PATENT SPECIFICATION 1,082,952

DRAWINGS ATTACHED.

Inventor:—ANTHONY ROBINSON.

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Int. Cl.:—G 06 g 1/06.

COMPLETE SPECIFICATION.

Slide Rule.

We, DOWTY GROUP SERVICES LIMITED, a British Company, of Arle Court, Cheltenham, in the County of Gloucester, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to calculating devices and it has for its object a calculating device suitable for use as an aid to stock control.

It can be shown that the minimum total cost for an item held in stock, including manufacturing, storage and interest charges, is given by the equation

$$Q = \sqrt{\frac{200\ MC_s}{IC}} \qquad (1)$$

where

Q = the quantity to be ordered

M = the rate of use of such items, i.e. the number in a given period

C_s = the cost of purchasing a batch of items or of setting up for a batch

C = the cost of each item

I = the percentage of cost of an item for storage and interest charges.

The main use of formula (1) is to determine the quantity Q of items or material which is most economic to order.

It is found that in a store of a substantial number of different items, these can be classified into a relatively small number of groups in which respectively different but constant values of $\frac{200\ C_s}{I}$ can be assumed.

Thus for each group of items the equation (1) may be simplified to

$$Q = K\sqrt{\frac{M}{C}} \qquad (2)$$

where

$$K = \sqrt{\frac{200\ C_s}{I}} \qquad (3)$$

The factor K can alternatively be derived by a different method which avoids the difficulties in assessing the factors C_s and I.

It can be shown that

$$\Sigma N = \frac{1}{K}\Sigma\sqrt{MC} \qquad (4)$$

where ΣN is the total number of orders placed over a given period for a group of items having a similar K factor.

Equation (4) can thus be re-written as

$$K = \frac{\Sigma\sqrt{MC}}{\Sigma N}$$

According to the invention a slide rule having logarithmic scales of Q and of the factors M, K and C as hereinbefore defined, comprises one member bearing two of said logarithmic scales, and two members movable with respect to the said one member, each movable member bearing a respective one of the remaining two logarith-

[*Price 4s. 6d.*]

mic scales, the arrangement of the logarithmic scales being such that one movable member can be set against a selected value on the logarithmic scale of one of the factors M, K and C, the other movable member can be set against a selected value on the logarithmic scale of the second of the factors M, K and C, whereupon the position of a selected value on the third of said factors M, K and C indicates the required value of Q.

According to a particular form of the invention, a slide rule comprises a stock, and a slide and a cursor both movable independently one of the other in one direction relative to the stock, the stock bearing logarithmic scales spaced apart at opposite sides of the rule of which one scale is one of the factors M or C as hereinbefore defined and the other scale is that of the factor K as hereinbefore defined, the cursor bearing a logarithmic scale of the other of the factors M or C in a direction perpendicular to the scales on the stock, and the slide bearing a logarithmic scale of the quantity Q as hereinbefore defined on which equal values are defined by rulings which are inclined to both the scales on the stock and the scale on the cursor, the cursor being settable against a given value on one scale on the stock and the slide being settable against a given value on the other scale on the stock whereupon a given value on the cursor scale indicates the required value of Q on the slide scale.

The accompanying drawing shows a slide rule in accordance with the invention in Figure 1, and

Figure 2 shows another embodiment of the invention.

In the drawing a longitudinally channelled stock has a slide mounted in the channel, and a cursor mounted on the stock for movement with respect to both the stock and the slide.

The face of the stock at one side of the channel, uppermost in the drawing, is inscribed with a logarithmic scale of M whose values increase from left to right. The face of the stock on the other side of the channel, lowermost in the drawing, is inscribed with a logarithmic scale of K, whose values increase from right to left. The scale of K is twice that of the scale M.

The cursor has a hair-line perpendicular to the M and K scales and along the hair-line a logarithmic scale of C is inscribed having its lowest value coincident with the junction of the M scale and the slide.

The slide is inscribed with diagonal lines providing a scale of quantity Q which increases in value from the bottom left-hand corner to the top right-hand corner. The Q scale is in fact logarithmically based, but the lines are ruled to provide division into convenient whole number quantities. If the diagonal lines are inclined at 45° to the longitudinal direction, the scale of C will have the same spacings as the scale of M. However, in order to lessen the width of the slide rule, the angle of inclination of the diagonal lines is reduced in this embodiment and the spacings of the scale of C are correspondingly reduced. The slide has an arrow A indicated thereon for setting against a given value of K.

The scales on the slide rule are based on an expression of equation (2) in logarithmic form, i.e.

$$\log Q = \log K + \tfrac{1}{2} \log M - \tfrac{1}{2} \log C.$$

On operating the slide rule, the slide is first shifted so that the arrow A is set against the given value of K on the lower scale. The cursor is then shifted to set the hair-line thereon against the known value of rate of use M on the upper scale. The unit cost on the cursor scale then lies at a position on the diagonally lined slide scale directly indicating the required value of quantity Q.

The slide rule may be two-sided with different ranges of one of the factors, for example K, engraved on opposite sides, whereby the over-all range of the slide rule is increased.

The embodiment of Figure 2 illustrates diagrammatically another manner by which calculations according to the equation (2) can be performed. The numerical values are omitted. The stock bears at its upper edge a logarithmic scale of K whose values increase from left to right. A first slide bears a logarithmic scale of M whose values increase from left to right and whose intervals have half the spacing of the intervals on the K scale.

In use the left-hand end of the M scale is set against a given value on the K scale, and then the cursor which is mounted on the stock is set with its hair-line L against a given value on the M scale. A second slide, bearing a logarithmic scale of C whose values increase from right to left, is then set with the right hand end of the scale against the hair-line L on the cursor. The intervals of the C scale are similar to the intervals on the M scale. A given value on the C scale then indicates the required value of Q on the logarithmic scale of Q which is provided along the adjacent edge of the stock. Although the divisions on the Q scale are not themselves spaced logarithmically, the scale will in fact be logarithmically based as in Figure 1, so the divisions indicate convenient whole number quantities which increase in value logarithmically from left to right.

The factor scales may be arranged differently on the elements of a slide rule from

that described in each of the embodiments while still being capable of solving the equations (1) or (2) as the case may be. Although flat, straight slide rules have been described, the scales can also be applied to the elements of a cylindrical-type or a disc-type slide rule.

WHAT WE CLAIM IS:—

1. A slide rule having logarithmic scales of Q and of the factors M, K and C as hereinbefore defined, comprising one member bearing two of said logarithmic scales, and two members movable with respect to the said one member, each movable member bearing a respective one of the remaining two logarithmic scales, the arrangement of the logarithmic scales being such that one movable member can be set against a selected value on the logarithmic scale of one of the factors M, K and C, the other movable member can be set against a selected value on the logarithmic scale of a second of the factors M, K and C, whereupon the position of a selected value on the logarithmic scale of the third of said factors M, K and C indicates the required value of Q.

2. A slide rule having a stock, and a slide and a cursor both movable independently one of the other in one direction relative to the stock, the stock bearing logarithmic scales spaced apart at opposite sides of the rule of which one scale is one of the factors M or C as hereinbefore defined and the other scale is that of the factor K as hereinbefore defined, the cursor bearing a logarithmic scale of the other of the factors M or C in a direction perpendicular to the scales on the stock, and the slide bearing a logarithmic scale of the quantity Q as hereinbefore defined on which equal values are defined by rulings which are inclined to both the scales on the stock and the scale on the cursor, the cursor being settable against a given value on one scale on the stock and the slide being settable against a given value on the other scale on the stock whereupon a given value on the cursor scale indicates the required value of Q on the slide scale.

3. A slide rule according to Claim 2, wherein the slide rule is constructed as a flat slide rule with rectilinear scales.

4. A slide rule according to Claim 3, wherein the reverse face bears logarithmic scales of the factors, at least one of which covers a different range of values from that on the front face.

7. A slide rule substantially as herein described with reference to the accompanying drawing.

Agents for the Applicants,
F. J. CLEVELAND & COMPANY,
Chartered Patent Agents,
29, Southampton Buildings,
London, W.C.2.

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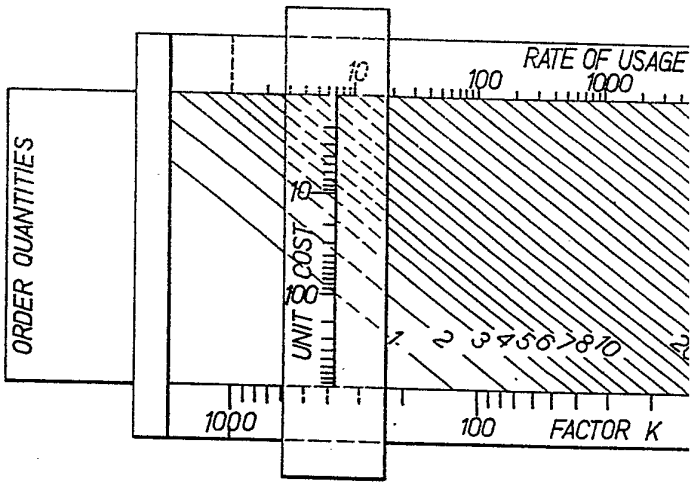
RATE OF USAGE
10
100
1000
ORDER QUANTITIES
UNIT COST
10
100
1
1. 2 3 4 5 6 7 8 10 2.
1000
100
FACTOR K

FIG. 1.

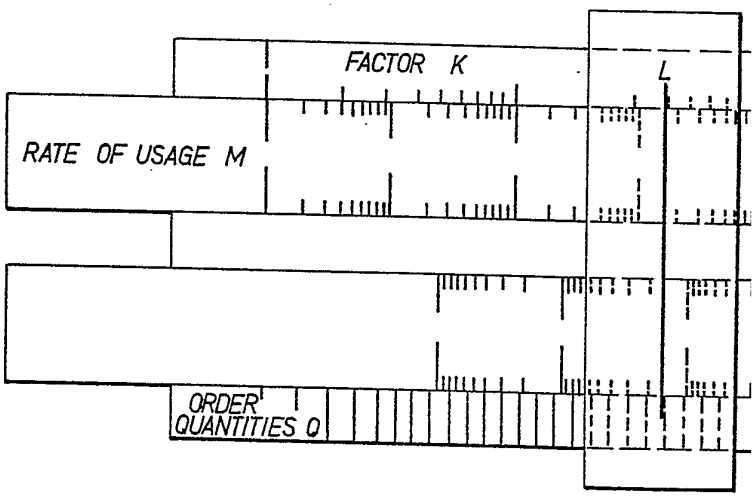
FACTOR K
L
RATE OF USAGE M
ORDER QUANTITIES Q

FIG. 2.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

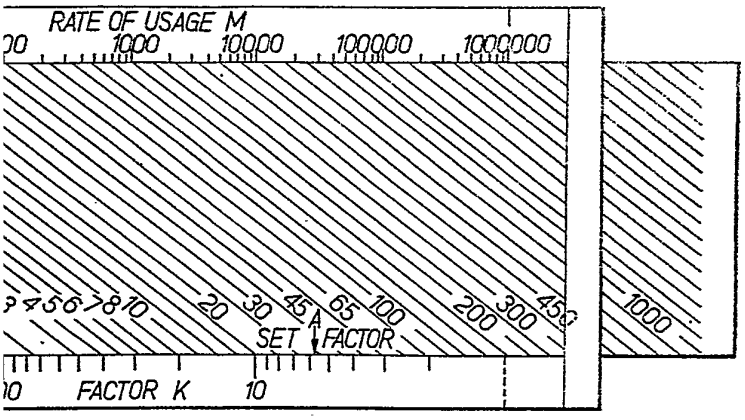

FIG. 1.

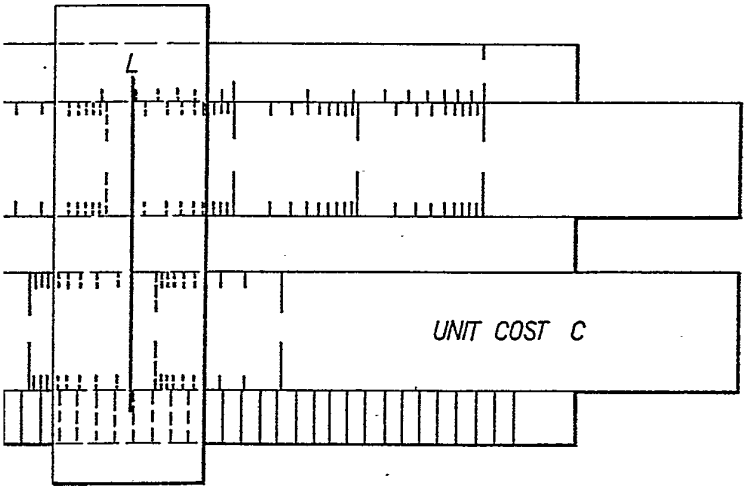

FIG. 2.

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1 SHEET

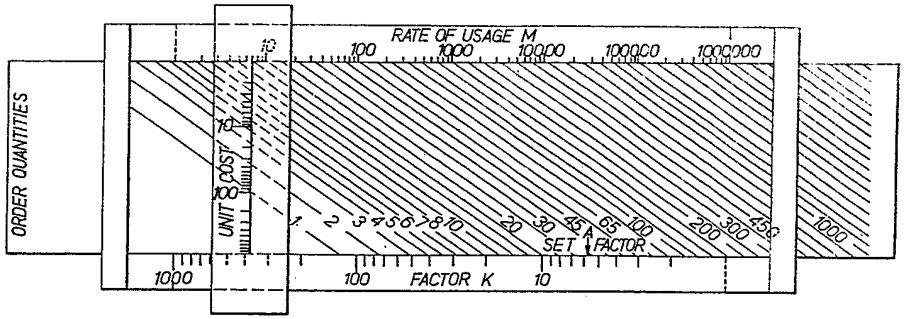

FIG. 1.

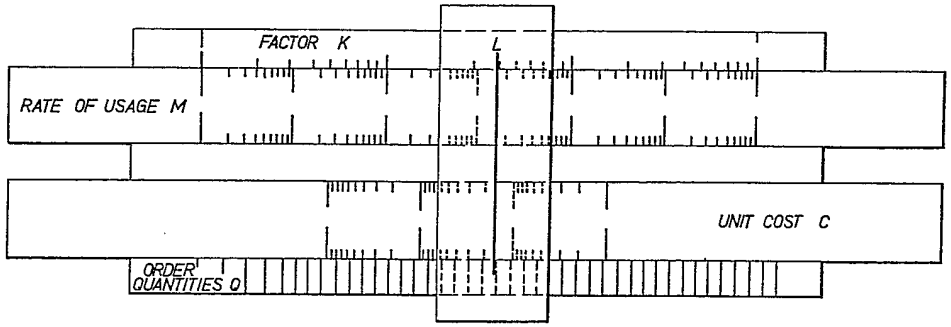

FIG. 2.