

# PATENT SPECIFICATION

646,399



Date of Application and filing Complete  
Specification : Jan. 26, 1948.

No. 2319/48

Application made in Italy on April 4, 1947.

Complete Specification Published : Nov. 22, 1950.

### CORRECTION OF CLERICAL ERRORS

SPECIFICATION NO. 646399

The following corrections are in accordance with the Decision of the Superintending Examiner, acting for the Comptroller-General, dated the fifteenth day of December, 1950:-

Page 3, line 37, after "Tons" insert "opposite the value to be converted (for instance 27, thus representing 27 Short Tons)".

Page 3, line 96, before "per Quintal," insert "per cubic metre, 1.6 cents per lb., 3.5 cents per kilogram, 350 cents or 3.50 dollars".

THE PATENT OFFICE,  
2nd February, 1951.

DS 66663/9/3495 150 1/51 R

10 This invention relates to a calculating instrument for the simultaneous conversion of weight, volumes, prices and currencies.

It is well known that in commercial transactions in which units of weight and units of volume are both employed, for example in connection with petroleum products, one is continually obliged to repeat various arithmetical conversions from one unit system to another with respect to quantities, prices, quotations, expenses, charges, freights, taxes, duties, profits and losses applicable to the products themselves, which are generally classified according to the respective Specific Gravity. Said quantities and prices are expressed in various units of weight or volume, and sometimes in the currencies of various countries. For instance, petroleum products may be quoted in £ per Ton or in U.S. Cents per U.S. Gallon; cereals may be quoted in £ per Ton or in £ per Bushel.

30 Such computation is in part aided by appropriate tables, charts and handbooks which furnish the basic data, and may be made quicker by the use of ordinary slide-rules. However these latter are not widely adopted because, apart from the fact that they do not avoid the necessity of studying tables and charts, they only save a limited amount of time, as each calculation must be repeated for each single conversion required.

The object of the present invention is to provide an instrument by which, given an initial quantity or an initial value of a product, expressed in a certain unit of measure (weight or volume), it is immediately pos-

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ately monetary values expressed in metric units (such as Dollars, Francs, Florins, Lire, Pesos, Contos, Krons, Piasters, 55 Pesetas), into values expressed in non-metric units, such as, for instance, those of the British currency (Pounds Sterling, shillings, pence). All this is done by the instrument itself without having to know 60 the basic conversion factors, and without having to consult any tables or charts, with the result that, apart from the advantage of saving a great amount of time, the instrument can be used even by a person with 65 very limited mathematical experience.

The invention consists in a calculating instrument for the simultaneous conversion of weights, volumes and prices for a plurality of units of measure and exchange, 70 comprising a normally stationary basic portion including two spaced-apart longitudinal members disposed to provide a guide-way therebetween and two longitudinal movably disposed bars in said 75 guideway and displaceable one with respect to the other, and means for adjustably linking said two bars to form a unit thereby, a logarithmic scale on each of said spaced-apart members along their edges 80 adjacent to said guideway representing weights and prices per unit of weight and volume and prices per unit of volume respectively, a double series of indices corresponding to different units of weight on one 85 of said two movable bars and a double series of indices corresponding to different units of volume on the other of said two movable bars, said indices being adjacent said two first-mentioned logarithmic scales 90

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RESERVED

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Index at acceptance:—Class 106(i), B5b, B5g(19:38).

## COMPLETE SPECIFICATION.

### Calculating Instrument for the Simultaneous Conversion of Weights, Volumes, Prices and Currencies.

I, PAOLO SBERNADORI, of 7, Via Bartolomeo Eustachio, Rome, Italy, of Italian nationality, 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 a calculating instrument for the simultaneous conversion of weight, volumes, prices and currencies.

It is well known that in commercial transactions in which units of weight and units of volume are both employed, for example in connection with petroleum products, one is continually obliged to repeat various arithmetical conversions from one unit system to another with respect to quantities, prices, quotations, expenses, charges, freights, taxes, duties, profits and losses applicable to the products themselves, which are generally classified according to the respective Specific Gravity. Said quantities and prices are expressed in various units of weight or volume, and sometimes in the currencies of various countries. For instance, petroleum products may be quoted in £ per Ton or in U.S. Cents per U.S. Gallon; cereals may be quoted in £ per Ton or in £ per Bushel.

Such computation is in part aided by appropriate tables, charts and handbooks which furnish the basic data, and may be made quicker by the use of ordinary slide-rules. However these latter are not widely adopted because, apart from the fact that they do not avoid the necessity of studying tables and charts, they only save a limited amount of time, as each calculation must be repeated for each single conversion required.

The object of the present invention is to provide an instrument by which, given an initial quantity or an initial value of a product, expressed in a certain unit of measure (weight or volume), it is immediately pos-

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sible, by means of one simple setting of the instrument, to read instantly and simultaneously the equivalent quantities expressed in all the other units of weight or volume, domestic or foreign, adopted in commerce for the same type of product. It is furthermore possible to convert immediately monetary values expressed in metric units (such as Dollars, Francs, Florins, Lire, Pesos, Contos, Kronas, Piasters, Pesetas), into values expressed in non-metric units, such as, for instance, those of the British currency (Pounds Sterling, shillings, pence). All this is done by the instrument itself without having to know the basic conversion factors, and without having to consult any tables or charts, with the result that, apart from the advantage of saving a great amount of time, the instrument can be used even by a person with very limited mathematical experience.

The invention consists in a calculating instrument for the simultaneous conversion of weights, volumes and prices for a plurality of units of measure and exchange, comprising a normally stationary basic portion including two spaced-apart longitudinal members disposed to provide a guide-way therebetween and two longitudinal movably disposed bars in said guideway and displaceable one with respect to the other, and means for adjustably linking said two bars to form a unit thereby, a logarithmic scale on each of said spaced-apart members along their edges adjacent to said guideway representing weights and prices per unit of weight and volume and prices per unit of volume respectively, a double series of indices corresponding to different units of weight on one of said two movable bars and a double series of indices corresponding to different units of volume on the other of said two movable bars, said indices being adjacent said two first-mentioned logarithmic scales

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respectively, a logarithmic scale on each of said movable bars adjacent the common edge thereof, corresponding to values of the specific gravity of the product for which the calculations are to be made and of the so-called A.P.I. Gravity thereof, respectively, and an indicator for each gravity scale on the opposite movable bar.

In the accompanying drawing Fig. 1 shows by way of example a plan view of a calculating instrument according to the invention, with its component parts placed ready for a calculation;

Fig. 2 shows, on a larger scale, the detail of one type of mechanical device mounted on the instrument for the micrometric setting of its movable parts; and

Fig. 3 shows a second example of one of the many equivalent or similar mechanical devices which can be used as a substitute for that shown in Fig. 2.

In the example of embodiment illustrated in Fig. 1, the instrument is composed of two stationary logarithmic scales A and B rigidly connected one to the other, with in between an interval acting as a longitudinal guideway for two slidable scales C and D. The two slidable scales C and D can be set and kept in a proper relative position either by an ordinary fixing knob or, preferably, by a micrometric device of the type shown separately, on a larger scale, in Fig. 2. Rotation by hand of a knob X, and consequently of a screw Y, causes an axial movement of a nut T which is transmitted to the scale C through an arm W. When this setting has been made, both scales C and D can be displaced together along the fixed scales A and B for the simultaneous reading of the results of the required conversions.

The stationary logarithmic scale A contains an increasing graduation representing quantities by WEIGHT, with no reference to any particular unit of measure, while the stationary logarithmic scale B contains an identical graduation representing quantities by VOLUME, also with no reference to any particular unit of measure. Both graduations of the stationary scales A and B represent also PRICES, costs, quotations, expenses, etc., on the understanding that, when the readings are made on scale A of weight, such prices are in terms of money per unit weight (for example, U.S. cents per Lb., U.S. cents per Long Ton), and analogously, when the readings are made on the scale B of Volume, such prices are in terms of money per unit volume (for example, U.S. cents per Litre, U.S. cents per Imperial Gallon, U.S. cents per Barrel, U.S. cents per Cubic Meter). Any money values or any currencies may be employed, provided that the same money values or currency be considered for all the

various units of measure, either of weight or of volume, in each problem to be solved.

The slidable scale C, on its edge adjacent the stationary scale A, bears two series of logarithmically spaced marks, in two different colours, for instance black and red. Each one of these marks, instead of being numbered, is defined by initials or symbols indicating a particular unit weight it represents. Thus, in the example of embodiment shows in Fig. 1, one series of marks coloured black includes one mark representing Long Tons (LT), another mark representing Metric Tons (MT), and so on, other marks representing respectively Short Tons (ST), Quintals (100 Kg), Kilograms (Kg), Pounds Avoirdupois (Lb). The other series of marks coloured red includes an equal number of marks similar to those of the black series, but disposed in a different position and in the reverse order. The black marks serve for the conversion of quantities by weight, while the red marks serve for the conversion of prices, quotations, expenses and the like per unit weight. In order that they may be readily distinguished, the red marks may also bear a characteristic sign, for instance, a small triangle as in the Fig. The red marks which are of course shown as black in the drawing may be identified by these small triangles.

In like manner, the slidable scale D, on its edge adjacent the stationary scale B, bears two series of properly spaced marks, in two different colours identical to those of scale C. One series of black marks includes one mark representing Cubic Metres (CM), another mark representing Barrels (Bbl), and so on, other marks representing Cubic Feet (CF), Imperial Gallons (IG), U.S. Gallons (G), Litres (Lt), U.S. Quarts (Qt), etc. The other series of red marks includes an equal number of marks similar to those of the black series, but disposed in a different position and in the reverse order. The black marks, on scale D, serve for the conversion of quantities by volume, while the red marks serve for the conversion of prices, etc., per unit volume. The red marks on this scale also bear a small triangle, as in the case of scale C.

A black pointer or arrow F is engraved on scale C, on its edge adjacent the slidable scale D, as a reference line for reading the graduation of the SPECIFIC GRAVITY engraved in black on Scale D. Next to that, a red pointer or arrow is engraved on scale D, as a reference line for reading the graduation of the A.P.I. GRAVITY (or a Baume scale of density), engraved in red on scale C.

Lastly, in the remaining space on the two slidable scales C and D, comprising two rectangular areas U and V, two different

series of logarithmic graduations are inserted facing one another, one on the scale D and the other on scale C. Each of these graduations is defined and numbered in terms of the monetary system of a particular country. These graduations are preferably engraved on interchangeable plates to give an assortment of combinations for the currencies of many countries.

10 In the particular example shown in Fig. 1, the graduation engraved on area V is in terms of Pounds Sterling, shillings and pence, while the graduation engraved on area U is in terms of Dollars, cents and fractions of a cent. The latter may also be employed, applying the appropriate reductions, to represent some other decimal monetary system, for instance Francs, Pesos, Lire, Florins or Marks, when these currencies have to be changed into British money.

In using the calculating instrument above described, when the problem involves conversions of quantities by weight or by volume, the operator first adjusts the slidable scales C and D by means of a micrometric device of the type illustrated in Fig. 1 and in Fig. 2, in order to set the black arrow F opposite the line of the black graduation representing the specific gravity possessed by the product for which the conversions are to be made (for instance 0.900). He then moves by hand the whole, formed by the two slides, as if it were a single slide, and places the black mark representing the given unit of weight (for example ST, i.e., Short Tons) read on the stationary scale A of weight. He will thereby be able to find immediately and simultaneously the result of all possible conversions sought by simple reading, on the graduations of scales A and B, the values in alinement with the marks representing the remaining units of measure, either of weight or of volume. Following the example, the operator will therefore be able to read simultaneously, on scales A and B, the following results for the conversions sought: 24.1 Long Tons, 24.49 Metric Tons, 244.9 Quintals, 24,490 Kilograms, 54,000 Lbs., 27 Cubic Meters, 170 Barrels, 954 Cubic Feet, 5,950 Imp. Gallons, 7,140 U.S. Gallons, 27,000 Litres, 28,560 U.S. Quarts, etc.

55 In case the unit to be converted is a unit of volume, the operator proceeds in a similar way, after placing at first the black mark relative to the given volume unit (for instance, Barrel), opposite the value to be converted (for instance 170, thus representing 170 Barrels). After that he can read immediately and simultaneously all the equivalent quantities sought, on the graduations of scales A and B, in alinement with each one of the marks represent-

ing the other units of measure.

When the problem involves conversions of prices, quotations, charges, profits and the like (generally expressed in terms of money per unit weight or per unit volume), the operator acts in the same way as noted above for conversions of quantities, with the only difference that the red marks, the red arrow G and the red graduation of the A.P.I. Gravity (or the red equivalent scale of density adopted) have to be used instead of the black ones. For example, given a price of 10 U.S. cents per U.S. Gallon, quoted for a petrol of 57 A.P.I. Gravity, and wanting to convert such price into the equivalent price related to any other unit of measure by weight or by volume, the operator only has to adjust the slidable scales C and D, in order to set the red arrow opposite the value 57 of the red graduation of A.P.I. Gravity, and then move the whole until the red mark G (i.e., U.S. Gallon) comes opposite the value 10 of the scale of volume B. He will then be able to read on the graduations of the scales A and B respectively, opposite each red mark, the following equivalent prices: 2.5 U.S. cents per U.S. Quart, 2.63 cents per Litre, 12 cents per Imp. Gallon, 4,200 cents or 4.20 dollars per Barrel, 26.33 dollars per Quintal, 32 dollars per Short Ton, 35 dollars per Metric Ton, 35.60 dollars per Long Ton, etc.

When the problem consists in converting a given amount of money, expressed in terms of one monetary system, into the equivalent amount expressed in terms of another monetary system (as, for instance, from the British into the American system or vice versa), the operator simply adjusts the two slidable scales C and D in accordance with the selected rate of exchange and therefore, for example, brings the "one" line of the Pound Sterling graduation opposite the equivalent Dollar value of the graduation of Dollars, at the selected rate of exchange (for example £1 = 4 dollars). He may also, if he prefers, bring the "one" line of the Dollar graduation opposite the equivalent Shilling value of the graduation of shillings (for example 1 dollar = 5 shillings). He will then be able to find immediately any solution sought by simply reading the value, in terms of the other currency, that stands opposite the given value. For example, at the above mentioned rate of exchange, he will be able to read simultaneously all the following equivalent solutions: 1 cent = 0.6 pence, 5 cents = 3 pence, 6 pence = 10 cents, 15 cents = 9 pence, 1 shilling = 20 cents, 60 cents = 3 shillings, 15 shillings = 3 dollars, £3 = 12 dollars, 18 dollars = £4 10s., £1 5s. = 5 dollars, etc.

A similar procedure may be followed

either in case the Dollar scale is employed to represent some other decimal monetary system or in case interchangeable graduations are provided to cover a wide assortment of monetary systems.

In other available spaces of the instrument there can be inserted some ancillary independent graduations, such as for example that shown on Fig. 1, for conversions of Temperature from degrees Fahrenheit to degrees Centigrade and vice versa.

Fig. 3, as already mentioned, illustrates another example of a mechanical device which may be fitted on the instrument in place of that shown in Fig. 2. Here too the setting of the two movable scales C and D is obtained by the axial displacement of the nut T along the screw Y operated by hand by means of the knob X, through the rocker arm W, the shorter end of which is held by the rod S connected to the support E mounted on scale D, whereas the other end is connected to the scale C by means of the rod R. In this way a small displacement of the nut T results in an amplified movement between the scales.

It is understood that the shape of the instrument, the number and the arrangement of the scales, as well as the devices for setting and fixing its sliding parts, as hereinbefore described, may be varied and yet remain within the scope of the invention as defined in the appended claims. The invention may include, for instance, also the following arrangements:

- (a) A different assembly or arrangement of the stationary and slidable scales and their graduations;
- (b) Substituting for the fixing knob or the mechanical devices illustrated by way of example in Figs 2 and 3, other devices having the same function.

It will be apparent that the calculating instrument is particularly useful for the conversion of quantities and costs in connection with liquid and semi-liquid products, powdered and granular solids, and indeed any products which adapt themselves to the shape of the vessel holding them and which can be measured both in units of weight and in units representing volume.

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

1. A calculating instrument for the simultaneous conversion of weights, volumes and prices for a plurality of units of measure and exchange, comprising a normally stationary basic portion including

two spaced-apart longitudinal members disposed to provide a guide-way therebetween and two longitudinal movably disposed bars in said guide-way and displaceable one with respect to the other, and means for adjustably linking said two bars to form a unit thereby, a logarithmic scale on each of said spaced-apart members along their edges adjacent to said guide-way representing weights and prices per unit of weight and volume and prices per unit of volume respectively, a double series of indices corresponding to different units of weight on one of said two movable bars and a double series of indices corresponding to different units of volume on the other of said two movable bars, said indices being adjacent said two first-mentioned logarithmic scales respectively, a logarithmic scale on each of said movable bars adjacent the common edge thereof, corresponding to values of the specific gravity of the product for which the calculations are to be made and of the so-called A.P.I. Gravity thereof, respectively, and indicator for each gravity scale on the opposite movable bar.

2. A calculating instrument as claimed in Claim 1, further including, on the adjacent faces of said movable bars, a logarithmically graduated scale corresponding to the values of a currency of non-decimal subdivision and another logarithmically graduated scale corresponding to the values of a currency with decimal subdivision, respectively.

3. A calculating instrument as claimed in Claim 1, wherein one series of indices on each of the two movable bars is different both in shape and colour from the other series of indices relating to the same units of weight and volume respectively, the first one of the two series of indices being applicable for the conversion of quantities and the second one of the series of indices being applicable for the conversion of price.

4. A calculating instrument as claimed in Claim 1, wherein said means for adjustably linking the movable bars comprises a device with a micrometric screw adapted to establish with precision the relative initial position of said two movable bars and to maintain unchanged such relative position during the simultaneous displacement of said bars.

5. A calculating instrument substantially as described with reference to the accompanying drawings.

Dated this 26th day of January, 1948.

MARKS & CLERK.

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

Fig. 1

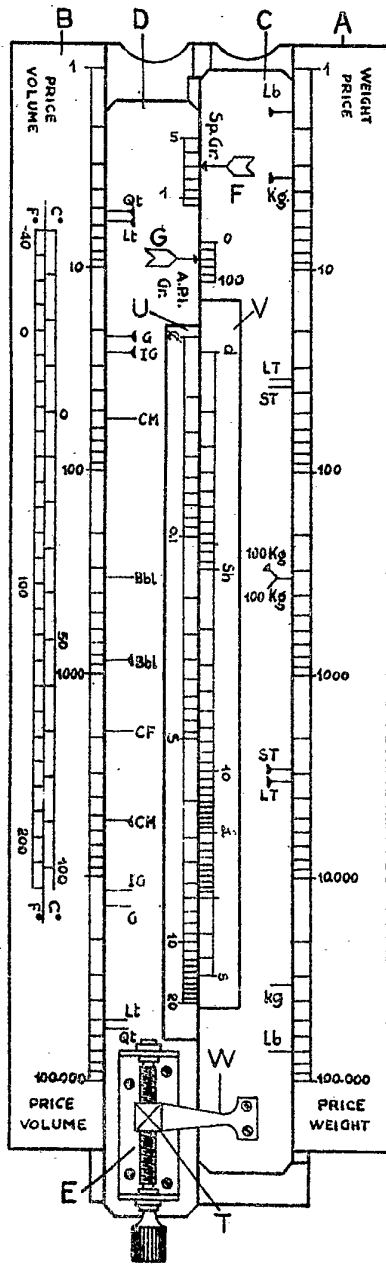


Fig. 2

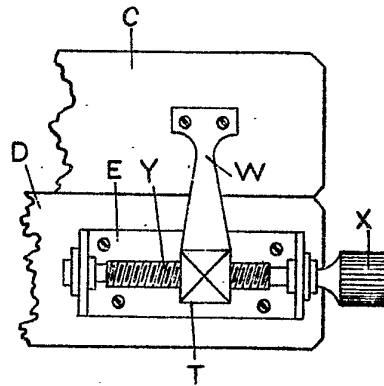


Fig. 3

