

PATENT



SPECIFICATION

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COMPLETE SPECIFICATION:

Improvements in Calculating Machines.

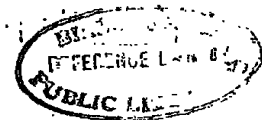
We, the Firm of CHATEAU FRÈRES, of 125, Boulevard de Grenelle, Paris, France, Manufacturers, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

- 5 The present invention relates to improvements in calculating machines of the Ohdner type, that is to say in calculating machines which proceed by successive additions when the crank handle is turned in the clockwise or positive direction and proceed by successive subtractions when the crank handle is turned in the contra-clockwise or negative direction.
- 10 Such machines are well known in which the drums of the counter comprise two series of figures each going from 0 to 9 and 9 to 0 but in opposite directions, each figure of one series being arranged below a figure of the other series and forming its complement of 9; but there has been only a single one of the sets of figures visible through the counter apertures or inspection windows, a mechanical
- 15 arrangement intervening to carry the plate provided with the apertures, in such a way as to allow only the useful set of figures to appear, the other set of figures being hidden.
- In the present invention there is no transfer or movement of the plate, which always remains fixed: instead of allowing a single figure at a time to appear in
- 20 each aperture, we cause two figures to appear simultaneously, arranged one above the other and of such a value that the total of each of these pairs of figures is equal to 9, the apertures being of a height such that they allow the two figures of each pair which are the complements of 9 to be seen simultaneously; these figures of the two series are preferably of different colours to facilitate reading.
- 25 For the purpose of rendering calculations more rapid and easier and for example in the case of a multiplication sum, for obtaining in the different apertures and in figures of different colours when a first factor has been multiplied by a second factor, in certain of the apertures (1) the result of the calculation subject to the known unitary error in the lowest denomination, and (2) in other apertures
- 30 the result of a multiplication by another second factor which is complementary (taking complements relative to 1) to the one previously employed.

We shall employ for example, the upper figure in each aperture for the positive direction of rotation and the lower figure for the negative direction of rotation, the eye reading quite naturally in the decimal system the number

35 formed by the juxtaposition, in the different apertures, of the upper figures or of the lower figures.

[Price 6d.]



The annexed drawing shows, by way of example, one form of carrying out the invention.

Figure 1 shows the development of the periphery of a drum of the counter. Figure 2 shows a view in side elevation of the drum, the figures being supposed brought down into the horizontal plane. Figure 3 is a front view of part of the calculating machine, showing two figures appearing at the same time in the apertures of the counter.

Each drum *a* (Figure 2) is provided on its periphery with two series of figures, proceeding one from 0 to 9, and the other from 9 to 0, each figure of one series being arranged below a figure of the other series, and being its complement of 9; each aperture *b* of the counter is of such a height (Fig. 3) that it shows simultaneously the two figures which are complements of 9 of each group. For greater facility, there may be given to the figures of the two series, different colours; suppose, for instance that the upper figures of each group are black and the lower figures are red; the drum *a* is operated through a toothed wheel having ten teeth *a*¹, so that one turn of the crank handle causes to appear before one aperture *b* of the counter, a group of two figures complements of 9 one to the other, for example (1—8), (2—7) (9—0).

The present invention enables to be obtained different advantages according to whether it is applied to the apertures of the second factor or operation counter or to apertures of results (*i.e.* totalizing counter).

If the counter is constructed to count the turns of the crank handle in each order of units and to record the remainders or "carried forwards" when the crank handle is turned in the positive direction, this arrangement also enables the turns of the crank handle to be counted and the "carried forwards" to be registered when the machine works in the negative direction, without adding any new device to the calculating machine.

In fact, if a multiplication be made by turning the crank handle in the positive direction and reading off the black figures, we shall have—as usual—the different figures of the multiplier and record of the carried forwards. If on the other hand a division be made, the counter being set to zero, the whole line of black figures comprises zeros and the line of red figures comprises nines. Making a single turn of the crank handle in the negative direction, all the black 9's and the red 0's will appear simultaneously. It will be sufficient, from this moment, to act as is customary, in the negative direction, in order to have in red figures the figures of the quotient, a single turn of the crank handle in the negative direction causing to appear the red figure 1, two turns the red figure 2, 11 red, 12 red and so on.

The calculating machine will work then, for divisions, because of the lower figures, complementary to 9 of the corresponding upper figures, as if we had a special counter continuing to count in the positive direction and making "carried forwards" whilst the machine works in the negative direction.

The arrangement of the two figures complementary one the other to nine, in the apertures of results or products enables us to obtain for example the following effect for discount operations, by utilising for different operations of discounting the parts on the left and right of the group of setting slides or table and of the apertures of the totalizing counter.

Suppose that it is desired to ascertain the discount at 5% on a sum of 25 francs. The number 25 is set upon the right hand portion of the table: a single turn of the crank handle is made in the positive direction, whilst suitably placing the carriage to cause to appear in the apertures of results the number 25.00 in black figures. Leaving everything in place, the same number 25 is set up on the left hand part of the table, hitherto left free. The carriage is caused to progress two notches to the left (since it is the $\frac{1}{100}$ of 25×5 which is to be subtracted). The apertures of results situated at the left show 0's as upper black figures and 9's as lower red figures. Next, five turns of the crank handle are made in the negative direction; upon the right hand part of the apertures, the

number 23, 75 can be read in upper black figures, which amount is the sum less the discount, that is to say the sum to be paid. On the other hand, upon the left hand part of the apertures, it is as if one had added this discount to 9 9 9 9 - - - on the lower red figures; it will suffice to add 1 to the unit of the lowest order of the number obtained in red figures, that is to say to 1.24 to obtain the amount of the discount desired (1.25 frs.).

In another example, let it be desired to work out the discount on 25 francs at 3.75 *per cent.* We set up 25 upon the right hand part of the table; a turn of the crank handle is given in the positive direction, suitably placing the carriage to cause to appear in the apertures of results the number 25.0000 in upper black figures. The carriage is drawn back two rows towards the left, since we have to subtract from this number the hundredth part of 25×3.75 . The number 25 is set up in the free part of the table, on the left, and by turning the crank handle in the negative direction, the multiplication of $25 \times .0375$ is effected (*i.e.* 25 multiplied by 3.75 %); on the right can be read in the apertures, by the black upper figures, the number 24,0625 which is the sum to be paid, that is to say the sum less the discount: on the left in the red lower figures, can be read the sum 0.9374 which is by adding 1 to the unit of the lowest value, the discount required (0.9375 franc).

As a general rule, where N is the first factor and n the second factor, we obtain in the left hand apertures in red figures $N n$, subject to the unitary error in the lowest denomination, and in the right hand apertures in black figures $N - N n$, that is to say $M \times (1 - n)$, namely the product of the first factor by a factor which is the complement to 1, of the second factor first employed.

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) The arrangement upon the periphery of each drum of the counters of a calculating machine of the Ohdner type (that is to say a machine proceeding by successive additions or by successive subtractions according to whether the crank handle is turned in the positive or in the negative direction), of two series of figures going one from 0 to 9, the other from 9 to 0, each figure of one series being arranged below a figure of the other series and forming its complement of 9, in combination with apertures having a height such that they allow to appear simultaneously the two figures complements of 9 one to the other of each pair for the purpose of expediting and facilitating calculations and showing in different groups of apertures, in the case *e.g.* of a multiplication sum when one factor has been operated upon by the second factor, both the result of the calculation subject to the known unitary error in the lowest denomination, and the result of a multiplication by another second factor which is complementary (taking complements relative to 1) to the one previously employed, substantially as and for the purpose above described.

(2) A form of carrying out Claim 1, in which the figures of the two series are of different colours in order to facilitate reading off.

Dated this 2nd day of May, 1916.

For the Applicants,

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Fig. 1.

0
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7
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4
5
5
4
6
3
7
2
8
1
9
0

Fig. 2.

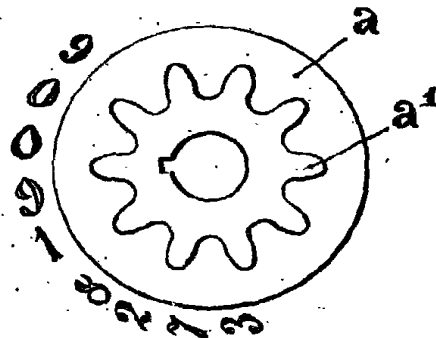
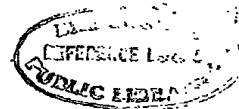
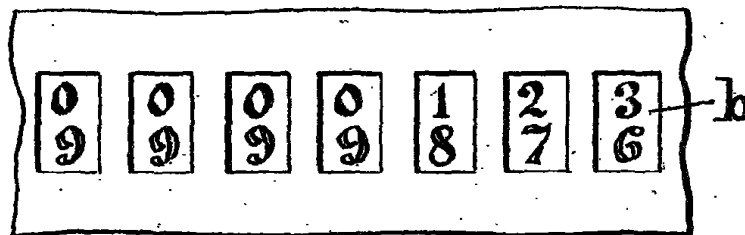


Fig. 3.



[This Drawing is a full-size reproduction of the Original.]