

# PATENT SPECIFICATION

Convention Date (Australia): Feb. 14, 1927.

285,383

Application Date (in United Kingdom): Feb. 13, 1928. No. 4546/28.

Complete Accepted: May 13, 1929.

COMPLETE SPECIFICATION.



## Improved Means for Ascertaining the Percentage Composition of Substances after a Given Dilution, and vice versa.

We, NESTLE & ANGLO-SWISS CONDENSED MILK COMPANY, (AUSTRALASIA) LIMITED, carrying on business as Manufacturers, at 347, Kent Street, Sydney, in the State of New South Wales, Commonwealth of Australia, an Australian Company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improved means for ascertaining by mechanical calculation the percentage composition of substances on mixing, or if a mixture is required with a definite percentage of a constituent, the required quantities of each of the substances can be ascertained in the same manner.

The main object of the invention is to provide for Doctors and Nurses a ready means for ascertaining the desired proportions for dilution of any food substance, provided its analysis is known. The proportion required may be obtained either by weight or by volume. At present, the ordinary method of calculation is tedious and requires expert knowledge. The use of this invention is not confined solely to food products but may be used for calculating dilutions of any other substance.

According to the invention we provide a table or chart setting out the analysis of the substances, for example milk products, showing the percentage proportion of the components such as water, fat, protein, maltose, dextrin and the like. Preferably, for convenience, attached to the card or base carrying this table is a circular disc superimposed concentrically upon a circle printed or otherwise indicated on the base, the disc (which is slightly less in diameter than the said printed circle) being pivoted at its centre and capable of rotation.

This moveable disc has a slot (preferably sector shaped) formed therein extending from adjacent to its periphery towards its axis. Adjacent to one side of the slot are printed in successive lines the names of several substances, the required dilution for which is to be calculated, as for

example, "condensed milk", "malted milk", "skimmed milk", etc. each of which corresponds to a concentric circle indicated on the base, and of which part is visible through the slot in the superimposed disc.

A similar space is also provided corresponding to one of the concentric circles visible within the slot which is for use in calculations in which the unit is a predetermined weight (for example one ounce) of any substance. Near the periphery, the disc is provided with a series of scale markings corresponding to logarithmic sub-division of the circumference thereof. The circumference of the circle imprinted upon the base is also sub-divided logarithmically and appropriately numbered at intervals while symbols, or reference letters, are provided at intervals corresponding to the percentage of each constituent present in the various food products under consideration, such percentages being indicated together with the corresponding symbols or letters in the table. The letters and symbols on the circle printed on the base are arranged adjacent to the periphery thereof so as to be visible beyond the circumference of the disc superimposed thereon. Within the circle printed on the base the series of concentric circles above referred to, each circumferentially divided logarithmically are provided, the divisions of these logarithmically divided circles corresponding to medicinal table-spoonsful. The circles are positioned so that the value which is to be read in any example is the point at which one edge (the reference edge) of the slot in the disc cuts the appropriate circle which corresponds to the name of the substance under consideration and indicated adjacent to the edge of the slot as previously described. The inner concentric circles indicated on the base and the dimensions of the slot are such that each circle may be viewed completely through the slot by rotation of the disc.

In order that the invention may more readily be understood reference may be had to the accompanying drawing where- in the means for carrying the invention

into effect are shown to consist of a base upon which a chart or table is indicated together with a series of concentric circles each radially sub-divided and at the centre of which a superimposed concentrically pivoted rotating disc is arranged.

In the drawing the chart or table 1 is divided into spaces vertically and horizontally and set out therein, in tabulated form, are analysis, calorific values etc. of soluble food products of various kinds. The names of the food products are tabulated in the spaces 2 under the heading "food" and the percentages and other particulars of the food products are tabulated in the columns 3.

A graduated circle 4 is indicated on the base and a concentrically mounted, rotatable, graduated and slotted disc 5 is provided for use in conjunction with the base and the table. A sector shaped slot 6 is arranged in the disc as shown and adjacent to one side of this slot the names 8 of the soluble food products mentioned in the chart or table are arranged at intervals adapted to correspond each with the circumference of one of the concentric circles indicated on the base and visible through the slot 6. In the drawing, for the sake of clarity only five of such circles are shown. A further space 9 is also provided suitably inscribed and corresponding to a concentric circle on the base on which calculations may be made for a predetermined weight (for example one ounce) of any substance. A radial space 10 which has the effect of bracketing the spaces 8 directs as to the quantity of the soluble food product to be considered as the unit (for example one level medicinal tablespoonful). The graduated circle 4 is sub-divided logarithmically and is provided with appropriate scale numbering; symbols, for example, letters, are also indicated at points adjacent to the periphery and corresponding to the percentage of each constituent contained in the various food products under consideration. All these markings and symbols are visible outside the periphery of the rotating disc 5. The concentric circles 12 and 14 on the base are visible through the slot 6 and are sub-divided logarithmically. The periphery of the rotatable disc 5 is also sub-divided logarithmically. The space 13 may contain directions for operating the device. The relation of the sub-divisions of the circle 14 corresponding to the space 9, (which in this case is the outermost circle visible within the slot) to the divisions of the remaining scales are derived in the following manner:—

Where "A" = percentage of a given constituent in the food product under

consideration,

"B" = percentage of the same constituent in the required dilution of the food product

"C" = weight in ounces of the food product to be diluted

"D" = weight in ounces of water required to dilute the quantity of food "C"

$$\text{then "D"} = \frac{C}{B} (A - B) \text{ fluid ounces} \quad 75$$

$$= C \left( \frac{A}{B} - \frac{B}{B} \right)$$

$$= C \left( \frac{A}{B} - 1 \right)$$

$$\text{or volume of water} = C \left( \frac{2A}{B} - 2 \right)$$

tablespoonfuls (since 1 fluid ounce = 2 medicinal tablespoonful). 80

In the present case  $C=1$ , i.e. the scale refers to 1 ounce weight of food product

therefore the volume of water =  $\frac{2A}{B} - 2$

tablespoonfuls.

From this it will be seen that the relation between the outer scale on the base and the scale of circle 14 is that the graduation of the scale on circle 14 is double the graduation of the scale of the outer circle on the base minus two. 90

Placing, therefore, the desired percentage (B) as indicated on the disc 5 opposite the percentage of the constituent in the food product (A) shown on the outer circle on the base, the answer to the fraction  $\frac{A}{B}$  is shown on the outer circle opposite the reference edge of the slot i.e. at the graduation 1.0 on the periphery of the disc. 95

The graduation on circle 14 where the latter intersects the reference edge of the slot will thus be  $\frac{2A}{B} - 2$ . 100

For example if  $A=30\%$  and  $B=2\%$  then  $\frac{A}{B} = \frac{30}{2} = 15$ . The graduation on

circle 14 is thus  $\frac{2A}{B} - 2 = \frac{60}{2} - 2 = 28$ , which is the graduation at the intersection of the circle 14 and the reference edge of the slot. 105

The graduations obtained as above for circle 14 refer to one ounce weight of concentrate and the graduations are in terms of medicinal tablespoonfuls. The remaining concentric circles on the base which are all in part visible through the slot have graduations relating to one medicinal tablespoonful of the concentrate. To arrive at the corresponding graduations for the circles 12 and the circle 14, the figures on the scale of the circle 14 must therefore be multiplied by 120

the weight in ounces of one medicinal tablespoonful of the substance. These factors are suitably given in one of the columns in the table. For instance, for a given substance on the chart or table the multiplier might be .2 or 1/5th. In this case, therefore, 6 on the scale on that one of the circles 12 corresponding to the substance under consideration would be opposite to 30 on circle 14. In the same way, for a substance in which, for example, the weight of one medicinal tablespoonful is 0.45 ounces, each graduation on the outermost scale would then be multiplied by 0.45 to arrive at the required graduation.

When it is desired to ascertain the weight of substance and volume of liquid required to give a definite percentage of any constituent on dilution, and provided the percentage of the same constituent in the substance or mixture of substances is known and that the fluid does not contain the same constituent, the device is employed as follows:

EXAMPLE:

Water and a substance containing 40% of starch are required to give a dilution containing 3% of starch. The movable disc is rotated until 3 on its periphery coincides with 40 on the outer and printed circle. The number of tablespoonfuls of water to one ounce weight of the substance is indicated on circle 14 where it cuts the reference edge of the slot, in this case 24.5 tablespoonfuls. If the quantities of fluid and substance in a mixture are known the percentage of a constituent may be found by reversing the method.

When it is desired to find the volume of both water and a substance (details of which have been predetermined and indicated on the device) which on mixture will give a definite percentage of the constituent of the substance, for example, a protein percentage in condensed milk, the operation is as follows:

EXAMPLE:

Assuming the percentage of protein required is 1.5 and the proportion of protein in the substance is given in the analysis table as 9.3, the rotating disc is moved until 1.5 on its periphery coincides with 9.3 on the outer printed circle. The number of tablespoonfuls is then shown on the inner concentric circle corresponding to condensed milk, where this circle cuts the reference edge of the slot. To find the percentage composition when definite quantities of food and water are mixed, for example, 1 tablespoonful of malted milk to 8 of water, the rotating disc is moved until the reference edge of the slot cuts the concentric circle

corresponding to malted milk at the value 8. The figures for the composition of the mixture are thus on the periphery of the rotating disc coinciding with the figures or symbols on the periphery of the fixed disc for the composition of malted milk. For example, .7% on the rotating disc (which is the fat percentage in malted milk) coincides with 9 on the outer printed circle. .7 is therefore the percentage of fat in the mixture of one tablespoonful of malted milk with 8 tablespoonfuls of water.

By this device also the weight corresponding to the volume of any substance detailed in the chart can be found as follows:

Where the edge of the slot in the rotating disc cuts the concentric circle on the base corresponding to a particular substance indicates the weight in ounces corresponding to the volume in tablespoonfuls which is shown on circle 14 where it intersects with the reference edge of the slot.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Improved means for ascertaining the percentage composition of substances of or for a given dilution, comprising a base showing a chart divided into spaces vertically and horizontally, a graduated circle indicated on the said base and a movable graduated and slotted disc superimposed on the said circle.

2. In improved means of the kind described for ascertaining the percentage composition of substances, a chart divided into spaces and having set out thereon in tabulated form the analyses and calorific values of soluble food products of various kinds, a fixed graduated circle and a movable graduated disc superimposed thereon.

3. In improved means of the kind described for ascertaining the percentage composition of substances, a chart containing tabulated analyses and calorific values of milk products, a movable graduated disc and a fixed graduated circle having their circumferences subdivided logarithmically, the movable disc having a slot adjacent to which the names of soluble food products are placed, and so disposed that the individual products may be read in association with appropriate graduations disposed on concentric circles and visible through the said slot.

4. Improved means for ascertaining the percentage composition of substances of or for a given dilution, substantially as described and as illustrated with reference to the accompanying drawings.

70

75

80

85

90

95

100

105

110

115

120

125

130

---

DICKER, POLLAK & MERCER,  
Chartered Patent Agents,  
Dated this 13th day of February, 1928. 20 to 23, Holborn, London, E.C. 1,  
Agents for the Applicants.

---

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1929.

[This Drawing is a reproduction of the Original on a reduced scale.]

