ½ dr.; musk, 10 gr.

GRINDING THE MIXTURE.

The mixture is now passed through a mill looking like a multiple mangle. The object of this is to break down the sugar and cocoa to smaller particles. The rolls may be made either of granite or of polished chilled cast iron. The cylinders in contact run at

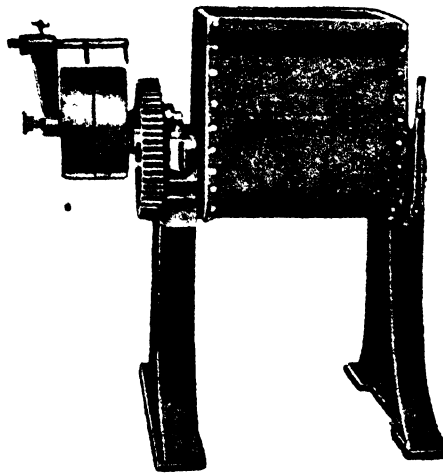


FIG. 16. · CHOCOLATE MIXING MACHINE.

different speeds and the chocolate always clings to the roll which is revolving with the greater velocity, and is delivered from the rolls either as a curtain of chocolate

or as a spray of chocolate powder. It is very striking that the soft chocolate-coloured mass becomes, after merely passing between the rolls, a dry powder. There we find that the sugar having been more finely crush-

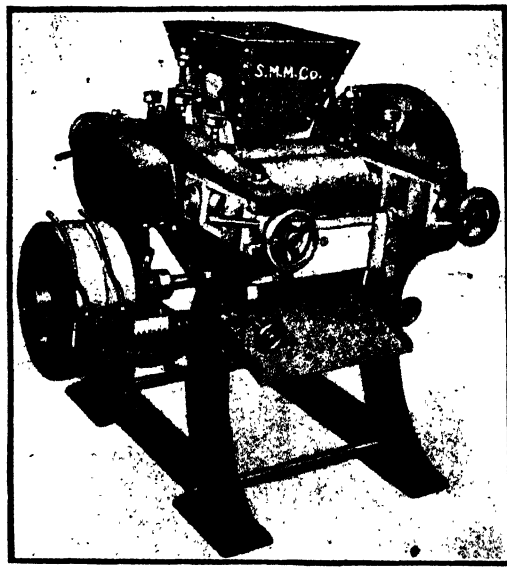


FIG. 17. CHOCOLATE GRINDING MACHINE.

ed requires a great quantity of cocoa butter to lubricate it before the mixture can again become plastic. The chocolate in its various stages of manufacture, should be kept warm or it will solidify and much time and heat will be absorbed in remelting it; for this reason the chocolate factory must be equipped with a number of hot chambers, in which the chocolate is stored before passing on to the next operation. The dry powder coming from the rolls is either taken to a hot room, or at once mixed in a warm melangeur. The

grinding between the rolls and the mixing in the melangeur are repeated any number of times until the chocolate is of the desired fineness. The chocolate may now proceed direct to the moulding operation or it may first be conched, which process we just describe below.

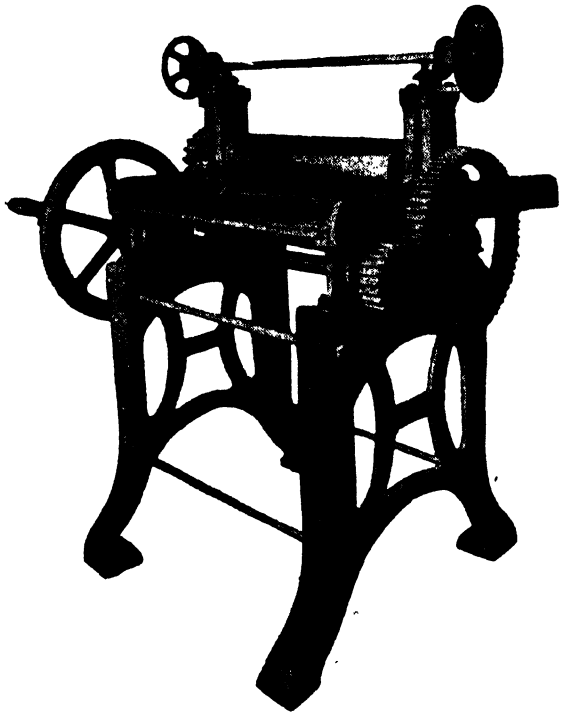


FIG. 18. CHOCOLATE GRINDING ROLLER.

CONCHING.

This is an extraordinary process said to have been originally introduced to make the chocolate readily melted in the mouth without a cloying effect due to the presence of excess of cocoa butter. In this process

the chocolate mass is put in a vessel shaped like a shell (hence called a conch), and a heavy roller is pushed to and fro in the chocolate.

FLAVOURING.

Although the fundamental flavour of a chocolate is due to the blending of beans and their methods of manufacture, yet the piquancy and special character are often obtained by the addition of minute quantities of flavourings. These must be added as late as possible so as to avoid the possible loss of aroma in handling. The flavours used include cardamom, cassia, cinnamon, cloves, coriander, lemon, mace, and vanillin.

MOULDING.

The chocolate mass which is stored in hot chamber is now submitted to the moulding operation. But before actually going through this process, the dough is passed through a compressing machine for removing air-bubbles. This is a necessary process, as the consumers would not care to purchase chocolate full of holes. As in previous operations, every effort has been made to produce a chocolate of smooth texture and fine flavour, so in the moulding process skill must be exercised in converting the plastic mass into hard bars and cakes, which snap when broken and which have a pleasant appearance.

The important factor in obtaining a good appearance is the temperature, and chocolate is frequently passed through a tempering machine to give it the desired temperature. A suitable temperature for moulding varies from 28°C to 32°C.

Each mould has to contain the same quantity of chocolate. The chocolate mass stands up like a lump of dough and has to be persuaded to be down and fill the mould. This can be most effectively accomplished by hanging the mould up and down on a table. In large

factories the method used is to place the moulds on rocking tables which rise gradually and fall with a bump. During the shaking up the chocolate fills every crevice of the mould, and any bubbles, which if left in would spoil the appearance of the chocolate, rise to the top. The chocolate then passes on to an endless band which conducts the mould through a chamber in which cold air is circulating. As the chocolate cools, it solidifies and contracts so that it comes out of the mould clean and bright. In this way sticks and cakes of chocolates are produced ; other forms require more elaborate moulds. Thus the chocolate eggs, which fill the confectioners' window just before X'mas, are generally hollow and are made in two halves by pressing chocolate in egg-shaped moulds, and then uniting the two halves. Chocolate cream, caramels, almonds and in fact, fancy chocolates are produced in quite a different manner. For thin varieties a rather liquid chocolate is required known as covering chocolate.

MILK CHOCOLATE.

Milk chocolate consists of an intimate mixture of cocoa nibs, sugar, and milk powder. The manner in which the milk is mixed with the cocoa nib is a matter of taste, and the art of combining milk with chocolate. so as to retain the full flavour of each, has engaged the attention of many experts. At present there is no general method of its manufacture—each maker has his own secret processes, which generally include all the processes already described.

I.

Cocoa mass	10	parts
Cocoa butter	20	,,
Sugar	44¾	,,
Milk powder	25	,,
Flavouring	¼	part

II.

Cocoa mass	28 parts
Cocoa butter	12 „
Sugar	33¾ parts
Milk powder	24 „
Flavouring	¼ part

COVERING CHOCOLATE.

Chocolate is much used in covering bonbons and other sweets. The process of manufacturing the chocolate mass remains the same but the proportions vary a little. More of cocoa is added to make the mass flow readily. Good covering mass can be had from good beans only.

I.

Cocoa mass	30 parts
Cocoa butter	20 „
Sugar	49¾ „
Flavouring	¼ part

II.

Cocoa mass	30 lbs.
Cocoa butter	55½ „
Sugar	14 „
Vanilla	½ lb.

III.

Cocoa mass	30 parts
Sugar	49 „
Vanilline sugar	1 part
Cocoa butter	20 parts

When amorphous sugar is used a little amount of grinding blends the ingredients perfectly with a minimum amount of cocoa butter. In making cheap coverture the butter may be replaced by coconut fat and other vegetable fats.

COVERING PROCESS.

The covering operation with chocolate should be done with care and discretion, otherwise the final products will not be perfectly glossy and are likely to develop bloom.

The essential thing which can help eliminating the defects is the perfect regulation of temperature. This alone can add fine finish to the covered goods.

The various processes involved in the manufacture of covered goods are: (1) melting; (2) tempering; (3) covering; (4) dipping; (5) cooling; (6) pressing. Machineries have been designed to do these works mechanically but hand processes are equally efficient when small batches are to be treated.

The melting pans should preferably be steam-jacketed so that the whole mass is heated evenly. The aim of the manufacturer should be to effect quick melting. There should be beaters and agitators which will keep the mass in motion so that no portion of it gets over-heated. The ingredients are also mixed intimately in kneading machines.

After melting the chocolate mass is treated in a tempering machine in large factories to maintain the stock at a uniform temperature.

DETAILED PROCESS.

The detailed process of covering bonbons with chocolate by hand and by machine follows:—

When the covering is done by hand, the melted chocolate mass is maintained at a steady temperature of about 31°C in a shallow pan heated by steam pipes at the bottom of the pan. The melted mass should have the same consistency as the cream.

The preparations to be coated are then thrown into the molten mass of chocolate. After dipping they are found to be completely covered with brown chocolate.

The preparations are then removed with fingers, preferably with the help of forks. Impress marks on the top and place them readily on pieces of smooth or glazed paper to set. Lastly the chocolates are wrapped with tissue paper and tin foils of attractive colour. As already mentioned the finish, colour and glossiness will appear when the molten chocolate is kept at a steady temperature of 31°C.

MECHANICAL PROCESS.

When covering is done with the help of machineries, the confectioners employ a coating machine or an enrober.

In coating machines the molten chocolate is kept in their well. Wire baskets or trays covered with wire screens are suitably filled with large pieces of goods on steam-heated tables and are fed into the well. The trays are given a rocking motion and are withdrawn from the chocolate bath. The trays and the contents are tapped with the result that the surplus chocolate drips off and runs back into the main well.

A sheet of glazed paper or tin plate having the same size of the basket or tray is placed on the covered goods. The paper is held in position by means of a light hand board. The basket is then inverted and covered goods are transferred on the paper or tin.

The enrober does the whole work automatically without requiring manual handling. Pieces to be covered are fed into one end of the machine on a travelling canvas belt. The continuous stream of goods are successively passed through molten chocolate in the well of the machine. There is an air blasting arrangement which removes the surplus chocolate which adheres to the pieces. To ensure perfect withdrawal of the excess chocolate, the pieces are further given tapping movement. These are then transferred to

plates on another travelling web belt and are at once passed continuously to a cooling chamber to set. It has been found by experiments that finish and colour of the resulting products are improved by rapid cooling.

The plates containing the covered goods are placed on racks, one over the other, leaving a little space between the two. The temperature of the room should be maintained at 8°C or 46.4°F. It should be noted that the temperature at which the goods are packed should not be much higher than the temperature of the cooling room. The cooling room temperature should be guided by that factor. In small factories refrigerators with arrangements for a number of racks may be used with profit. The chocolates are then left to set till they get firm. The pieces should not be disturbed while setting.

COMFIT PAN PROCESS.

The covering operation may also be completed in a comfit pan and as these goods appear a bit dull, their colour and gloss may be improved by gumming as in the case of dragees or by further crystallization in sugar syrup.

The chocolate mass is melted in a steam kettle till it acquires a creamy consistency. The temperature should not exceed 88°F. Now take a comfit pan through the jacket of which cold water is made to circulate. Put about 40 lbs. of interiors to be covered in the pan.

The comfit pan is made to rotate and the molten chocolate is added slowly in a stream with one hand. With the other hand stir the centres. When all the pieces are well moistened with chocolate mass, stop rotating the pan. The coating operation is repeated till the goods become round or olive-shaped. During

all these operations care should be taken to pour the chocolate quickly and to stir them moderately; otherwise chocolate mass will not stick to the interior.

FIG. 19. REVOLVING COMFIT PAN.

The resulting product is rather dull due to several charges of chocolate. They should be finally applied a glaze consisting of:—

Gum benzoin dissolved in alcohol	2 parts
Sugar	1 part
Cacao butter	1 part

If the glaze appears to be a bit thick a little more alcohol may be added to it.

The glaze also should be applied in a comfit pan as usual and the centres stirred with hand. The treatment should be continued until the required glaze is obtained.

STORING CHOCOLATES.

The handling of chocolate is a fine art and requires very careful attention. If chocolate is cooled very rapidly, the outer surface will solidify, trapping the latent heat within, which heat will gradually find its way to the surface and cause fat bloom. The proper temperature for storing chocolate is 55° to 65°F and the proper relative humidity 60 to 65 %.

If chocolate is stored in a warm place or exposed to heat the cocoa butter softens or melts, and expands, forcing its way through the spaces between the sugar and cocoa butter particles to the surface. On cooling the cacao butter crystallizes, forming a grayish white film which is greasy to the touch. This type of bloom is known as fat bloom and is a source of trouble during summer months.

Chocolate picks up foreign odours readily and should be stored in a clean room with free circulation of air.

CHAPTER XII.

BONBONS.

THE principle of making bonbons consists in boiling white sugar to perfect transparency in a continuous cooker and in allowing it to cool down sufficiently so that it can be handled with ease. Soft centres made of chocolate or of fruit pulps are placed on the sugar and rolled on from one end to another. The roll is then placed on one end of the table. Under its own pressure this assumes the shape of a cone. The cone is then treated in a batch roller when a pencil-like thread of uniform thickness of about $\frac{1}{2}$ in . diameter is obtained. The merging stick is then cut into sticks of suitable size and punched into fancy shapes in a candy press. It is essential that during press work distribution of pressure should be uniform, otherwise the impressions will not be even and perfect. The bonbons are finally sorted and packed.

METHOD OF PREPARATION.

In modern factories large machines are fitted which render a continuous process possible. Here an unbroken stick of candy is obtained. This is passed between continuous running dies which are subjected to increasing pressure as they are carried on moving chains. The bonbons are here shaped into sizes as required and are put into cooling chambers to set. The principle of manufacture, however, remains the same.

The simplest bonbons are prepared with stiff fruit pulps or pastes. These are flavoured suitably with essences and cut in fancy shapes, oblong or square and given a suitable varnish or glazing as follows:—

GLAZING.

4 oz. of gelatine is stuffed for 12 hours in 5 lbs. of rose water. To the solution dissolve by heat 2 oz. of alum and pass through a hair sieve. To every pound of the gelatine mixture add 1½ lb. of icing or pulverised sugar. This makes a fine glaze.

To glaze the bonbons, dip them to half their depth by means of a round wire dip. Withdraw and allow to dry. When one-half is thus glazed, other side can be glazed similarly.

COLOURS FOR BONBONS.

Finally colour them suitably and with it add raspberry essence a little. The colour may either be applied dry or by brush. Method follows:—

I. Fine white gum is dissolved in water and coloured strongly. Mix this with a quantity of dry powdered starch and keep dry.

To apply the colour, dip a piece of wadding moistened in steam in the coloured powder and lightly rub on the different parts of bonbons to be coloured.

II. Dissolve gum as before and colour strongly. Now make a fluid paste by mixing this with powdered starch and sugar. This is put on a glass cup to dry.

To colour the bonbons rub a moistened brush on the colour and apply to the parts to be coloured.

BONBON VARNISH.

The bonbons can also be given a coating of varnish made of rosin 9¼ oz., sandarac gum 6½ oz. and alcohol 4 lbs. The two gums are ground finely and then put into alcohol which dissolves them on mild stirring. Filter and pack for future use.

ORDINARY BONBONS.

Some bonbons are neither varnished nor given a glaze as explained above. These contain fruit paste

ground fine with powdered sugar in a special grinding machine. Success depends upon perfect grinding so that no grit is left in the paste or sugar. A recipe follows:—

Blanched and roasted nuts	1 lb.
Chocolate dough	1 ,,
Powdered sugar	5½ oz.
Vanilla	q.s.

Procedure:—All the ingredients are ground finely in a Reducing Machine. When the dough is cool, it is worked over a scraper till it begins to solidify. Now cut the bonbons off with a die press into pieces 1¼ inch thick and wrap in tin foil.

FRUIT BONBONS.

A few typical recipes of fruit bonbons are given below :—

Raspberry Bonbons.

Grind apricot to a paste with a little glucose. When glucose is being added it is a good plan to add a pinch of acid like citric or tartaric to the paste during grinding. Raspberry essence is added to the paste and mixed intimately. The paste is then rolled over a table and cut into squares. Then apply glaze as explained on page 113.

Lemon Bonbons.

Juice is extracted from lemons and filtered through a hair sieve. Powdered sugar is then mixed into the juice. This preparation is liable to get unusually dry. To keep it in a soft condition add 5 per cent. of glucose. The paste is then rolled out and cut or cast into squares. Apply glaze as explained on page 113 with gelatine solution and add lemon essence on top for good flavour effect. Colour may be added as desired.

Orange Bonbons.

The method of preparation is the same as above. Simply substitute lemon juice by orange juice. Proceed as above. Finally colour and flavour with orange essence.

COATED BONBONS.

Another class of bonbons, by no means of less importance, is the coated bonbon. It has interior made of almond or pistachio paste cooked in sugar and glucose or of some fruit pulp reduced to half by boiling in a steam pan and then mixed with an equal weight of sugar boiled to the *crack*. The pasty mass in either case is rolled out by hand, cut with hand cutters and coated with fondants.

CHOCOLATE BONBONS.

I.

Raw sugar	7 lbs.
Crystallised sugar	3 ,,
Golden Syrup (made from scrap lozenges)	8 ,,
Glucose	3 ,,
Fresh butter	1 lb.
Condensed milk	2 lbs.
Vanilline sugar	1 lb.

Procedure :—Boil the first four ingredients in a steam pan till the *hard ball* stage is attained. When this consistency is reached, steam is turned off and the mass is allowed to cool to some extent. Now add melted butter slowly to the mass with moderate stirring. When all the butter has been absorbed in the mass, add condensed milk and vanilla sugar and mix well. Boil through the mass once again to effect intimate mixing. Pour out on a cooling table and when pasty and still warm pull in a hook for satiny effect.

Treat in a batch roller for rolling out the mass and feed into a punching machine which cuts and stamps bonbons as these emerge. These bonbons are finally coated with chocolate as described on pages 107-110.

APRICOT BONBONS.

Pulp of apricot, almond, or pistachio is extracted and ground in a clean manner. The paste is then cooked in a steam pan till its weight is reduced by half. Stir all the time cooking goes on.

Now take sugar equal in weight to the original pulp and boil it to the *crack* stage in another pan.

Sweeten the cooked pulp with boiled sugar and mix well in a good mixer as in the case of lozenges. Mix suitable flavours and colours.

The mixed mass is then transferred to the steam-jacketed hopper of a depositing machine and cast in starch and allowed to dry. The process of moulding in starch and drying has already been described.

The bonbon is then coated with chocolate as described on pages 107-110 or can be crystallised in sugar.

APPLE BONBONS.

To make apple bonbons the apples are first washed clean, peeled, and cut into small slices after removing the seeds. These are then softened by stewing in covered steam pans. While the pieces are still hot the pulp of the apples is extracted with a fruit pulping machine. When the pulp gets cold it is cooked in a steam pan till the volume reduces to half. In the meanwhile dry, granulated sugar is boiled to the *ball point* and double the weight of the remaining pulp is mixed with the pulp in combination with suitable flavours and colours. Finally crystallise in sugar or coat with chocolate or fondant.

COATING BONBONS WITH FONDANTS.

Bonbons may also be coated with fondants. The essential features of the process follow :—

The fondant which is prepared with 15 per cent. glucose is melted by heating up to 80°C. The mass is stirred well and beaten up so that the whole looks creamy. When the right consistency has been attained for dipping the bonbons, the temperature of the fondant should be allowed to fall, but not below that required for casting. The bonbons are then dipped by hand and taken up by a fork as in the case of coating bonbons with chocolate by hand (page 107) and allowed to set. If the fondant sets, this is softened by reheating in a stove or its temperature may be maintained steady.

CHAPTER XIII.

NOUGAT.

THE principal ingredients in the preparation of nougats are crystallised loaf sugar, glucose, albumen and blanched and chopped almonds, pistachio, etc. In the best varieties of nougats, white honey is added along with glucose.

PRINCIPLE OF MANUFACTURE.

The principle of manufacture lies in this that the albumen is soaked in cold water for several hours. When dissolved, the albumen solution is passed through a sieve to remove the knotty substances and beat in an egg whisk till quite light and firm.

In the meantime the honey and glucose are mixed together in a special machine which not only mixes the two intimately but also beats them. It is imperative that the operation of heating and mixing takes place over a long period of time, generally 2 to 2½ hours. For this purpose a slight steam pressure is used during mixing.

In another kettle cook sugar to a *crack* and put the almonds and pistachios in the drying room so that they may be had in a warm condition when wanted for future use.

It should be the lookout of the manufacturers that the various articles are ready for mixing at the same time. The glucose and honey mixture should be quite ready when the sugar has been cooked to the *crack*.

When everything is ready, mix together the cooked sugar, vanilla sugar to the glucose-honey composi-

tion in the mixing machine. For a time suspend the mixing operation and add the warm almonds and pistachios. It is necessary to stir the mass with a spatula all the time.

FRAMING AND CUTTING.

The nougat is now ready for framing. Spread out in suitable frames to a thickness of ½ inch and level off the dough with a roller. The frame is therefore previously lined with wafer paper. The top of the nougat is in like manner covered up with the same paper after moistening the top with a sponge. It is common to cut the nougats into suitable pieces while warm, or half-warm. The dimensions to which the

FIG. 20. NOUGAT CUTTING MACHINE.

nougats are cut are 4 inches long and weighing 25 to 50 to a lb. The nougats being soft and highly sticky in nature, are difficult to be cut nicely. A machine has newly been put into the market to do this work automatically and decently to boot. After cutting these are placed for a moment on a cold clean marble slab. The nougats are likely to absorb moisture from the air and be soft and slippery.

Hence to keep them in good condition the confections should not be allowed to get in touch with atmosphere during cooling, so that their regularity in shape may not be impaired by any means. Finally wrap in tin foil or use wafer paper on top and bottom.

Colours may be added during sugar boiling.

NOUGAT WITH ALBUMEN.

A few recipes outlining the process of making nougats having albumen as one of the ingredients follow:—

I.

Crystallised sugar	28 lbs.
Glucose	40 ,,
Unblanched almonds	24 ,,
Albumen	½ lb.
Vanilla Sugar	⅛ ,,

Procedure:—Cook crystallised sugar and glucose to the *crack*. In the meantime dissolve the albumen in 3 lbs. of cold water ; and about 15 mins. before the boiling of sugar is complete, pass it through a sieve and beat stiff in an egg whisk. When the boiling of sugar is complete it is put in a Mixing and Beating Machine and whipped for some time. When a part of the syrup appears cloudy on being taken out with a scraper, pour in the vanilla sugar, and the albumen and colour, if necessary. Mix well with a spatula with rapidity and add in the nuts and almonds previously warmed. The

sides of the pan should be scraped from time to time. Finally put into frames as before.

II.

Crystallised sugar	28	lbs.
Glucose	40	,,
Unblanched almonds	36	,,
Pistachios	4	,,
Albumen	½	lb.
Vanilline Sugar	⅓	,,
Colour	q.s.	

Procedure:—Boil the sugar and glucose to a *crack*. Beat the albumen solution for about 5 minutes and pour into the syrup. Mix well and incorporate suitable colours previously dissolved in water or alcohol. Finally mix well and incorporate suitable colours previously dissolved in water or alcohol. Finally mix the almonds and pistachios. Finally mould as before.

III.

Loaf sugar	32	lbs.
White honey	10	,,
Glucose	30	lbs.
Blanched Almonds	44	,,
,, Pistachio	8	,,
Albumen	½	lb.
Vanilline Sugar	⅔	,,

Procedure:—Dissolve the albumen in 6 times its weight of water and allow to soak overnight. When well soaked add honey and beat slowly in a mixing and beating machine after have sifted the solution through a sieve. Now boil sugar and glucose to a crack. Add this along with vanilla sugar to the albumen honey mixture. Stir with the spatula and mix in with stirring the blanched fruits which has been previously warmed. Cast in moulds as before.

NOUGATS WITHOUT ALBUMEN.

Nougats are sometimes prepared without albumen. The process of manufacture remains in principle the same. In some cases the albumen is replaced by gelatine but in other cases no substitutes are added.

The process of manufacture will be evident from the recipe:—

Moist sugar	12	lbs.
Glucose	12	,,
Unblanched almonds	10	,,
Nuts, chopped	2	,,
Vanilline sugar	½	lb.

Procedure:—Sugar and glucose are boiled as before to a *crack* and to the syrup add the warmed nuts and almonds. Continue cooking and after some minutes add vanilla sugar. Remove from fire and spread on water paper to cool. This confection is not wrapped but sold in bottles.

II.

Fondant	120	lbs.
Blanched Almonds	30	,,
Steeped gelatine	4	,,
Glycerine	5	,,

Procedure:—Have gelatine soaked in water to allow it to get gelatinous. Prepare the fondant with glucose 25 per cent ready for casting. To the fondant add the glycerine and the gelatine and mix well. Then put in the warm almonds. Then mould as before.

FRUIT NOUGATS.

In some cases almonds and pistachios are replaced by preserved fruits such as orange, lemon, etc. To 16 lbs. of fondant is usually mixed 4 lbs. of preserved fruits. It is necessary to add 1½ oz. citric acid (for 4 lbs. fruits) to the preparation as the syrup in these

cases does not contain glucose. The acid in the fruits retards crystallisation, thus removing the necessity of adding glucose.

The usual process is: Heat fondant which may be flavoured with vanilla and add suitable colours and the preserved fruits cut into quarters along with the citric acid. Mix with a spatula and mould as before. Before cutting heat the sheet of paste so that the fondant may not crumble when taken out.

CHAPTER XIV.

DRAGEES

DRAGEES are preparations of very soft colours and glossy coatings of sugar and have the following ingredients in their composition :

(1) Almonds.
(2) Loaf sugar.
(3) Perfumed water, such as distilled rose water or orange flower water.
(4) White gum.
(5) Pure alcohol.

PRINCIPLE OF MANUFACTURE.

The operations involved in preparing dragees may be broadly classified as :

(1) Gumming.
(2) Bulking.
(3) Whitening.
(4) Filling.
(5) Polishing.

Gumming.—The almonds are heated in a pan and after being sifted to remove dust, etc. are put in a pan containing gum which has been previously melted and sifted while hot. Mix well so that all the nuts get a thin coating. Then the nuts are transferred to a drying room till quite dry.

Bulking.—Dissolve half of the sugar in half of the orange flower water and heat. This syrup is poured slowly over the nuts in a pan kept warm. Then allow to dry and again add more sugar. After three coatings of sugar, add melted gum for another coating. Stir the dragees with hand and allow to dry overnight.

Whitening.—For whitening, melt a third of the sugar with a part of orange flower water and proceed as above. In some cases whites of eggs beaten stiff are added to the syrup for filling.

Finishing.—Melt 1/12th. part of sugar with water and perfumed water. When the sugar is melted, add some alcohol. Add the syrup a little at a time and dry completely. Keep the dragees warm.

Polishing.—For finishing dissolve the rest of sugar in water and alcohol. Add the warm sugar to the warm dragees. Last three coatings should, however, be applied cold. Don't apply gum during the finishing operation. Put in muslin bags and roll often to prevent sticking. In each case the dragees should be warm before syrup is poured in.

ALMOND DRAGEES.

Almonds	24 lbs.
Loaf sugar	37 ,,
Orange flower water	10 ,,
Water	3 ,,
White gum	3 ,,
Pure alcohol	1½ gills.

Procedure:—As above. Almonds should be only warm and not too hot. Sift and dust with granulated sugar. For bulking use 19 lbs. sugar and 6 lbs. orange flower water (38°Be), for whitening melt 10 lbs. of sugar with 3 lbs. orange flower water (38°Be), for polishing melt 4 lbs. of sugar in 2 lbs. of pure water and then add ¼ gill. of pure alcohol (36°Be).

ANISEED DRAGEES.

Dry 10 lbs. green aniseed in a drying room. Remove the dust under a blast of air. Gum and bulk as above using syrup 28°Be. Finish off as before.

When colour is to be used, add it during the finish-

ing operation to the syrup while it is being prepared, and mix intimately. Usually light colours are selected.

In making cheap dragees, use a syrup of 34°Be during bulking and add flour and scraping when the syrup is just turning or partially dry. During whitening process a little starch may be added instead.

In making charges take care to warm the dragees in each case before coating with hot syrup.

ALMOND PASTE PONDANT DRAGEES.

Procedure:—Prepare 40 lbs. fondant with 25 per cent. glucose and grind 3 lbs. blanched almonds with ¾ lb. of glucose. The paste should be fine. Now boil 6 lbs. sugar and 2¼ lbs. glucose to a small *crack* and mix with almond paste. Then add this paste to the heated fondant and then cast in starch and allow to dry overnight in the drying chamber. Next day take off the dragees and blow off the dust. Now put into crystallising syrup 33°Be for 12 hours. When the crystal coating is thick, withdraw from the syrup and allow to drip. While still moist put into dragee pans with powdered gum and stir gently with the hand. The dragees will thus be dry. Let them dry in the open air till the following day. Then coat several times with cold syrup without warming the pan. Next day do the bulking work without much heating the pan. Next day repeat the bulking operation with a little white of eggs.

DRAGEES WITH SOFT CENTRES.

Dragees having soft centres are often made according to the method stated above. The centre is made from fruit paste or unsweetened chocolate and is cooked in powdered sugar and flavoured with vanilla sugar. The paste is then made into small pieces or cast in starch. The remaining part of the process is same as above.

CHAPTER XV.

SATIN PRALINES

TO prepare satin pralines, boil sugar in steam pan, vacuum pan or continuous cooker. A little marine blue may be added to the syrup when white stuff is required.

PROCESS OF MANUFACTURE.

The syrup is allowed to cool as in the case of satin goods and pulled on the candy hook. The dough should not be pulled too much as then it may lose its elasticity and may become quite soft. Now spread the dough 2 inch thick over a clean oiled or greased table. The sheet should be rendered quite smooth and even and be preferably square in shape.

In the meantime grind praline into a fine paste in a reducing mill. This is to be put in the centre of the sheet of syrup. Pralines about one-third of the weight of the syrup should be taken. It should extend about four-fifths of the length of the sheet. Now bring up the edges of the sheet of sugar and lap and weld them together so as to obtain a large roll.

This roll is then put in an erect position on the table. The soft roll cannot keep its position. Under the action of gravity it will lose its roll form and the base will be flattened giving it a conical appearance. Now lay out on a warm board covered with brass webbing and take care that the square mass keeps pliable. The smaller end of the cone is drawn out into a roll about 1 inch thick. Cut into sections as in the case of hollow satin goods and put into a cutting and stamping machine.

In order that the praline does not lose its rounded shape the roll should be turned over from time to time.

PRALINES IN COMFIT PANS.

I.

Blanched almonds	10	lbs.
Loaf sugar	40	,,
Glucose	4	,,

Procedure:—Blanch the almonds and put hot in the comfit pan which has been properly heated. Sugar is boiled in four equal batches with proportionate amount of glucose to *ball* point. The comfit pan is set on rotating and turning on the steam, the sugar is added slowly on the almonds. Stop motion and stir with a spatula so that masses do not gather. When the first batch of sugar has been finished, proceed with the second, third and fourth batches as before. When ready sprinkle the pralines with cold water. Now turn off steam, stop the pan allow to cool. Crystallise next day.

II.

Turkish Nuts	15	lbs.
Small Almonds	15	,,
Crystallised Sugar	120	,,
Glucose	20	,,
Transparent Melted Gum	4	,,

Procedure:—Roast nuts to a light yellow colour. Put in heated comfit pans. Boil sugar and glucose to *ball* point in four batches. Put the sugar on the nuts and stir with a spatula. When the sugar boils to a *crack*, add further batches of sugar gradually. When boiling to the *crack*, turn off. Finally cover with melted gum before taking from the pan. Dry in drying room and coat a second time with gum.

III.

Large almonds	30	lbs.
Crystallised sugar	90	,,
Glucose	10	,,
Distilled rose water	10	,,
Melted gum	3	,,
Carmine Paste (for colour)	8	oz.

Procedure:—Put rose water in the syrup and proceed as above.

ROASTED CHOCOLATE PRALINES.

Large almonds 30 lb.; Crystallised sugar 90 lbs.; Glucose 10 lbs.; Unsweetened chocolate 10 lbs.; Melted gum 3 lbs.; Vanillin sugar 6¼ oz.

CHAPTER XVI.

INDIAN CONFECTIONS

INDIAN confections are so popular in all parts of India and are in such high esteem in the eyes of both Indians and non-Indians that a chapter on the manufacture of Indian sweets will not be found out of place. These have been dealt with exhaustively in *Bengal Sweets*. We satisfy ourselves here with confections requiring the use of sugar.

CHIEF INGREDIENTS.

The chief ingredients in the manufacture of confections are roller flour of the best quality, *suji* which may either be of coarse or medium grain, sugar, *chhana*, *khoa* or condensed milk and ghee. Pulse meal and rice flour also are much in vogue in confectionery making. Among minor articles may be mentioned raisins, almonds, pistachios, spices and condiments which are used to some extent to improve the flavour and the taste.

All the ingredients except chhana and pulse meal and rice flour are too well known to require any explanation. Methods of preparing these articles follow:—

Chhana.—It enters into the composition of *sandesh*, *rasagollah* and very many dainty preparations. It is obtained from milk, and as upon the excellence of its quality the success in making confectioneries greatly depends, the importance of having it in good condition cannot be overestimated. This can be bought in the bazaars of Bengal but outside Bengal its preparation is only indifferently known. Hence the process of making *chhana* is given in detail.

Fresh cow's milk is taken in a deep iron pan and boiled. Now squeeze out the juice of one or two good ripe citrus lime (*pati variety*) in a cup and scatter it at once over the bubbling surface of milk. Stir briskly with a wooden rod or spatula. The whole milk immediately curdles and *chhana* separates out. Usually juice of 2 limes will be found sufficient for one seer of milk. Citric acid may be used for curdling when limes are not available. Now strain the curdled milk through a piece of cloth. The solid matter collected is known as *chhana* while the liquid is called whey. *Chhana* thus prepared is put in a new piece of cloth and the whey is allowed to drip as much as possible. On a large scale the bundle of *chhana* is placed between two wooden planks and a heavy weight is put on the upper one. When no more whey gets out the chhana is ready for use.

Pulse Meal.—This should be freshly made from sound pulse. Use of old or mouldy pulse is to be discredited by all means, for then the confections are likely to savour ill. Meal may be obtained from gram, matar, etc.

Rice Flour.—This should, like pulse meal, be freshly prepared. This should be preferably made from sun-dried or *atap* rice. Usually *atap kamini* is powdered fine in mills without leaving any grit.

Khoa.—This is obtained by boiling milk sweetened with sugar over a moderate fire till the mass dries up leaving only a plastic mass behind. (Refer to page 144).

Sugar.—Good refined sugar should be used and where mentioned mix amorphous sugar (p. 11).

CLARIFICATION OF IMPURE SUGAR.

When only ordinary sugar is used in making syrups the process of clarification is indispensable. This is

best done by dissolving the sugar in water and then stirring into it a mixture of fresh milk and water. Mix a quarter seer of fresh milk with an equal weight of cold water. Bring to boil 5 seers of sugar in 1 seer of water, or in proportions as desired. When the whole mass boils up dip a clean cloth in the mixture of milk and water and squeeze this over the boiling syrup moving the cloth round and round all the while for ensuring better distribution over the entire surface of the syrup. Continue boiling when a scum will be observed forming on the surface. Remove this carefully with a ladle. More of the mixture of the milk and water is added a little at a time and same process of removing the scum is repeated till the surface remains free from scums on the addition of the mixture. The syrup is then removed from fire, and allowed to stand to cool a little, when it should be again skimmed if necessary, and then passed through a clean cloth or hair sieve.

CLASSIFICATIONS.

Indian confections may be broadly classified under a number of groups:—

(1) Bundia, Mihidana, Motichur, Darbesh, Jilapi, etc. belong to *mithai* group and are made by frying a batter made of pulse meal, rice flour, and soaking in sugar.

(2) Sandesh, a group by itself, is made by cooking chhana with sugar.

(3) Rasagollah, Puntua, Lady Canning, Chum Chum, Danadar, etc., are made of chhana and puffed up or coated with syrup.

(4) Khaja, Gaja, etc., are special preparations of flour fried in ghee and then treated with syrup.

(5) Miscellaneous preparations like Batasa, Chandrapuli, Hulwa, etc.

BUNDIA.

Matar meal	5	seers
Rice flour	5	,,
Sugar	24	,,
Ghee	6	,,

Procedure:—Gram powder and rice flour are beaten together in sufficient quantity of water in a wooden tub. The beaten mass should neither be too thick nor too thin. If the beaten mass is too thick it is to be thinned out by addition of more water. The beating should be done so that the ingredients are mixed well and a homogeneous light mass is obtained. Great stress should be laid on this beating as without it crisp or palatable bundias will not be obtained.

The beating is considered to be complete when a bit of it dropped on the surface of water floats clearly on water. If the mixture is too thin, the drop is liable to break up and get dissolved in water and if too thick the drops will sink.

Now ghee is melted over a moderate fire in an iron cauldron. When the ghee smokes, a flat skimmer with elevated rims all round and having big holes in it is held on the smoking ghee. A quantity of the prepared batter is taken with a small cup and is poured on the skimmer to just fill it. The skimmer is then given a sudden jerk on the side of the vessel and drops fall through the holes on the ghee. More batter is added to the skimmer in this way so that the drops occupy the whole surface of the frying pan. For the time being stop adding more batter and have the drops well fried till no more soft. Remove with a skimmer and let the ghee drip.

In the meanwhile prepare a syrup with the sugar by boiling it to four thread stage and then thin it down by addition of water. The fried balls are then trans-

ferred to the still warm syrup to imbibe the juice and allowed to remain there for some time. Then remove them from the syrup and put in a vessel to dry.

MIHIDANA.

Matar meal	5	seers
Rice starch	3	,,
Sugar	16	,,
Ghee	8	,,

Procedure:—Beat the first two ingredients as in the case of bundia. But the batter should be a bit stiffer than that for bundia.

Now melt the ghee on a moderate fire and pass the mixture as before through a skimmer with small perforations. During frying, ghee should all along be present in sufficient quantity to cover up the small fritters. It is also necessary that burnt ghee is not used.

Now prepare a syrup with the sugar and transfer the fried fritters to the syrup and thence to another plate to dry.

The small fritters are then to be formed into balls, say 24 to the seer. To do this a small quantity of ghee is mixed with water and this mixture is then intimately incorporated with the fried grains. Now take up sufficient quantity in two hands and make balls by moving them round and round. Before forming into balls, raisins, slices of pistachios or cardamom (minor) powder may be introduced into the mass.

MATICHUR.

The batter is to be made a bit differently. Use is made of gram meal or cow pea meal instead of matar meal. The proportion of the gram meal to rice powder should be 10 to 6. A quantity of kalai pulse, soaked in water and brayed to a paste after removing

the husk, may be added to the batter to make it stiff. The method of preparation is in essence same as *mihidana*. Here the fritters are made a little bigger than those for *mihidana*.

DARBESH.

Matar meal	6 seers
Rice flour	1½ ,,
Sugar	20 ,,
Khoa	5 ,,
Raisins	1 seer
Almond sliced	½ seer
Pistachio	¼ seer
Ghee	8 seers

Procedure:—Make a batter of matar meal and rice flour as in the case of *bundia*. Now pass through a medium-holed skimmer and fry the fritters. Pass them into the syrup made from 4 seers of sugar. When half of the batter is used up, mix with it some aniline saffron-coloured dye and make fritters as before and soak in syrup from remaining 4 seers of sugar. Leave overnight. Next day mix equal quantities of plain and coloured fritters and *khoa*, previously brayed and passed through a sieve. Add also the raisins and chopped almond and pistachios. Now form into round balls. Occasionally dip the palms of hands in warm water during forming.

JILAPI.

Flour or Suji	½ seer
Rice flour	2 seers
Ghee	1 seer
Sugar	5 seers

Procedure:—Flour or suji is first of all to be kneaded and allowed to ferment. For this purpose 3 tollahs of curd and aniseed water 1/16 tollah are mix-

ed with a little warm water. Knead flour or suji with this water some time and keep it covered with a moist cotton cloth in an earthen-ware or enamelled pan.

Now into the dough introduce and incorporate the rice flour. Mix well and make into a batter by dissolving in water as in the case of *bundia*. Now melt ghee on a shallow pan over a slow fire. Take a metallic cup having a hole at the bottom or a coconut shell in half with one open eye. Close the hole by hand and fill it with the batter. Now open the hole and move the cup round and round to produce the well-known figure of jilapi. Eight to ten such *jilapis* may be fried at a time. Turn over with a thin rod. Cease pouring more batter and fry well both sides—not too hard. The preparation should be just brown.

The fried pieces are taken up and immersed under a thin syrup and taken up again. The *jilapi* should be ready for use. It should be crisp and puffed up with juice.

AMRITI.

Kalapi pulse paste	11	seers
Rice flour	3	,,
Sugar	22	,,
Ghee	8	,,

Procedure:—Kalai pulse is soaked under water and divested of its husk. This is then brayed fine on a muller. Rice flour is then well mixed with the pulse paste. The whole is then mixed in water and beaten well as in the case of bundia. The batter should fall in a ropy state when allowed to drop. The batter is taken in a string, thick and clean cotton cloth. The ends of the cloth are tucked tight and the bag is held over smoking ghee in a shallow pan. The batter will fall in a ropy state from the bag. Move the bag round and round making small windings and proceed

in a circle. A number of amritis may be fried at a time. When one side is brownish, turn them over. Both sides being fried put in thin syrup and immerse under the syrup. When the next batch of *amrities* are to be soaked in the syrup, take the former batch up for use. Mix colours with the batter, if necessary.

SITABHOG.

Chhana	10	seers
Flour	2	,,
Ghee	$1\frac{1}{2}$	,,
Sugar	9	,,

Procedure:—Flour should be taken of the first quality. Leaven it with $1\frac{1}{4}$ seers of ghee and mix well. Now incorporate well into this mass 10 seers of chhana, from which water has been driven out by pressure. The mixed mass is then to be fried in small grains or fritters. For this purpose a skimmer with fine holes in it is held over the melted ghee over a slow fire. A portion of the mass is put on hand. Small drops fall on the ghee and are then fried soft and at once transferred to warm light syrup. Finally make into balls.

SANDESH.

Quality of sandesh depends greatly upon the quality of chhana. It should therefore be of the best variety. As the chhana available in the market is adulterated to some extent it has now been the custom of big manufacturers to make their chhana themselves in their factory.

Chhana freshly made contains a fair quantity of water. Hence the first step in making sandesh is to press out the water. Chhana is put in a clean piece of cotton cloth and is placed between two wooden platters. The lower plate has usually a hole through

which the whey may pass of as soon as extracted. For better results, weights are placed on the wooden platters. When no more whey oozes out, take out the chhana and pour it on a wooden platter. Care should be taken that no fat escapes during extraction of milky water. For this purpose no very heavy weight should be placed, and extraction should not be allowed to proceed to the extreme. Usually it is found that when the milky water escapes, chhana loses half of its original weight.

Before sandesh can be prepared the chhana requires further treatment. The whole mass is divided into a number of lumps by a shearing motion. Each of these lumps is kneaded or rubbed well on the platter with the palm of the hand. This will make the dough soft and pliable.

Sugar for sandesh making should be white refined. Otherwise the resulting product is bound to be of dirty colour. Syrup is to be made from it by boiling and clarifying. Quantity of syrup obtained depends upon the grade of sugar employed. Dobarra sugar is the best to use. The syrup from it is quite clear and need not be clarified while 15 chhataks of syrup may be obtained from 1 seer of the sugar.

The proportions of chhana and sugar to be used determines the quality of the sandesh. A number of proportions are given below : Syrup ½ seer, chhana 2½ seers; syrup 2½ poas, chhana 2½ seers; syrup ¾ seer, chhana 2½ seers; syrup 1¼ seer, chhana 2½ seers; syrup 1¼ seers, chhana 2 seers; syrup 1½ seers, chhana 1½ seers; syrup 1¾ seers, chhana 1¼ seers; syrup 2 seers, chhana 1 seer; syrup 2 seers, chhana ½ seer.

Cooking should be carried over strong fire. An iron damper may be placed on the mouth of the oven to regulate the temperature. When the cooking goes on very vigorously the pan may be removed from fire

and placed upon a straw ring. When temperature gets steady, the pan may again be put on fire.

Success in confectionery depends greatly on stirring with big wooden spatulas. All the time cooking proceeds, the mass should be agitated briskly, specially at the end. Otherwise the mass may get charred.

The consistency and texture of the sandesh are also a variable factor. In some cases the cooking is carried till a hard mass is obtained while in other case a soft mass is aimed at.

The prepared mass is often flavoured with nutmeg, mace, cardamom minor, all in powder. In some cases rose water or rose otto is mixed into the dough. In some cases the juice of mango ginger may be added, in which case a distinctly mango-like flavour will be obtained. Juice of oranges or rinds of oranges may also be used to impart an orange flavour.

The dough is finally divided into a number of balls, weighing 20 to 32 to a seer. These balls are then put into moulds imitating apple, mango, fish or palm kernel. Fillers flavoured with ottos may be inserted within the balls before moulding. A recipe follows:—

Chhana	8 parts by weight.
Sugar	1 part by weight.

Procedure:—Place the chhana enclosed in cloth bag on a wooden platter and put another plate on it. Now compress it little by little by hand or with weights so that it is transformed into a soft dough. Repeat this operation twice, if possible and bray the chhana well to make it soft. Meanwhile prepare thin syrup with the sugar in a shallow iron pan and put the well brayed chhana into it. Then bake the mixture over a slow fire stirring all the while with a wooden spatula, called *taru*. Throughout the operation the fire should be damped with a fire-damper and the mass agitated uninterruptedly; otherwise there is every chance of the

mass getting scorched. Sometimes the pan gets too much heated when it is difficult to regulate the temperature of the mass. At this stage the pan is removed from the fire for some time. It is then replaced over the oven. But even at this period the agitation of the mass is continued. This operation generally takes a quarter of an hour or a little longer. The stuff when properly cooked can be drawn away from one side of the pan to the other without breaking. Then remove from the fire and allow to cool. When almost cool, mould it with wooden moulds, which are invariably made in imitation of various fruits, such as mango, custard apple, palmyra kernel, sour plum, etc., so that the sandesh is designated according to the shapes it is moulded.

RASAGOLLA.

Chhana	8 parts
Arrowroot	¼ part
Sugar	40 parts
Water	12 ,,
Simple syrup	a sufficient quantity

Procedure:—Take the chhana in a wooden platter. In the meantime intimately mix the arrowroot with a small quantity of sugar and then incorporate it into the chhana by degrees so as to form a soft dough. Now divide it into a number of pellets of desired size and make into round balls with the hands.

Meanwhile prepare a thin syrup with the sugar. For this purpose dissolve the sugar in the water and boil for a few minutes in a capacious iron pan. When it has acquired the required consistency, gently introduce the above balls one by one into it. Continue boiling for about half an hour so as to cook them properly. This can be ascertained when a sample taken out of the syrup does not collapse on immersion in a quantity

of cold stock syrup. It must be noted here that during the whole of the boiling process the consistency of the syrup should be maintained constant throughout. This is, of course, effected by the addition of little water from time to time that is to say by making up the loss of water through evaporation. When the cooking is finished sprinkle a few drops of water on the boiling surface twice or thrice at intervals of a minute, in such a way that the water drops may not fall on the balls and then transfer the cooked balls into the heated stock syrup ready beforehand. After a few hours the rasagolla retains an appreciable amount of syrup within it thereby making it soft and juicy.

The rasagolla should be spongy containing juice in each of its cells. In costly varieties fillers such as scented khoa or otto are put into the chhana pellets before cooking.

CHHANAR MURKI.

Press chhana to expel water from it. Then stiffen it with one quarter of its weight of rice flour. Now lay the mass evenly and cut into small cubes. Cook them in light syrup till reddish. If the syrup gets thick, add water to thin it. When well cooked, allow the syrup to be thick and remove the pan till only a little syrup remains. The murki will be non-sticky.

PANTUA.

Chhana	4 seers
Fine flour or Arrowroot	½ seer
Sugar	5 seers
Ghee	½ seer

Procedure:—Take chhana in a napkin and place it between two wooden platters with a heavy weight on the top of the upper platter. Surplus water of the chhana will be pressed out. The chhana is then poured

on a wooden platter and kneaded well on the platter with the palm of the hand. To give the final preparations a good body add the fine flour or arrowroot and mix well in the mass of the chhana. Then divide the chhana into a number of round pellets each containing in the centre a grain of cardamom major. Now give them an elongated shape by moving them in the palm of the hand. Now melt ghee in a pan. Although only ½ seer of ghee will be required for the purpose it will be necessary to take bigger quantity to have the chhana pellets well cooked. When the ghee is ready, drop the pellets one by one and allow to dry. Extra ghee taken will be left after the process. Then transfer to raw syrup or one-thread syrup.

In good quality pantuas, khoa is sometimes used while kneading the chhana to improve the taste.

CHHANABARA.

Preparation is much the same as in the case of Pantua. Chhana is here mixed with greater quantity of fine flour. To one seer of chhana may be mixed fine flour up to the quantity 1½ seers. Make into round pellets and cook as before and put into syrup.

Sometimes the chhanabara after being taken up from syrup is given a coating of amorphous sugar.

LADY CANNING.

Chhana	16	seers
Khoa	4	,,
Fine flour	2½	,,
Sugar	30	,,
Ghee	3	,,

Procedue:—Chhana is prepared as in the case of pantua. Khoa is broken into pieces and brayed and passed through a sieve. Knead the chhana with the palm of the hand on a wooden platter and to this mix

well khoa and fine flour. Make into round pellets, 20 to the seer and fry as in the case of pantua. Finally put in syrup.

DANADAR.

Proceed as in the case of Rasagolla. Take them up from the syrup and rub them all over with high boiled syrup. The syrup dries up and the surplus, if any, is allowed to drip. Finally coat them with dobarrah sugar.

KHEER MOHAN.

Proceed as in the case of rasagolla and make rather big pellets. Now mix otto or rose, powdered cardamom seed with khoa brayed and sifted. Divide this mass into a suitable number of small pellets to serve as fillers inside the chhana balls. Insert the fillers into the chhana pellet and flatten them out by pressing.

Now prepare syrup by boiling sugar in water as in the case of rasagolla. It should be clear. To the boiling syrup add the flattened pieces. When the pieces are no more loose, remove the pan from fire and allow the piece to remain there for some time. Then take them up one by one and put on grained dobarrah sugar and stir slowly. After a while the pieces will cool down and grains of sugar will stick to it.

GAJA.

Flour	4	seers
Ghee	4	,,
Sugar	3	,,

Procedure:—Flour is taken on a wooden platter and a cavity is made into the middle. Now add here melted ghee which should be one-eighth of the flour. Now make a soft dough by proper kneading. During

the process a quantity of black cuminseed or sesamum may be added to improve the taste.

Now the soft dough is rolled out level on a flat plate with a rolling pin. The thickness of the rolled dough should be about 1 inch. Now mark into suitable sizes with a sharp knife by passing it lengthwise and breadthwise. Take up the pieces from one side and drop in simmering ghee in a big pan. The fire should be regulated very carefully and care should be taken to ensure a slow steady heat. Under strong heat the interior portion of the gajas remains unfried and floury. Use excess of ghee as in the case of Pantua. Frying is complete when surface of the sweets looks brownish.

During boiling stir the cubes from time to time to have even frying. When properly fried transfer them to warm syrup which should be of rather thick consistency. Stir so that all the sides of the cubes get even coating of sugar. Finally take up and allow to dry.

PERA.

Fresh cow's milk	2 seers
Refined sugar	¼ seer

Procedure:—Pour the milk in an iron pan of 4 times the capacity of charge and dissolve the sugar in it. Then bring the whole to a boil and agitate constantly with a ladle by raising and pouring till the mass begins to get thick. Gradually the milk begins to get viscous. At this stage it is very necessary that the mass is agitated constantly with a wooden spatula. Unless this operation is done with proper attention the whole mass is likely to get charred. Heating is continued and then the paste shows sign of drying or condensing. At this stage vigorous stirring is essential. The operation is considered finished when the remain-

ing mass is quite plastic. Now remove the pan from fire and set aside to cool. When cool a portion of the paste is taken up and made into a number of small balls, which are then flattened out with pressure of the palm.

BARFI.

Make syrup by boiling 1 seer of sugar in water. When it is ready remove from fire and add 2 chhataks of sugar candy and stir.

In the meanwhile bray one seer of khoa and pass through a sieve. Mix the khoa with powdered cardamom minor and one or two drops of otto of rose.

When the syrup shows signs of crystallisation, pour in the khoa and mix well by stirring. When plastic in mass, pour on a brass plate having rims one inch high. Spread all over the plate and make the upper surface even. When solidified, mark with a sharp knife in the shape of cubes and separate carefully.

PISTACHIO BARFI.

Pistachio	½ seer
Khoa	4 ,,
Cardamom Powdered	½ tolla
Ghee	⅛ seer
Syrup	1 ,,

Procedure:—Pistachios are soaked in water, the husks separated and then brayed. This pasty mass is then fried in ghee as in the case of hulwa till slightly reddish. Then mix into it khoa, previously brayed and sifted and powdered cardamom minor. Now pour in thick sugar syrup and stir briskly. When all the ingredients are about to condense, pour on a brass plate. Roll out evenly ; the sheet however should be much thinner than the usual barfi. When solid cut into oblong patterns and put silver leaves over them.

CHANDRAPULI.

Coconut (Grated)	1 seer
Syrup	2½ seers
Pistachio	q. s.
Cardamom Powder	q. s.

Procedure:—Select good coconuts and grate them carefully, leaving out dirty portion. Now take the gratings in a clean cloth and squeeze about three-fourths of the milk. Bray the coconut pulp finely on a perfectly clean muller.

Now make 2½ seers of syrup from sugar by heating and into it introduce the brayed coconut. Stir constantly with a wooden spatula. When the syrup thickens and a portion of the mass tested between the fingers gives a sticky feel, remove the pan from fire and stir vigorously. Mix flavours at this stage. When the whole becomes plastic, pour on a wooden platter and knead well. Divide into suitable number of pellets and mould in wooden moulds.

MUNG LADDU.

Mung meal	1 seer
Ghee	1 ,,
Cardamom Powder	1 tollah

Procedure:—Mung pulse is soaked in water overnight and husked. The pulse is then dried and powdered coarsely. This is known as mung meal.

Now fry this meal in ghee as in the case of hulwa till rather reddish. In the meanwhile prepare syrup from one seer of sugar by boiling. When it thickens, pour in fried mung meal and stir. Also add the cardamom powder. Finally make into laddus.

SUJI LADDU.

Procedure:—As in mung laddu. Fry suji in ghee till reddish. Pour on a wooden platter and mix crush-

ed sugar well into the mass. Then make into laddus by pressing in hands.

COCONUT DROPS.

White sugar	10 lbs.
Condensed milk	2 qts.
Cream or cream fondant	6 lbs.
Butter	2 oz.
Strip coconut	4 oz. to 2 lbs.

Procedure:—Mix sugar and cream on a mild fire with gentle stirring. Wash the side of the pan and cook to 236°F. Add the cream fondant and stir until melted. Finally add butter and enough coconut to make a medium paste.

II.

Sugar	5 lbs.
Water	1 qt.
Cream Fondant	5 lbs.
Glycerine	2 oz.
Fine coconut	2 oz. to 1 lb.

Procedure:—Dissolve sugar in water and after heating the syrup to 234°F add cream fondant and glycerine with stirring till melted. Now work in coconut. When a paste is attained drop on wax paper with rubber bag.

HULWA.

There are different varieties of it, the most common being that made from suji or semolina while the bases of others are meal of pulses, paste of almond or pulp of fruits.

I.

Suji	1 seer
Ghee	¾ „
Sugar	1 „

Procedure:—Melt the ghee on a pan over fire. When the ghee is ready, pour the suji into it and stir vigorously so that it does not stick to the bottom and get burnt. Then add water and boil for some time. Stir constantly, otherwise the mass will clod. When ebullition occurs add sugar and stir again. Remove when cooked. To improve the taste further the following may be added :

Almond paste	¼ seer
Saffron	⅛ tollah
Milk	¼ seer
Nutmeg	⅛ tollah
Cardamom minor	1/16 ,,
Aniseed	1/16 ,,

Almond paste and saffron should be dissolved in milk in a cup prior to addition to the mass. Lastly mix in the powdered spices.

II.

Gram meal or Moong pulse meal	¾ seer
Ghee	½ seer
Sugar	¾ seer
Saffron	1/16 tollah

Procedure:—Melt the ghee on a pan and when ready add the gram meal ; stir continuously until it becomes brownish. Add water and when ebullition occurs add sugar. Stir well and remove when the mass thickens.

III.

Almond	1 seer
Pistachio	⅛ ,,
Raisins	¼ ,,
Khoa kheer	¼ ,,
Aniseed	1 tollah
Cardamom seed	⅛ ,,

Cloves	⅛ tollah
Cinnamon	⅛ ,,
Saffron	1/16 ,,
Cassia leaves	4 pieces
Ghee	½ seer
Sugar	¾ ,,

Procedure:—Melt the ghee on a pan and singe in it cassia leaves and saffron. Cook the almond and pistachio paste in this ghee together with powdered khoa. Mix together thoroughly and pour in water : scrape the bottom of the pan from time to time, otherwise everything will be spoilt. When the mass thickens strew the aniseed and add the sugar. Sprinkle the spices after removal from fire and cover up.

BATASA.

First prepare a quantity of syrup using one seer of water for every 3 seers of water by cooking slowly over a gentle fire. Remove from fire and keep the stock syrup for ready use.

Now take a flat earthen pan having the capacity of about 2 seers. The pot has at the upper portion a medium-sized hole which can be closed by a cloth plug at will. Into the pot is taken one seer of the syrup. The pot is then put on fire and allowed to boil. The syrup is stirred with a wooden spatula. When it is found that the syrup taken out with the rod gives a sticky feel, the syrup is considered to be ready for dropping. Now remove the pan from fire and put in it some broken pieces of batasa. Beat the mass with the rod against the side of the vessel till the colour of the syrup changes into forthy white. Now remove the cotton plug and beat well the entire mass. Then allow drops to fall on a bamboo mat or *chatai* till they are of appropriate size. The workman holds the pan on

one hand and drops the syrup with the rod on the mat in rows, care being taken that no two pieces adhere together. As soon as the drop falls on the mat, it swells up. When swelling is not satisfactory, a little lime water may be added. The size of the drop may be made as desired. Small drops will give small batasa while big drops will give *Feni Batasa.*

When the syrup in one pan is being dropped, cook stock syrup in another pan in the same manner and make batasa from it as already described.

MATH.

Cook sugar in the same manner as in the case of batasa. Only difference here is that the cooked syrup is not dropped on the mat but is put within wooden moulds imitating chariots, temples, boats, men, animals, etc. The moulds have two parts which are put in position and bound together by a string. Syrup with constant beating with the rod is put within the mould through the hole. Place the mould upside down on a wooden platter. After a short time the mass cools down. The mould is then unfastened and the solid preparation is taken out.

The syrup may be coloured suitably in pink, yellow, etc.

CHAPTER XVII.

MACARONI AND VERMICELLI

MACARONI and vermicelli are popular articles of food prepared from wheat and are capable of being manufactured on a small scale with profit. Spaghetti is only another name of macaroni.

Though macaroni and vermicelli are both made from flour, there is one important distinction between the two. Vermicelli is drawn in the form of fine thin threads and is so named because of its thread-worm-like appearance. Macaroni on the other hand is made in the form of thin sticks and pipes. Other preparations of wheat met with are in the form of pastes stamped in the shape of lozenges, stars, discs, etc. or such fanciful forms as ribbons, tubes, etc.

In boiling macaroni swells up to double its size without becoming pasty or adhesive, maintaining always its original tubular form without either rupture or collapse. It can be kept any length of time without alteration or deterioration, and it is on that account, in many circumstances, a most convenient as well as a highly nutritious and healthful article of food. In its various forms it is principally used as an ingredient in soups, and for the preparation of puddings, with cheese, &c.

These various forms are prepared in a uniform manner from a granular meal of hard wheat which itself, under the name of semolina or semila, is a commercial article. The semolina is thoroughly mixed and incorporated into a stiff paste or dough with boiling water, and in the hot condition it is placed in a strong metallic cylinder, the end of which is closed with a thick

disc pierced with openings which correspond with the diameter or section of the article to be made. Into this cylinder an accurately fitting plunger or piston is introduced, and by very powerful pressure it causes the stiff dough to squeeze out through the openings in the disc in continuous threads, sticks, or pipes, as the case may be.

Macaroni is prepared from the hard semi-translucent varieties of wheat. Hard wheats are much richer in gluten and other nitrogenous compounds than the soft or tender wheats, and their preparations are more easily preserved, to which conditions their suitability for the manufacture of macaroni is due.

When pipe or tube macaroni is being made, the openings in the disc are widened internally, and mandrels, the gauge of the tubes to be made are centred in them.

Macaroni is dried rapidly by hanging it in long sticks or tubes over wooden rods in stoves or heated apartments through which currents of air are driven. It is only genuine macaroni rich in gluten, which can be dried in this manner ; spurious fabrications made with common flour and coloured to imitate the true material will not bear their own weight. Imitation quantities must therefore be laid out flat and break up, while in other cases they become mouldy on the inside of the tubes.

True macaroni can be distinguished by observing the flattened mark of the rod over which it has been dried within the bend of the tubes ; it has a soft yellowish colour, is rough in texture, elastic, and hard, and breaks with a smooth glassy fracture.

Many of the good qualities of genuine macaroni may be obtained by enriching the flour of common soft wheat with gluten obtained in the preparation of

wheaten starch, and proceeding as in the case of semolina.

In making pastes the cylinder is laid horizontally, the end is closed with a disc pierced with holes having the sectional form of the pastes, and a set of knives close against the external surface of the disc, cutting off the paste in thin sections as it exudes from each opening.

VERMICELLI.

All that is required for making a start with this industry is a small, smooth plank of wood and some dough made out of wheat flour or sooji. The dough is made by mixing the sooji with water into a hard ball and then beating the ball with an ordinary wooden pestle in a stone mortar, until it becomes soft enough to be drawn into fine threads.

In making vermicelli the operator takes his seat on a small bench about 2 ft. high in such a manner that lengthwise ends of the bench are opposite to him. The operator then rolls the dough into a long roll with his hand, something like the carded cotton ready to be spun into yarn by the charka. After this, left end of the roll of dough is rolled by the right hand, while so doing, roll a bit firmly so that it lengthens into a thin string 1/20th of an inch thick. From time to time oil or ghee must be applied to the fingers so that they do not stick to the thread or the thread to the plank. When the string is five or six inches long the operator must hold its end in the left hand until it is long enough to reach the shallow plate of metal, bamboo, or cane about a foot in diameter, which is kept on the left side of the plank. As the string thus continues to draw forth it is wound round closely on the plate on circle outside the other, beginning with the centre so that the thread may not overlap. This continues until the

dough is finished. When the plate is full its contents are dried in shade and finally comes out in thin cakes and is ready for use. Instead of sooji wheat flour or corn flour may be used but in this case the product is much inferior in quality.

This crude method of manufacturing vermicelli has been replaced by machine. Those manufacturing on small scale are using hand machine, whereas powder-driven machine is used in case of large scale production.

CHAPTER XVIII.

MEDICINAL CONFECTIONS & CONSERVES.

ANYTHING prepared with sugar is known as confection. In medicine, the name is commonly applied to substances, usually pulverulent, mixed up to the consistence of a soft electuary with powdered sugar, syrup or honey.

In the preparation of confections, all the dry ingredients should be reduced to very fine powder, and passed through a sieve not coarser than 80 holes to the inch; and the pulps and syrups used to mix them up should be perfectly homogeneous and of a proper consistence. The mixture should be intimate and complete in order that the characteristic constituents may be equally distributed throughout the mass. The consistence of the newly made confection should be sufficiently solid to prevent a separation of the ingredients, and yet soft enough to allow of it being easily swallowed without previous mastication.

Confections should be preserved in stone jars covered in writing paper and placed in a cool and not too dry situation. Without this precaution they are apt to mould on the top. If at any time the mass ferments and swells up, the fermentative process may be arrested by placing the jar in a bath of boiling water for an hour or two, or until the whole becomes pretty hot; when it should be removed from the heat, and stirred occasionally until cold. Should the sugar crystallise out of the confection, or 'candy,' as it is called the same method may be followed. Or, the mass may be well rubbed in a mortar until the hard lumps of sugar are broken down and a uniform con-

sistence again produced. On the large scale it may be passed through the mill.

CONFECTION OF ALMONDS.

Sweet almonds, 8 oz.; white sugar, 4 oz.; powdered gum-arabic, 1 oz. Macerate the almonds in cold water, then remove the skins and beat them with the other ingredient until reduced to a smooth confection.

AROMATIC CONFECTION.

I.

Nutmegs and cinnamon, of each, 2 oz.; cloves, 1 oz.; cardamoms, ½ oz.; prepared chalk, 16 oz.; white sugar, 2 lbs. Reduce the whole to a fine powder, and keep it in a closed vessel. When wanted for use, mix it with water to the consistence of a confection.

II.

Aromatic powder and simple syrup, of each, 5 oz.; clarified honey, 2 oz.; powdered saffron, ½ oz.; and add oil of cloves, 30 drops.

This confection is cordial, stimulant, antacid, and carminative. Dose, 10 to 60 gr., either as a bolus or stirred up with a glass of water. Useful in diarrhoea, acidity of stomach, heartburn, and any like affection if accompanied by looseness of the bowels.

CONFECTION OF CASSIA.

Prepared cassia, ½ lb.; manna, 2 oz.; prepared tamarinds, 1 oz.; syrup of roses, 8fl. oz. Mix with heat, and evaporate to a proper consistence.—Dose, 2 dr. to 6 dr.; or more. Useful as a laxative.

CONFECTION OF CATECHU.

Compound powder of catechu, 5 oz.; simple syrup, 5 fl. oz.—Dose, 10 gr. to 20 gr. Use as an astringent, in diarrhoea, &c.; either alone or combines with chalk.

CONFECTION OF COPAIBA.

I.

Turpentine, 1 oz.; copaiba ½ oz. Mix, add mucilage of gum arabic, 1 oz.: triturate to an emulsion, and further add conserve of roses, 4 oz.

II.

Copaiba, 2 oz.; oatmeal, q.s. to form an electuary. Mix, then add conserve of roses 1 oz.

III.

Copaiba and powdered cubebs, of each, 4½ dr.; yolk of 1 egg; conserve of roses, ½ oz. All the above make excellent medicines in gonorrhoea. Dose, 1 to 3 dr. 3 or 4 times a day, made into boluses and covered with wafer paper before being swallowed.

CONFECTION OF IPECACUANHA.

Ipecacuanha, 12 gr.; sulphur, 20 gr.; orris root, 1 dr.; syrup of mallows and manna, of each, 2 oz. Dose a teaspoonful, 2 or 3 times daily. Used in whooping-cough, dyspepsia &c.

CONFECTION OF JALAP.

Compound powder of jalap, 2 dr.; treacle to 1 oz. Dose, 1 to 3 dr. as a purgative.

CONFECTION OF ORANGE FLOWERS.

I.

Orange flowers, 1 part; white sugar 2 parts. Beat together to a confection.

II.

Orange flowers, 1 part; simple syrup, 3 parts. Evaporate to a proper consistence. Both are used as agreeable adjuncts or vehicles for other medicines. The first is the best article.

CONFECTION OF ORANGE PEEL.

External rind of the fresh orange separated by rasping, 1 lb. Beat it in a stone mortar with a wooden pestle to a pulp, then add white sugar, 1 lb., and beat them together until incorporated. This confection is an agreeable tonic and stomachic; it is much used as an adjunct to bitter and purgative powders, and as a vehicle for the sesquioxide of iron.

CONFECTION OF PEPPER.

I.

Black pepper, in fine powder, 2 parts; caraway, in fine powder, 3 parts; clarified honey, 15 parts. Triturate. Dose, 60 to 120 grains.

II.

Black pepper and elecampane, of each 1 lb.; fennel, 3 lbs.; white sugar 2 lbs. Reduce to a very fine powder, and keep it in a covered vessel, for use, add it, gradually, to honey, 2 lbs.; and beat the whole to a paste (i.e., 2 oz. of honey to each 7 oz. of powder).

III.

Black pepper and liquorice root, of each, ½ oz.; refined sugar 1 oz.; oil of fennel, ½ fl. oz.; honey, 2 oz. Mix 14 Dose, of each of the above, 1 to 3 dr. 2 or 3 times daily, for 3 or 4 months. Useful in piles, fistula, &c.

CONFECTION OF PEPPERMINT.

Green peppermint, 4 oz.; white sugar, 12 oz. Antiemetic and antiflatulent. Useful in colic, diarrhoea, &c. in the form of a bolus, or made into a mixture.

CONFECTION OF ROSES.

I.

Fresh red-rose petals, 1 lb.; white sugar 3 lbs. Mix.

II.

Fresh petals, 3 oz., sugar, 8 oz. It is astringent and tonic, but is principally used as an elegant vehicle for more active medicines. It keeps well 1 to 2 dr. Used either alone or combined with chalk; in slight cases of diarrhoea, vomiting in pregnancy, etc.

CONFECTION OF SENNA.

I.

Senna, 8 oz.; corianders, 4 oz. Rub them together, and by a sieve separate 10 oz. of the mixed powder; also boil figs. 1 lb., and fresh liquorice, bruised, 3 oz., in water of 3 pints, until reduced to one half. Press, strain, and evaporate the strained liquor in a water-bath to 24 fl. oz.; then add sugar 2½ lbs. Dissolve, and further add prepared tamarinds, cassia, and prunes, of each, ½ lb. Remove from the heat, and when the whole has considerably cooled, add the sifted powder, by degrees, and stir until the whole is thoroughly incorporated.

II.

Senna leaves, in fine powder, 2 oz.; corianders (in fine powder), 1 oz.; oil of caraway, ½ dr. Mix and add them to pulp of prunes, 5 oz.; pulp of tamarinds, 2 oz.; brown sugar, 8 oz.; water 2 fl. oz. previously brought to a smooth paste by the heat on a water-bath.

III.

Senna, 8 oz.; corianders, 4 oz.; liquorice root 3 oz., figs and pulp of prunes, of each, 1 lb.; white sugar, 2½ lbs.; water 3½ pints.

IV.

Boil figs, 12 oz., and prunes, 6 oz., gently in distilled water of 24 oz., in a covered vessel for hours. Then, having added more distilled water to make up the

quantity to 24 fl. oz., add tamarinds 9 oz., and cassia pulp, 9 oz. Macerate for 2 hours, and press the pulp through a hair sieve, rejecting the seeds, &c. Dissolve refined sugar, 30 oz., and extract of liquorice, ¾ oz. in the mixture with a gentle heat. And while it is still warm, add to it gradually senna in fine powder, 7 oz., and coriander in fine powder, 3 oz., and stir diligently until all the ingredients are thoroughly combined. The resulting confection should weigh 75 oz.

Confection of senna is a gentle and pleasant purgative, and well adapted for persons suffering from piles, and as a laxative during pregnancy. The dose is 1 dr. to ½ oz. taken at bedtime or early in the morning.

CONFECTION OF TURPENTINE.

Oil of turpentine, 1 fl. oz., liquorice powder, 1 oz. Triturate together, then add clarified honey, 2 oz. Dose ½ to 2 dr. Used for worms.

CONSERVE.

Conserves are made both by the confectioner and the druggist; by the first as sweetmeats and by the other chiefly as vehicles for more active medicines. Conserves stand for flowers, herbs, roots, fruits and seeds beaten with powdered sugar to the consistency of a stiff paste, so as to preserve them as nearly as possible in their natural freshness.

CONSERVE OF ARUM.

From fresh arum tubers ½ lb.; sugar 2½ lbs. Used as a diuretic and attenuant in dropsy or as an expectorant in chronic coughs. Dose, ½ teaspoonful, gradually increased.

CONSERVE OF LAVENDER.

Lavender flowers, 1 part; powdered lump sugar 3 parts. Beat together to a smooth paste. Used to sweeten the breath.

In a similar way conserves are made from various other leaves and flowers; add only twice their weight of sugar, when they are not very odorous or active.

CONSERVE OF ROSES.

Confection of roses and powdered gum, of each, 1 oz.; sulphuric acid, 1 to 1½ dr.; (diluted with) water, 2 dr. An excellent substitute for tamarinds.

CONSERVE OF SEA WORMWOOD.

From sea wormwood, 1 lb.; sugar 3 lbs. As a stomachic bitter and vermifuge in dyspepsia, &c.

CONSERVE OF SLOES.

From the pulp of the fruit, 1 part; sugar 3 parts. Astringent. Useful in simple diarrhoea, &c. either alone or combined with chalk.

CONSERVE OF SQUILLS.

Fresh squills, 1 oz.; sugar, 5 oz. Diuretic attenuant, and expectorant. Useful in dropsy, chronic coughs, &c. Dose, 10 to 20 gr.

CONSERVE OF TAMARINDS.

Tamarind pulp, 2 oz.; white sugar, 3 oz. Evaporate by the heat of a water-bath to the consistency of honey.

CONSERVE OF VIOLETS.

Violet flowers, 1 part; sugar, 3 parts. Beat to a paste. Demulcent and laxative; used as a purge for infants, and by ladies to perfume the breath.

CHAPTER XIX.

PUDDINGS.

PUDDINGS make most delicious forms of confections which have got ready sale in the market. Like Indian confections they are however liable to be spoilt on keeping for a few days and are best enjoyed when served fresh.

In making puddings, the usual procedure is to make a pasty batch of suitable consistency with addition of milk and flavours, occasionally leavening it with butter and whisked egg. The paste is then poured into a mould which is then put over a moderate fire to set. The moulds should in all cases be placed for a few minutes in boiling water before placing in the oven. The object is to prevent the dish from becoming hard or over-cooked round the sides; the steam from the water prevents this.

GINGER SNAP PUDDING.

Crush very small 1 dozen ginger snap rolls, butter a deep baking-dish, and put the crushed ginger snaps into it. Mix a pint of milk with 1 well-beaten egg and a little mixed spice, stir well, and pour over the crumbs. Stand the mould in a deep pan of hot water and bake in a slow oven until set.

CHOCOLATE PUDDING.

Stir into the yolks of 4 eggs a large tablespoonful of flour, add it to half a cake of Chocolate Menier that has been made into a stiff paste in a little hot milk. Stir all together and add 4 tablespoonfuls of sugar, and

3 tablespoonfuls of milk. Bake in a gentle oven for half an hour and serve at once with beaten cream.

STEAMED MARMALADE PUDDING.

Well butter a pudding mould and put layers alternately of fine white bread-crumbs and orange marmalade till you have used a cupful and a half of bread-crumbs and a cupful of marmalade. Beat well 2 eggs with a pint of milk, add a little sugar, and pour over the bread and marmalade. Set aside for twenty minutes, then put a cover on the mould and a buttered paper twisted to fit over the top, and steam for one and a half hours: serve hot with a lemon sauce.

BREAD PUDDING.

Beat lightly the yolks of 3 and the whites of 2 eggs (reserving the 1 white for later on), add a cupful of sugar, a cup of fresh white bread-crumbs, ½ a tea-cupful of stoned raisins or sultanas, a little vanilla essence and mix with a quart of fresh milk. When this is done put the mixture into a dish and bake in a moderate oven. Remove-from the oven and put over the top a good layer of stiff jam. Beat the remaining white to a froth with 1 tablespoonful of powdered sugar; spread this over the top and allow it to take colour in a quick oven. Serve with whipped cream.

APPLE CUSTARD PUDDING.

Stew 4 large apples until quite soft, mash them well with a dinner-fork and beat well with 2 ounces of butter and 3 tablespoonfuls of sugar, the juice and rind of 1 lemon; beat well 2 eggs, and add to the apples and continue beating a few moments. Line a deep pie-dish with a short pie-crust, pour in the apple mixture, and bake in a moderate oven three quarters of an hour.

RICE OR TAPIOCA PUDDING.

Scald one quart of fresh milk without allowing it to boil, add three parts of a teacupful of white sugar-loaf, a pinch of salt, and a little nutmeg. It is best to use the double milk saucepan. Stir into the hot milk six tablespoonfuls of either rice or tapioca, allow to boil for an hour on a slow oven for two hours longer after putting one or two small pieces of butter on the top.

GOOSEBERRY AND BREAD PUDDING.

Carefully remove the stalks and ends of a quart of green gooseberries and stew them gently with 1½ cupfuls of white powdered sugar and ½ a large cupful of boiling water, 2 tablespoonfuls of butter and 2 cupfuls of fine white bread-crumbs. These must be rubbed fine. Beat in the yolks of 3 eggs and the beaten white of 1. Pull all in a well-buttered dish that has been heated to melt the butter; bake in a moderate oven about twenty minutes. Beat with a clean knife-blade the remaining whites of the eggs, add 2 tablespoonfuls of sugar, spread over the top of the pudding, and return to the oven a few seconds to take a golden-brown colour. Serve very hot.

ORANGE PUDDING.

Put into an enamelled saucepan ¼ lb. of fresh butter, the same of white sugar; stir into this smoothly a dessertspoonful of fine white flour, 7 yolks of eggs, beaten, the juice of 1 orange and 1 lemon, and the grated rind of the orange. Stir it over a slow fire (using a double saucepan,) not allowing the mixture to actually boil, or any lumps. Pour it into an earthenware basin. Beat the whites to a stiff froth, pour into the other ingredients, and cook in a slow oven for thirty-five minutes. The mould must be placed in a deep vessel of boiling water while in the oven. This

pudding must be served as soon as ready with a custard flavoured with orange or some well-whipped and sweetened cream.

ARROWROOT PUDDING.

Mix 3 teaspoonfuls of fine arrowroot with a little cold milk, pour on to it when quite smooth a pint of boiling milk, 3 tablespoonfuls of sugar, and ½ a teaspoonful of vanilla. Put this mixture into the top half of a double milk saucepan ; place over a hot stove, stirring one way for five minutes. Pour into a wet iced mould and set aside to cool. Serve with either whipped cream or fruit sauce.

SNOW PUDDING.

Soak 6 leaves of sheet gelatine in a little cold water, then strain and scald in a teacupful of boiling water, add a teacupful of sugar, ½ a cup of lemon juice. Stir vigorously and then add the whites of 3 eggs beaten to a stiff froth, stir briskly, turn into a fancy glass dish and place in a cool spot till required.

AMBER PUDDING.

Proceed as for Snow Pudding using cider instead of boiling water and just enough boiling water to dissolve the gelatine, omitting the lemon juice, and sugar only to taste.

CRACKER PUDDING.

Soak about ½ lb. of crisp cream cracker biscuits in 2 pints of salted milk, add 2 oz. of butter—melted, and 2½ oz. of white sugar; allow to cool and beat in 2 eggs and if liked a few drops of some flavouring essence. Place the mixture in a deep buttered stone dish-around one if possible; bake for half an hour and then spread over the top the whites of 3 eggs beaten to a stiff froth with 4 tablespoonfuls of white sugar

and a teaspoonful of lemon juice. Return to the oven for a few minutes to brown slightly.

COTTAGE PUDDING.

Work well together with the hand 1½ cupfuls of flour into a teacupful and 1 tablespoonful of sugar and 1 teaspoonful of baking powder, and mix in the yolks of 2 eggs. Add the well-beaten whites and ½ cup of milk. Work well together. Turn the mixture into a well-buttered stone basin, and bake in a moderate oven one hour, and serve with a fruit sauce.

CHERRY PUDDING.

Beat the yolks of 3 eggs with 4 ounces of sugar, and add 3 ounces of fine white bread-crumbs (the loaf must be stale), the juice of half a lemon, and a little of the rind rubbed on a grater very fine, and ½ pound of stoned cherries. Beat all together; add the cherries last. Well butter a deep mould and line with a layer of bread-crumbs, put in the mixture and bake in a slow oven for an hour. Serve with whipped cream or fruit made from ½ pound of cherries cooked in syrup.

GLACE PUDDING.

Scald ¼ lb. stoned raisins in 1 pint of milk and ¼ lb. fine white sugar; allow this to stand on the side of a hot stove fifteen minutes; strain the milk and add it to a mixture of 1 egg mixed smooth with a tablespoonful of flour. Strain once again and allow it to cool, add ½ a cup of finely chopped almonds, the same quantity of candied pineapple, the same of ginger cut very small, a pint and a half of thick cream, and lastly 3 tablespoonfuls of table salt. Allow to get frozen before serving. The raisins can be used in a bread-and-butter pudding if to be eaten the same day.

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