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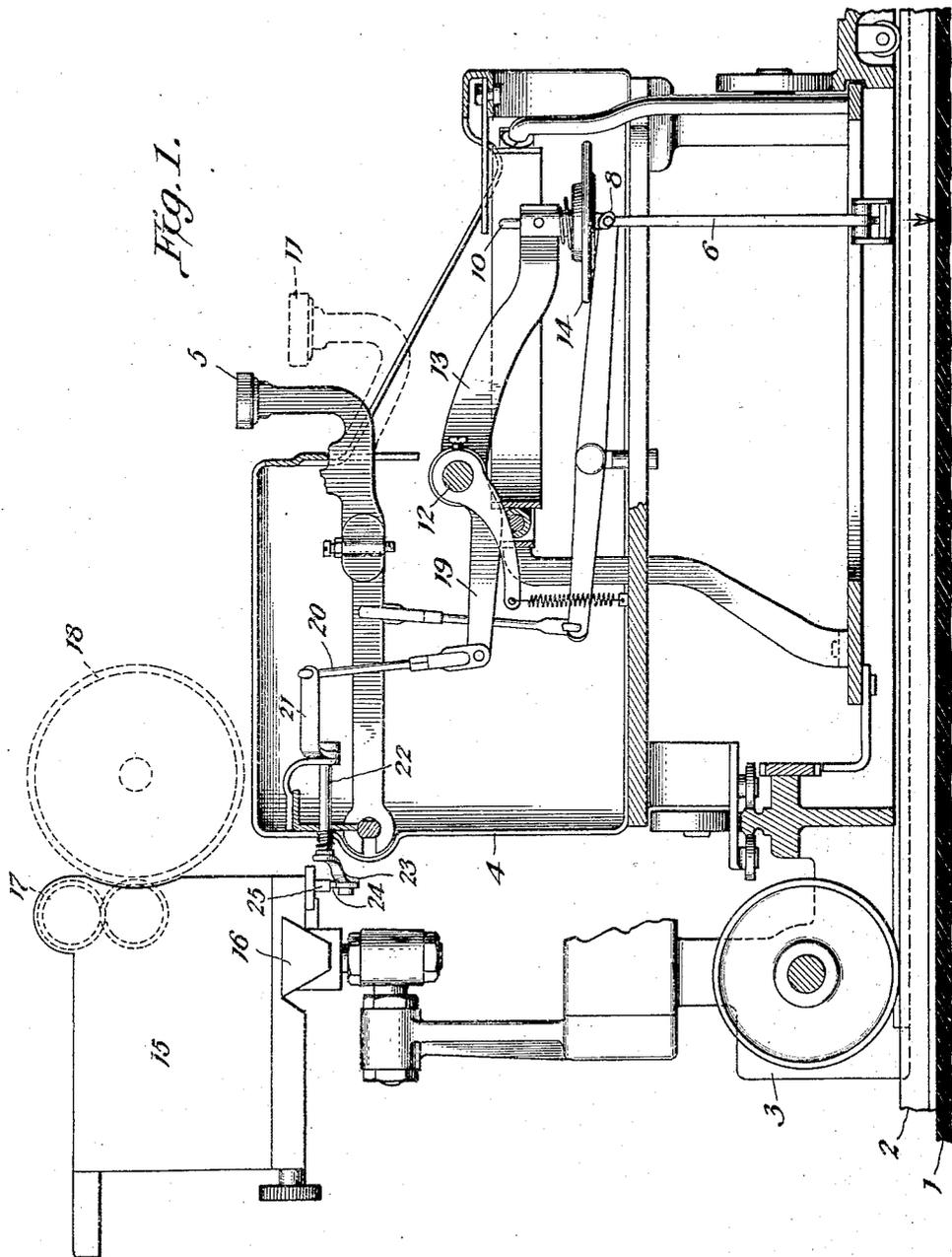
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H. A. FOOTHORAP

SPACING MECHANISM

Filed June 23, 1919

3 Sheets-Sheet 1



Inventor,

Harry A. Foothorap.

By *L. G. Gulick*

Attorney

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3 Sheets-Sheet 2

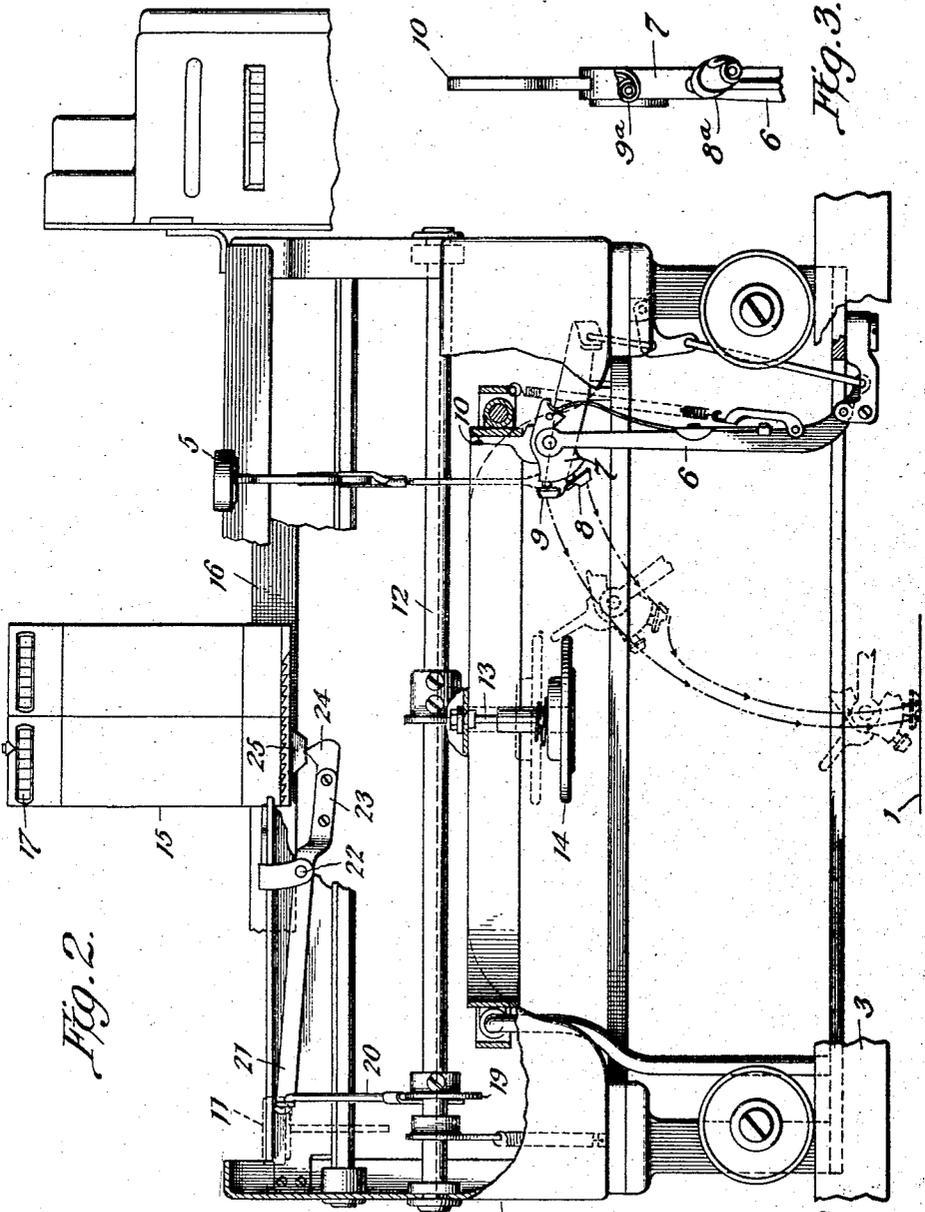


Fig. 2.

Fig. 3.

Inventor,
Harry A. Foothorap.

By *L. G. Juliska*
Attorney

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3 Sheets-Sheet 3

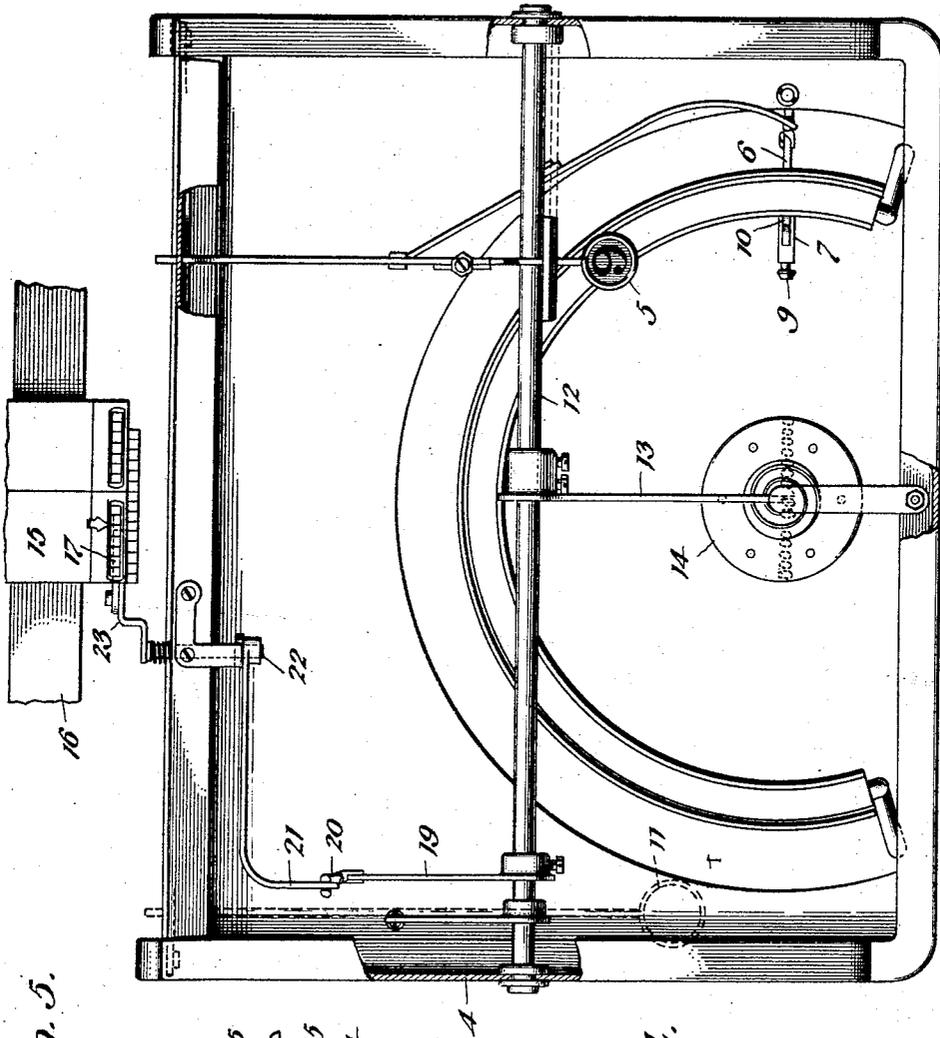


Fig. 5.

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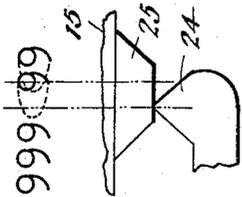


Fig. 5.

Inventor,
Harry A. Foothorap.

L. G. Juliker

By

Attorney

UNITED STATES PATENT OFFICE.

HARRY ARTHUR FOOTHORAP, OF HARRISBURG, PENNSYLVANIA, ASSIGNOR TO ELLIOTT-FISHER COMPANY, OF HARRISBURG, PENNSYLVANIA, A CORPORATION OF DELAWARE.

SPACING MECHANISM.

Application filed June 23, 1919. Serial No. 306,102.

To all whom it may concern:

Be it known that HARRY ARTHUR FOOTHORAP, citizen of the United States, residing at Harrisburg, in the county of Dauphin and State of Pennsylvania, has invented certain new and useful Improvements in Spacing Mechanism, of which the following is a specification, reference being had therein to the accompanying drawing.

10 This invention relates to typewriting machines and more particularly to a means for effecting a variation in the spacing of the characters printed, without varying the uniform letter spacing movement of the carriage.

Viewed in another aspect, the invention relates to combined typewriting and adding machines of that class in which numbers printed by the typewriter are accumulated or added in a register, having uniformly spaced denominational members to which an actuator is successively presented by uniform letter spacing movement of the carriage, corresponding to the uniform spacing of the denominational members of the register. Viewed in this aspect, the invention embodies the idea of automatically effecting a variation in the spacing of the characters printed, while maintaining uniform letter spacing movement of the carriage and the consequent proper stepping of the actuating mechanism to successive uniformly spaced denominational members of the register.

In the accompanying drawings:—
35 Fig. 1, is a vertical sectional elevation of so much of an Elliott-Fisher billing machine as is necessary to understand the application of my invention thereto.

Fig. 2, is a front elevation of the same machine with parts omitted and others broken away for clearer illustration of the essential construction.

Fig. 3, is an elevation of the upper end of the type bar, showing the type head and the arrangement of the type thereon.

Fig. 4, is a plan view of the fragmentary machine, and

Fig. 5, is a diagrammatic view contrasting the two spacings of quantity and money values and showing the cam which controls the character of spacing of the printed record.

Before proceeding with a detailed description of the mechanism, an understand-

ing thereof may be facilitated by a brief explanation of the general idea involved.

The Elliott-Fisher billing machine of commerce is a flat platen typewriter, in which the record is printed on a record sheet supported in a flat spread-out condition on a normally stationary writing surface. The record is made by printing mechanism mounted on a traveling carriage which moves step by step to successive letter spaced positions as the keys are operated to print the characters in succession. With this typewriting mechanism is combined computing mechanism, having number wheels or denominational members, located in successive letter spaced or denominational positions. To these number wheels is presented in succession, proceeding from highest to lowest order, an actuator, operated from the keys as they are depressed to print the numbers. As successive digits of a number are printed on the work sheet, the carriage advances uniformly to present the printing point of the machine at successive uniformly spaced positions. The digits printed will thus be uniformly spaced and as the spacing of the number wheels corresponds to the spacing of the digits, said number wheels will be successively operated to accumulate, in the proper denominational positions, the values of the digits as the number is recorded.

Since these machines are designed to compute values of various kinds, notably, quantity and money values, they are equipped with a variety of adding devices, or registers, which is that part of the mechanism operated by the actuator and including a series of number wheels.

A quantity register has a series of number wheels uniformly spaced throughout the length of the series, because quantity values are expressed by digits which are usually uniformly spaced. Money registers, however, have two co-axial series of number wheels, the spacing of each series being uniform, but a space being allowed for the decimal point between the two series. Obviously, the purpose of this arrangement is to accommodate the decimal space which must be provided between dollars and cents in the printed number, as fully explained in Patent No. 922559 to Laganke and Smith.

The money registers are equipped with

decimal trips which effect automatic spacing of the carriage over the decimal space, so that when the decimal position is reached the spacing movement of the carriage and of the actuator are exaggerated or doubled. This is obviously a variation in the spacing movement of the machine.

The invention with which we are now concerned has for its object, to permit the use of a quantity register, having a continuous series of uniformly spaced number wheels, for the computation of money values printed, in the usual way, with a decimal space between dollars and cents. The conflict between the uniform spacing requirements of the quantity register and the non-uniform spacing requirement of a money value record, and the obvious impossibility of spacing the carriage uniformly for one purpose and of simultaneously spacing said carriage non-uniformly for the other purpose has furnished the underlying problem of the present invention. One solution of that problem embodies provision for securing non-uniform spacing of the characters printed, without necessitating any disturbance of the uniform spacing movement of the carriage, which is necessary to present the actuator to successive uniformly spaced number wheels as the digits are printed with the decimal space, or, in what may be said to be, non-uniformly spaced relation. The desired end is obtained by the simple expedient of placing the upper case number types in off-set position, one space to the right of the normal printing point of the machine, and in providing an automatic case shift, which, when the actuator reaches the number wheel representing tens of cents, will automatically provide for the printing of upper case characters to the right of a decimal space which the off-setting of the characters provides when the keys are depressed to print tens and units of cents in off-set position.

This will be seen to constitute automatic changing or shifting of the printing point of the machine independently of and without varying the uniform letter spacing movement of the carriage.

With the foregoing general idea of the problem and its solution, we may now proceed with a description of the illustrated embodiment of the invention.

In the Elliott-Fisher machines of commerce, the work sheet is carried by a stationary flat platen 1, having longitudinal tracks 2, upon which travels the line space frame 3 of the machine. On the frame 3, a carriage 4 is mounted to travel laterally in the direction of letter spacing, impelled by carriage propelling mechanism and controlled by escapement mechanism, too well understood to require illustration, and operated from typewriter keys 5. The nine

key, its type bar 6, and the intermediate connections, are clearly shown in the drawings. At the upper end of each type bar is mounted a shiftable type head 7, having upper and lower case types 8 and 9, and a trigger 10 which extends beyond the end of the bar. Normally, the operation of the keys will swing the type bars toward the platen and cause the uppermost or lower case type to print. When it is desired to print upper case characters, the depression of a shift key 11, rocks a trip shaft 12, to depress an arm 13, extended therefrom and carrying a trip 14. This operation serves to drop the trip 14 from its normal position, indicated in dotted lines in Fig. 2, to its active position, indicated in full lines in said Fig. 2. When the trip 14 is at its normal position it is out of interfering relation with the trigger 10, but when depressed in the manner stated it is presented in interfering relation with said trigger, so that as the type bar is thrown down to print, the movement of the bar and the interference of the trip with the trigger will cause the type head to be shifted and thus present the upper case type at the printing point of the machine.

The described character of case shift is usual and well known, but its purpose has always been to cause either of two type carried by the same type bar to be presented at the single printing point of the machine so that the printing of either character would have no effect whatever on the spacing of the characters printed in a given line. Such indeed, is still the general purpose of the case shift mechanism of a machine embodying my invention, but in such machine a different purpose is subserved with respect to the case shift of the bars carrying digit type and operated from the digit keys. Thus, as shown in Fig. 3, for example, the type heads of the digit printing bars are equipped with upper and lower case digit type 8^a and 9^a. These type are or may be identical, except that while the lower case type 9^a is arranged to print the digit, for instance 9, at the normal printing point of the machine, the upper case type 8^a is mounted on the head with the digit, 9 for instance, located in such off-set relation to the lower case digit that it will print to the right of the normal printing point when the type bar is thrown down. This will be clearly understood by reference to the diagrammatic record shown in Fig. 5.

The upper row of 9's are printed in the usual uniformly letter spaced positions by successive operation of the nine key, printing from the lower case type. The first five of the lower row of 9's have been similarly printed but prior to the printing of the last two 9's the depression of the trip 14 has caused the shift of the type head and the

consequent printing of these two characters in offset position so as to leave a decimal space between dollars and cents, notwithstanding the fact that the letter spacing movement of the carriage, during the printing of the entire line of digits, has been uniform. In other words, the two rows of 9's in Fig. 5 show the digits spaced as usual in making records of quantity and money values, without in any way effecting or changing the uniform letter spacing movement of the carriage, which, by reason of my invention, is maintained regardless of which character of printed record is desired.

The description of the invention as thus far described is thought to be complete in the sense that it embodies an instrumentality whereby in a machine of this successive printing class the normal printing point of the machine may be changed or varied. In its further development, however, the invention contemplates the automatic shifting of the printing point of the machine at a predetermined point in the travel of the carriage, so that a normal or uniformly spaced record will be printed until such predetermined point is reached and a variation of the spacing effected at the desired location, as for instance, the decimal point.

In the Elliott-Fisher billing machines the typewriter having the characteristics described is equipped with computing mechanism which computes the total, for instance, of the values recorded on the work sheet, by the typewriter. This computing mechanism embraces one or more registers 15, mounted on a register supporting bar 16, carried by the line space frame 3, in rear of the carriage 4. Each register 15 includes a series of denominational members or number wheels 17, occupying successive denominational positions transversely of the register and operated by a master actuator 18, movable with the carriage 4 and operated or controlled from the numeral keys 5. The letter spacing of the printed record and the denominational spacing of the number wheels 17 of the register are coincident.

It follows that when a series of numerals or digits are printed on the work sheet in different denominational positions to express value, the wheels 17 of the register, occupying corresponding denominational positions, will be operated by the actuator 18 to accumulate in the register the value printed on the work sheet. It has already been stated that in some registers a space is left for the decimal space and that the carriage is automatically tripped over this space so that both the printing point of the machine and the master actuator will be automatically jumped over the decimal space by an exaggerated spacing movement of the carriage.

In certain cases, however, for reasons which, for the purpose of this invention, need not be entered into, it is not desirable when printing and computing money value to employ registers having decimal spaces. On the contrary it is highly desirable to secure a very compact arrangement of the registering mechanism, notwithstanding the desirability of having the printed record show the decimal space at the proper point.

For illustrative purposes there is shown in Fig. 2, two quantity registers in close relation. Each of these registers exhibits a series of digits in uniformly spaced denominational positions as indicated, for instance, by the upper row of digits in Fig. 5. Obviously, if the wheels carrying these digits are operated in succession by the actuator 18 presented to them by successive letter space movements of the carriage, such letter space movements must conform to the uniform spacing of the number wheels; and, if the printing point of the machine similarly advances across the column, the digits must be printed in uniformly spaced relation. This last, however, is undesirable in printing money values, the record of which should exhibit a space at the decimal point for convenience in reading.

For this reason provision may be made for automatically shifting the printing point of the machine to the right, as soon as that portion of the record which lies to the left of the decimal position has been completed, so that the next normal advance of the carriage will effect a normal advance of the master wheel to the next number wheel of the register but will cause that part of the record lying to the right of the decimal position to be printed an extra letter space from normal position as the last two number wheels representing "tens of cents" and "cents" are operated by the actuator. To this end it is merely necessary to provide means which will automatically depress the trip 14 at the proper point in the movement of the carriage so that the next operation of a digit key will effect the printing of the digit by an off-set type as heretofore described.

One means of accomplishing this result includes the rearward extension of an arm 19, from the shaft 12, and its connection by means of a link 20, with an arm 21, carried by the rear end of a rock shaft 22, extended through the rear wall of the casing 4 and having on its rear end a trip arm 23, having a pointed beak 24, designed to contact with and ride under a case-shift cam 25, carried by and depending from the bottom wall of the register 15. As the carriage advances the digits representing the value in dollars are printed in their proper denominational positions uniformly spaced apart as usual, and the master wheel is advanced to operate the corresponding denominational members of the register. By the time the master wheel

reaches the tens of cents member of the register, the movement of the carriage will have caused the depression of a trip arm 24 by the cam 25, to depress the trip 14 and the parts will be retained in this position as long as the master actuator remains opposite any number wheel representing a denomination to the right of the decimal, thus insuring the off-set printing of the corresponding digits and the provision of a decimal space in the printed record.

For illustrative purposes I have shown two registers on the bar, one only being equipped with a case-shift cam. The second, having no cam, will not cause the printing of upper case digits at any time during the traverse of the register. Therefore, the spacing of the printed digits will remain uniform and a quantity value will be indicated by the printed record, as well as the second quantity register.

It is thought that from the foregoing, the illustrated embodiment of the invention will be clearly understood, but I expressly reserve the right to effect such variations thereof as may fall within the scope of the protection prayed.

What I claim is:—

1. The combination with a platen and printing mechanism relatively movable to space the printed characters; of automatic means for varying the relation between the spacing of the printed characters and the spacing movement of the platen and printing mechanism.

2. The combination with a platen and printing mechanism having uniform relative movement to uniformly space the characters printed, of means brought into action by such uniform relative movement of the platen and printing mechanism to cause a variation in the spacing of the printed characters while the relative spacing movement of the platen and printing mechanism remains uniform.

3. The combination with a platen, of typewriting mechanism including a complete set of numeral type bars, each having a plurality of type presentable in position to print in the same line but at different printing points.

4. The combination of a platen and printing mechanism having relative movement, said printing mechanism including a series of type bars, two complete sets of upper and lower case numeral types mounted in relatively off-set positions to present the same at different laterally spaced printing points, and case shifting mechanism controlled by the relative movement of the platen and printing mechanism.

5. In a writing-adding machine, the combination with a series of denominational members, of recording mechanism, for printing digits in a line to express value, keys

controlling the operation of the recording mechanism and the denominational members, and operative to record any number the digits of which are non-uniformly spaced with respect to the spacing of the denominational members.

6. In a writing-adding machine the combination with a series of uniformly spaced denominational members, of means for printing a non-uniformly spaced series of digits to express any predetermined value, and keys operative to effect the simultaneous printing of any number and the operation of the denominational members.

7. In a writing-adding machine, the combination with a series of uniformly spaced denominational members, of means for printing a series of digits, a carriage movable uniformly to different denominational positions and serving to bring successive denominational members into action and to space the printed digits, and automatic means for exaggerating the spacing between certain of the digits printed.

8. In a writing-adding machine, the combination with a series of uniformly spaced denominational members, of means for printing a series of digits, a carriage movable uniformly to different denominational positions and serving to bring successive denominational members into action and to space the printed digits, and automatic means operated by the movement of the carriage to change the spacing of certain digits.

9. In a writing-adding machine, the combination with a uniformly spaced series of denominational members, of actuating means presentable to said members in succession, a carriage uniformly movable to present the actuator to successive denominational members, and means for printing a series of digits corresponding in number to the uniformly spaced denominational members but having a variation in spacing at the decimal point.

10. In a writing-adding machine, the combination with a series of uniformly spaced denominational members, of typewriting mechanism, including a carriage having uniform spacing movement, printing mechanism letter spaced by the movement of the carriage, and means for automatically varying the spacing of the printed character, while the uniform movement of the carriage continues.

11. In a writing-adding machine, the combination with a series of uniform spaced denominational members, of typewriting mechanism including a carriage, having selective relation to said denominational members and having printed mechanism including upper and lower case characters having different printing points, and automatic means controlling the case to be printed.

12. In a typewriting machine the combina-

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tion with a platen and printing mechanism having uniform relative letter spacing movement to space the characters printed successively in the same line of writing, of means
5 for causing exaggerated spacing of certain characters printed in said line notwithstanding the uniform letter spacing movement of the platen and printing mechanism.

13. In a typewriting machine the combination with a platen and printing mechanism having uniform relative letter spacing movement to space the characters printed successively in the same line of writing, of means supplemental to and operated by the uniform
10 relative movement of the platen and printing mechanism to exaggerate the space between

certain characters printed in said line of writing.

14. In a writing adding machine, a series of denominational members, a platen and
20 printing mechanism having relative step by step spacing movement, such relative spacing movement being uniform and corresponding to the spacing of the denominational members, and means whereby the
25 characters printed will be nonuniformly spaced.

In testimony whereof I hereunto affix my signature in the presence of a witness.

HARRY ARTHUR FOOTHORAP.

Witness:

J. F. CULVERWELL,