

Nov. 20, 1923.

1,474,533

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DECIMAL POINT CALCULATOR

Filed Aug. 7, 1922

Fig. 1

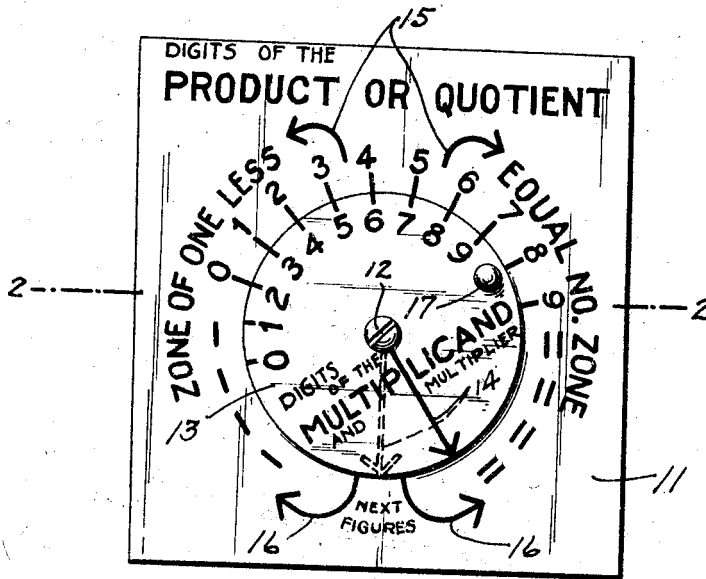


Fig. 2

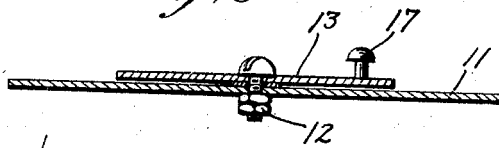


Fig. 4

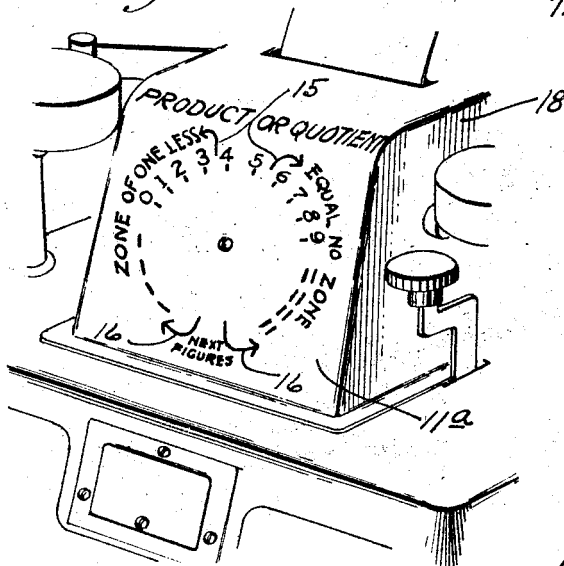
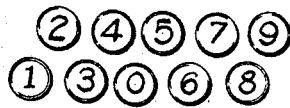


Fig. 3



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DECIMAL-POINT CALCULATOR.

Application filed August 7, 1922. Serial No. 580,124.

To all whom it may concern:

Be it known that I, CHARLES E. LATSHAW, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Decimal-Point Calculators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention provides what may be appropriately designated either as a decimal point calculator or as a decimal dial, and is in the nature of an improvement on or refinement of the decimal dial disclosed and broadly claimed in my prior Patent No. 1,301,140, issued April 22, 1919.

A device of the above character serves to enable the operator to very quickly locate the decimal point in making computations such as multiplication, regardless of how such computations are made; but its most useful purpose is found in connection with adding or computing machines, computing slide rules, and the like, and as a check in locating the decimal point in logarithm.

Adding machines, as is well known, are primarily constructed to perform the function of addition, and machines that list the items are generally equipped with keys for repeating. By the use of the repeater key, items are duplicated a plural number of times without rewriting the number on the keyboard. In performing multiplication with a multiplier composed of several digits, the items are repeated the required number of times, first in the tens, then in the hundreds, then in the thousands column, and so on. This form of addition is termed multiplication. Multiplying from right to left on the adding machines is very limited unless the machine is of very large capacity.

A person familiar with adding machine operations finds it very easy to multiply from left to right; but when using whole numbers followed by decimals, problems are found where the product is so large that the machine is not large enough to give correct results. Whereas, by reversing the operation and multiplying from left to right, the product will be substantially correct even when some of the right-hand numerals beyond the decimal point are dropped out of the computation. The dropping of these numbers at the right of the decimal point makes

it very difficult to mentally determine the proper location for the decimal point in the product. The device of my prior patent and more particularly the device of my present application, as already indicated, enables an operator to quickly determine the proper location of the decimal point in the product.

The particular device specifically disclosed in my prior patent as a concrete example of one form of my invention therein broadly claimed, the arrangement is such that the position of the decimal point in the product was determined by a relation of the digits in the multiplier and in the multiplicand; but in my present device I obtain in a simpler manner with much greater accuracy and a more comprehensive arrangement in which the position of the decimal point in the product preferably is determined by a relation of the digits in the multiplicand and in the product itself.

A preferred form of the present invention is illustrated in the accompanying drawings wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a plan view of the improved decimal point indicator;

Fig. 2 is a vertical section on the line 2-2 of Fig. 1;

Fig. 3 is a diagrammatic view showing the arrangement of the keys of a commercial adding machine having a keyboard of the ten-key type, representing the digits 1, 2, 3, 4, 5, 6, 7, 8, 9, 0; and

Fig. 4 illustrates an arrangement in which the front surface of the case of an adding machine of the above noted character is utilized as the base plate of my improved decimal point calculator.

Here it may be stated that this indicator more particularly will be found used in connection with the simpler forms of adding machines such as the commercial machine above noted.

In Fig. 3 the ten digit keys of an adding machine are marked in the usual way by the numerals 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

In Figs. 1 and 2, the base plate of the calculator is indicated by the numeral 11 and is there shown as an independent plate having at its center a nut-equipped bolt 12 on which is pivoted a rotary dial 13. The dial 13 is marked with the digits 0 to 9, inclusive, preferably spaced to extend approximately over

180 degrees of the circumference thereof, and the base plate 11 is similarly marked with digits 0 to 9, inclusive, correspondingly spaced. On the left-hand side of said base plate is marked with the words "Zone of one less," and with several circumferentially spaced minus (—) marks. At its right-hand side, said base plate is marked "Equal number zone" and with several circumferentially spaced equality (=) marks. Also the dial is marked with a radially extended arrow 14, and the base plate 11 is marked with reversely turned upper arrows 15 and reversely extended lower arrows 16. The dial 13 is preferably provided with an operating knob 17. In Fig. 4 the base plate 11^a there illustrated is one of the front plates of the keys of an adding machine, which latter is indicated as an entirety by the numeral 18.

OPERATION.

The use of the device above described is substantially as follows:

Reverse or backward multiplication begins with the first left-hand figure of both the multiplicand and the multiplier. Hence, the revision of the old method is obvious. This decimal and integral place calculator is a device for instantly locating a decimal point when using any adding, listing or non-listing machine as well as slide rules that are practical for multiplying from left to right. It provides a simple method for correctly locating the decimal point when multiplying integers followed by endless numbers of decimals. When whole numbers are found in both the multiplicand and the multiplier, whole numbers are multiplied by decimals or pure decimals by pure decimals, as directed.

First: Count all the whole numbers in the problem; that is, all integral places in both the multiplicand and the multiplier, and disregard the decimals following whole numbers, for the reason that the decimal point is determined by the number of integral places in the problem, and the decimals or fractions are disregarded.

Second: Select the first digit to the left of the multiplicand and locate it on the revolving dial.

Third: Complete the problem, then turn the dial until the selected digit of the multiplicand is opposite to the first left-hand digit of the quotient or product. Be it understood that all digits of the multiplicand are found on the revolving dial and all digits of the product are found on the base to which the dial is fastened.

Fourth: The arrow on the revolving dial will point to either "Next figures" or to the "Zone of equal numbers" or to "Zone of minus one." The arrow will point to the words "Next figures" only when the first digit of the multiplicand and the first digit of the product are one and the same. In that

case the next two figures of the multiplicand and the product are compared as above explained.

Fifth: When the arrow points to "Zone of equal numbers," place the decimal point as many places from the left of the product as there are whole numbers in the problem, and when "Zone of minus one" is pointed out by the arrow, place the decimal point one less place from left of product than there are whole numbers in the problem, always reckoning from left to right.

Decimals × decimals.

Proceed as above by selecting first digit to left of multiplicand and product and since ciphers followed by a decimal point and between the first digit are minus or negative places, it follows that when the arrow points to "Zone minus one," that one additional cipher must be added to the product. When arrow points to "Equal number zone," simply prefix product with as many ciphers as there are ciphers in the problem located between the decimal point and first digit of both the multiplicand and multiplier.

The words Product and Quotient on the base of the "Decimal and integral calculator" are placed there for the reason that the result of a multiplication is termed product and when division is performed by multiplying the decimal of the divisor by the number to be divided the result is in this case a product, nevertheless, it is also the quotient, for the reason that the result obtained by the multiplication of the decimal produces the quotient, same as if divided in the usual way, as illustrated in the follow problem:

Multiplication, $24\frac{5}{8} \times 13\frac{5}{8}$ equals 325 times.

It will be seen that this problem contains four integral places. The first left digit of the multiplicand is 2 and the first left digit of the product is 3. Turn the figure 2 on the dial until it comes under or opposite the figure 3 on the base. The arrow in this case will point to "Zone of minus one" and having four whole numbers in the problem it will be seen that 4 minus 1 equals 3. The decimal point is therefore placed to the right of the third digit from left of product.

Example #2 shows division of 65,420 pounds of wheat by 60, showing that there are 1090 bushels and 20 pounds in the 65,420 pounds. Multiply the decimal of 60 which is .016666666 by the gross number of pounds 65,420. The first digit of the multiplicand is 1 and the first digit of the product is also 1. These two digits brought opposite brings the arrow to point to "Next figures." Now locate the next figure of the multiplicand on the dial, revolving that figure until it is opposite the cipher on the base, which is the next figure of the product the arrow will point to "Zone of equal numbers." The ci-

pher in the decimal equivalent of 60 automatically cancels one whole number leaving 4 whole numbers for consideration. Simply place the decimal point behind the 4th digit from the left and the result reads: 1090 bushels and 20 pounds.

Another problem in division. Dividing 65,432,345 by 8201 giving a quotient or product of 7978.⁴⁷³⁴/₈₂₀₁. This problem contains 8

whole numbers. The decimal of the divisor 8201 is .0001219363, the three ciphers between the decimal point and the first left hand digit automatically cancels 3 of the whole numbers leaving 5 whole numbers for consideration. The first digit of the multiplicand is 1 and the first digit of the product or quotient is 7. By revolving the digit 1 on the dial until it comes under the digit 7 of the product the arrow on the dial will point to "Zone of minus one," which means the decimal point is placed behind the 4th digit from the left of the product.

The preferred arrangement illustrated in Fig. 1 may, of course, be varied, but in this arrangement the "Zone of one less" is at the left while the "Equal number zone" is at the right and "Next figures" zone is below the dial. Also the minus indication marks are at the left while the equal indication marks are at the right of the "Next figures" zone.

In the use of this improved device all mental calculations are made unnecessary and there are no "exceptions" to the general rules applied to its use. The novel relative arrangement of elements and indication marks are for simplicity of use, arranged in respect to the left-hand digits of the multiplicand and product, but may be arranged in respect to the digits of any one of the three factors, to wit: multiplier, multiplicand, and product. The present device has a further advantage over the device of my prior patent in that it is cheaper to construct.

The arrow on the revolving dial will only point to the words "Next figures" when the first digit of the multiplicand and the first digit of the product are one and the same. When this occurs, the first digit of the multiplier may be compared with the first digit of the product and the arrow will indicate the location of the decimal point. The word "Multiplier" can be placed on the dial in

connection with the word Multiplicand to read as follows: (Digits of the multiplicand or multiplier. The word "Multiplier" has been purposely omitted from the revolving dial to simplify the explanation and I will usually omit it from the commercial product, notwithstanding, that the co-action of the digits of the multiplicand and the multiplier with the digits of the products usually produce one and the same results.

What I claim is:

1. A decimal point calculator comprising a base, a dial mounted on said base, numerals on said base and dial, and co-acting indicating means on said dial and base, the relation of said numerals and indicating means being such that by aligning one of said numerals on said dial with one of the numerals on said base, said indicating means will determine the decimal point location in the product of which said numerals thus located are the left-hand digits of the product and one of the other factors.

2. A decimal point calculator comprising a base, a dial mounted on said base, numerals on said base and dial, and co-acting indicating means on said dial and base, the relation of said numerals and indicating means being such that by aligning one of said numerals on said dial with one of the numerals on said base, said indicating means will determine the decimal point location in the product of which said numerals thus located are the left-hand digits of the multiplicand and product.

3. A decimal point calculator comprising a base, a dial mounted on said base, digits circumferentially spaced on said dial and base, minus and equal indication marks on said base, and a pointer on said dial co-operating with said minus and equal indication marks substantially and for the purposes set forth.

4. The structure defined in claim 3 in which said base is also marked to indicate a "Next figures" zone with which the pointer on said dial also co-operates for the purposes set forth.

5. The structure defined in claim 3 in which said base is marked on one side to indicate a "Zone of one less" and on the other side is marked to indicate a "Equal number zone."

In testimony whereof I affix my signature.
CHARLES E. LATSHAW.