April 5, 1955 P. LÉGLISE 2,705,554

END-OF-LINE JUSTIFYING TYPEWRITER

Filed July 9, 1952 2 Sheets-Sheet 1

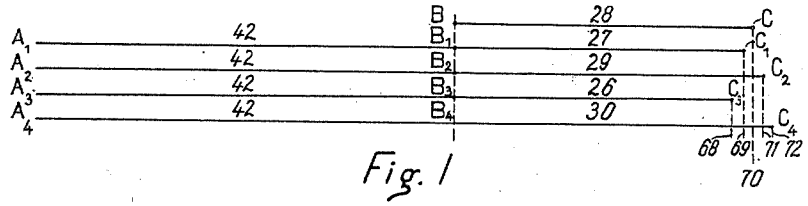


Fig. 1

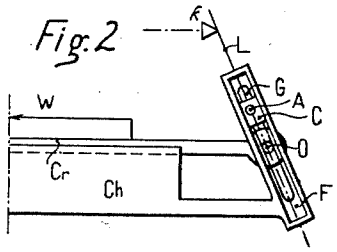


Fig. 2

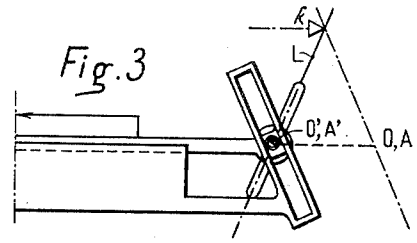


Fig. 3

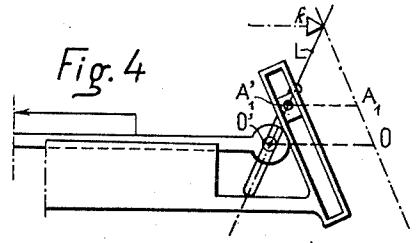


Fig. 4

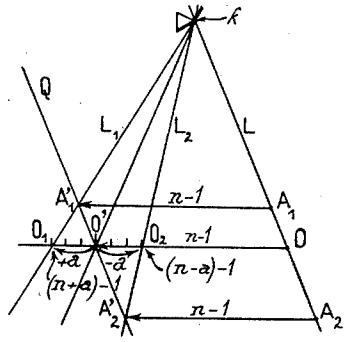


Fig. 6

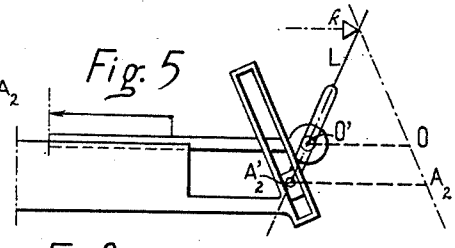


Fig. 5

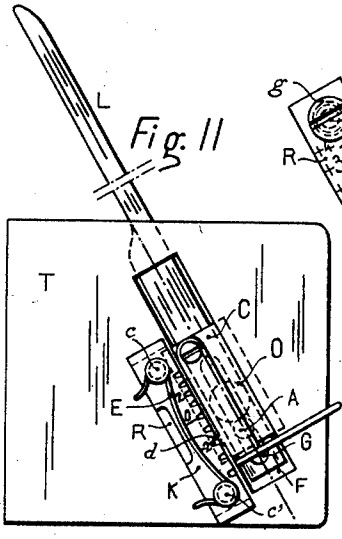


Fig. 11

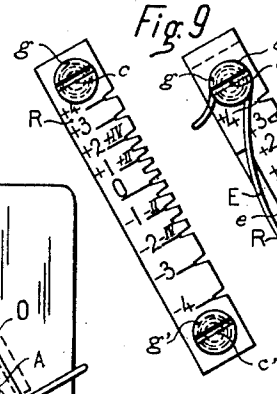


Fig. 8

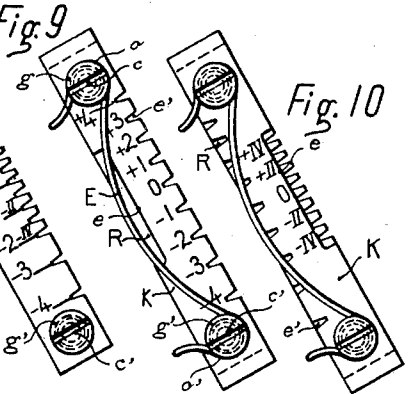


Fig. 9

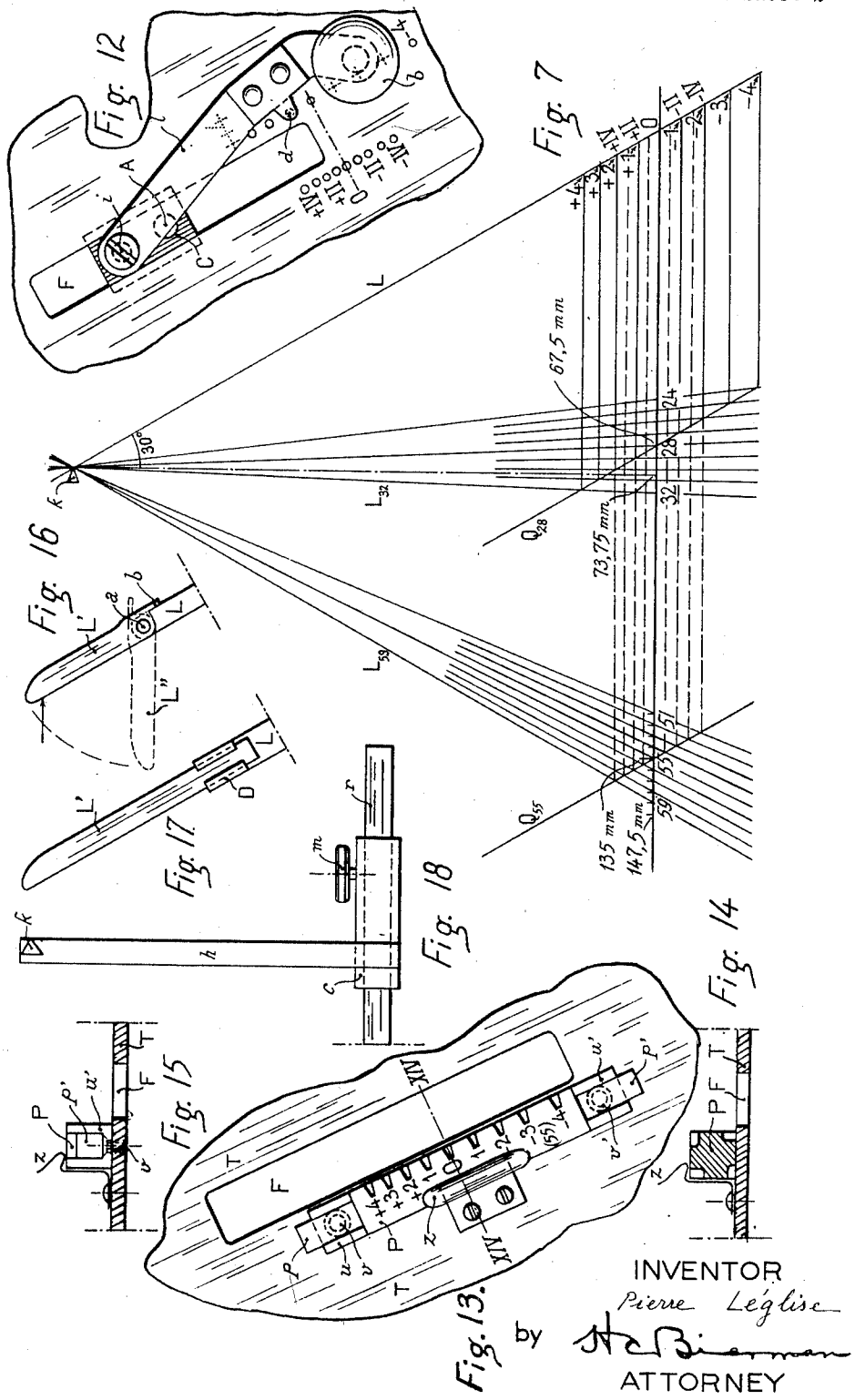
Fig. 10

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END-OF-LINE JUSTIFYING TYPEWRITER

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END-OF-LINE JUSTIFYING TYPEWRITER

Pierre Léglise, Paris, France

Application July 9, 1952, Serial No. 297,939

11 Claims. (Cl. 197—84)

The present invention is directed to end-of-line justifying typewriters adapted to execute justification on terminal segments of various lengths.

In the end-of-line justifying typewriters as described in the application Serial No. 215,748 filed March 15, 1951, under the title "Process and Apparatus for Justifying Typewritten Material," now Patent No. 2,696,286, the justification is effected by contraction or dilation of the final part of the lines only, said part being called the "terminal segment." Given four lines (Fig. 1) A_1C_1, A_2C_2, A_3C_3, A_4C_4 proceeding from a common vertical A_1A_4 of the page and comprising, for example, 69, 71, 68 and 72 characters respectively (the term character applying equally to the intervals between the words), the justification begins for all these lines only at a vertical of a certain point B, that is to say, for example, after the normal typing of the first 42 characters, and it gives to their various terminal segments B_1C_1, B_2C_2, B_3C_3, B_4C_4, a common length BC equal, for instance, to 28 characters. The length BC, a characteristic feature of the end-of-line justifying typewriter under consideration, is called the "normal terminal segment."

On the contrary, in the known justifying typewriters, other than the end-of-line justifying typewriters, but achieving like them the justification by the variable spacing out or drawing in of the characters, the dilations and contractions start at the beginning of the lines and concern the entire length of the lines. For convenience, these typewriters are henceforth called "complete justifying typewriters."

The invention has as an object end-of-line justifying typewriters in which the length intended to carry on the dilations and contractions of typing necessary for the justification may assume different values, in other words, end-of-line justifying typewriters presenting a plurality of normal terminal segments.

It has also as an object, in such typewriters with two normal terminal segments only, on the one hand, the observance by construction of a determined relation between the lengths of these segments, with a view of arriving at a single setting scale, and on the other hand, means calculated to differentiate on this scale the setting graduations relative to each of these segments.

It has equally as an object, in typewriters with several normal terminal segments, means by which the setting scale corresponding to the normal terminal segment employed for a given work is the only one visible and serviceable.

It has finally as an object arrangements for decreasing the volume of such typewriters when they are used as ordinary typewriters.

The character of the invention will be clear from the comparison made in the table below, of the dilations and contractions of the typing provided by the following justifying typewriters:

1. Complete justifying typewriter,
2. End-of-line justifying typewriter with two normal terminal segments of 28 and 55 characters respectively, and
3. End-of-line justifying typewriter with a single normal terminal segment of 28 characters (comprised in the previous one by the elimination of the normal segment of 55 characters),

in a given case of work, for example: the justification on a length of 70 characters of lines of 66 to 74 characters, the character being the Standard Pica with a width of 2.5 mm. By width of the character, the width of its face is understood, increased on each side by the half of the blank space normally separating two consecutive characters. As the face of the character may not be altered, the dilations and contractions of the typing are made by an increase or decrease of the blank spaces between the characters. For convenience, the terms "distended character" and "contracted character" will be used, it being well understood that the dilations and contractions in question affect only the half-spaces on each side of the character's face. The table gives the widths of the characters in millimeters.

The figures in column I represent the widths of the characters given by the complete justifying typewriter. For a line of only 69 characters, for example, the distended characters, in the above defined sense, will have a width of 2.5362 mm. Column I' gives the modifications of the width of the characters in relation to the normal typing (the minus sign denoting the contractions).

With the end-of-line justifying typewriter with two normal terminal segments of 28 and 55 characters, for the same line of 69 characters to spread out to a length of 70 normal characters, the final parts of the line concerned by the justification will include only 27 or 54 characters, which the justification will spread out to lengths of 28 and 55 characters respectively. The widths of the distended characters will then be respectively:

$$\frac{2.5\times 28}{27}=2.5925 \text{ mm. and } \frac{2.5\times 55}{54}=2.5463 \text{ mm.}$$

Column II indicates the widths of the characters resulting from the use of a normal terminal segment of 28 characters. Column III gives the widths resulting from the use of a normal terminal segment of 55 characters.

Columns II' and III' give the variations of the width of the characters in relation to the normal width of 2.5 mm., it being well understood that these variations affect only the terminal segments, since the beginnings of the lines are typed in a normal way.

Table

n, Number of characters of the line	Complete justification		End-of-line justification				D_{28}	D_{55}
			Terminal segment of 28 characters		Terminal segment of 55 characters			
	I $\frac{2.5\times 70}{n}$	I' (I−2.5)	II	II' (II−2.5)	III	III' (III−2.5)	(II−I)	(III−I)
	mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
66	2.6515	0.1515	2.9166	0.4166	2.6961	0.1961	0.2651	0.0446
67	2.6120	0.1120	2.8000	0.3000	2.6442	0.1442	0.1880	0.0322
68	2.5735	0.0735	2.6923	0.1923	2.5945	0.0945	0.1188	0.0212
69	2.5362	0.0362	2.5925	0.0925	2.5463	0.0463	0.0563	0.0101
70	2.5	0	2.5	0	2.5	0	0	0
71	2.4647	−0.0353	2.4138	−0.0862	2.4554	−0.0446	−0.0509	−0.0093
72	2.4305	−0.0695	2.3333	−0.1667	2.4123	−0.0877	−0.0972	−0.0182
73	2.3972	−0.1028	2.2581	−0.2419	2.3707	−0.1293	−0.1391	−0.0265
74	2.3648	−0.1352	2.1875	−0.3125	2.3305	−0.1695	−0.1773	−0.0343

The cases where the justification is obtained by adding to or subtracting from the length of the normal line at a maximum 2 characters (cases −2, −1, 0, +1 and +2) are by far the most numerous: they represent indeed, according to the language and nature of the texts, from 80 to 95 per cent of the cases likely to arise. This results from the fact that syllables or monosyllables of more than five characters are rather rare in most languages in current use such as English, Latin languages and German languages.

In the typing of a text with an uneven margin intended to be justified to a width of 70 characters, the most frequently occurring lines will then have from 68 to 72 characters (cases −2, −1, 0, +1 and +2), the lines of 67 or 73 characters (cases −3 and +3) will be rare, and the lines of 66 or 74 characters quite exceptional. In these circumstances, the justification on a normal terminal segment of 28 characters is perfectly tolerated by the reader, since the vast majority of cases entails only increases in the width of the characters by a maximum of 0.1923 mm. in relation to the normal width of 2.5 mm. (column II'), or decreases of width by at most 0.1667 mm.

The justification on a terminal segment of 55 characters gives however dilations and contractions about half as great (column III). For the rare or exceptional cases of justification (±3 and ±4) the widths of the characters are increased at a maximum by only 0.1961 mm. in relation to the normal typing, or decreased at a maximum by only 0.1695 mm. (column III'). To reduce these results to a simple formula, it may be said that in the great majority of justification cases, the increases or decreases in the width of characters with regard to the 2.5 mm. normal width do not exceed one-tenth of one millimeter (the exact maximums being 0.0945 and −0.0877 mm. respectively, as shown by column III'), and that in the other cases, they do not exceed two-tenths of one millimeter (the exact maximums being 0.1961 and −0.1695 mm. respectively, as shown again by column III').

An observation yet more remarkable may be made. Column D_{55} shows the differences of width which the characters present, on the one hand, in end-of-line justification on a normal terminal segment of 55 characters (column III) and on the other hand, in complete justification (column I). These differences being in the order of but some hundredths of one millimeter, the end-of-line justification appears as close as it could possibly be to the aesthetic optimum realized by the complete justification.

Of course, in all strictness, the above calculations retain their value only for the specific case chosen, but their main purpose was to show orders of magnitude. As to the comparison just made between the end-of-line justification and the complete justification, it is worth noting that a line of 70 pica characters is already long enough, and that shorter lines would reduce the variations in column D_{55}. At most, for a line of 55 characters, these variations would cancel themselves out.

The quasi-similarity of the results supplied by the two processes of justification having been shown, the advantages will now be given of end-of-line justifying typewriters with several normal terminal segments over complete justifying typewriters.

It is already well known that end-of-line justifying typewriters allow the carrying out of justifications without a preparatory typing, according to the process described in the above cited application for patent, whereas the complete justifying typewriters require such a typing. For justifications at the first attempt, the shortest normal terminal segment preferably will be used, since this requires the least time for calculations.

For works requiring a very special care, those where contractions and dilations must pass unnoticed by the most attentive eye, two methods are possible:

The first consists in using the end-of-line justifying typewriter as a complete one, by consequently making a preparatory copy. For justification, it then suffices, as with a complete justifying typewriter, to set the justifier, at the beginning of each line, to the number of characters lacking or in excess shown by the preparatory copy. Naturally, for a typewriter with several normal terminal segments, the element of the frame intended to establish contact with and to actuate the justifier is for preference set for the use of one of these segments, the length of which corresponds with the width of the column desired, at the same time remaining less than

it (or at most equal). After the normal typing of the first characters of the line (the first 15 if the width of the justified column is 70 characters and the normal terminal segment employed has 55 characters), the justifier sets itself in motion and the jutsification is carried out automatically. In this method of employment, the advantage of the end-of-line justifying typewriters over the complete justifying typewriters consists in providing, as has just been shown, practically the same results as the latter, but with less costly mechanisms since they involve a single variable, while the complete justification involves necessarily two independent variables.

The second method may be used for works that are to be reproduced through the medium of a photographic process. In such cases, the typist has no need to make a preliminary copy, but systematically justifies the text on the shorter normal terminal segment of the typewriter, e. g. that of 28 characters. So long as the number of characters lacking or in excess in any line does not exceed two, modifications of the widths of the characters in the terminal segments, in relation to the widths in complete justification, are at a maximum of about a tenth of a millimeter and therefore, for practical purposes, imperceptible; indeed they vary (column D_{28}) from −0.0972 to 0.1188 mm. But supposing that the blank typing of the terminal segment of a certain line results in an exceptional excess of 4 characters, the retaining of the same terminal segment of 28 characters for justifying this line would entail a variation D_{28} bordering on eighteen-hundredths of a millimeter (to be precise: −0.1773 mm.). If the typist thinks such a contraction would appear unaesthetic, she can disregard the beginning of the line already typed and entirely recommence the line in question. The number of characters now being known, it suffices to set the justifier and its actuating element, at the beginning of the line, so that the justification is effected over the last 59 characters of the line instead of over only the last 32. The justifier starts itself immediately after the typing of the 15th character instead of after that of the 42nd, and the variation D_{28} becomes a variation D_{55} of only −0.0343 mm., that is to say negligible. As, on the average, a case of ±3 or ±4 is likely to arise but once every ten lines, it is clear that the process permits the justification of 90 per cent of the text at the first typing, with an appearance which bears comparison with what complete justification obtains only with a second typing. When the page is finished, the beginnings of lines to be disregarded are suppressed by cutting and sticking, as is practiced regularly in the making-up of pages or preparation of dummies in printing. This use of the end-of-line justifying typewriters is altogether commendable, as has been said, for the justification of texts destined to be photographed, where it is then of so much advantage as the columns of text to set up are so much longer.

Thus, not only do the end-of-line justifying typewriters with several normal terminal segments provide justifications which are, for practical purposes, as good as those produced by complete justifying typewriters, but they are speedier than these latter in most cases and also, by their very principle, less costly to build.

The invention can be applied to the various types of end-of-line justifying typewriters with a system of relatively sliding parts: typewriters with ramps, typewriters with justifying lever pivoted on one of the elements (carriage, rack) having a longitudinal movement, and typewriters with justifying lever pivoting on an axle, the position of which is fixed on the frame for a given work. As an example, the application of the invention will be described for an end-of-line justifying typewriter with a carriage sliding on the rack, in which the justifying lever pivots on an axle integral with the rack.

Fig. 1 is a chart illustrating the principle of the end-of-line justification;

Fig. 2 is a diagrammatic view of a structure of end-of-line justifying typewriters in which the carriage slides on the rack and the justifying lever is carried by a pivot on the rack;

Figs. 3 to 5 illustrate the working of these typewriters respectively for normal, contracted and dilated typing;

Fig. 6 is a diagram showing the setting of these typewriters in its most general form, i. e. for justifications on a normal terminal segment of n characters;

Fig. 7 is a diagram showing the setting of an end-of-line justifying typewriter of the type shown on Fig. 2, for justifications on normal terminal segments of 28 and 55 characters, respectively;

Fig. 8 represents a single setting scale for end-of-line justifying typewriters with normal terminal segments of 28 and 55 characters respectively or, more generally, of n and $2n-1$ characters;

Figs. 9 and 10 represent the back and front of a removable cover plate for the scale of Fig. 8;

Fig. 11 is a general view of a justifier for typewriters with two normal terminal segments, equipped with the plate of Figs. 9 and 10;

Fig. 12 shows a single locking device for a system of setting comprising two distinct scales;

Fig. 13 is a plan view of a prism with four edges each comporting a series of setting notches, for end-of-line justifying typewriters with four normal terminal segments;

Fig. 14 is a cross-section along line XIV—XIV of Fig. 13;

Fig. 15 is an end view of Fig. 13;

Fig. 16 is a view of a justifying lever with a foldable end;

Fig. 17 is a view of a justifying lever with a removable end, and

Fig. 18 shows the arrangement of the adjustable slider, carrying, at the end of an arm, the actuating stop of the justifying lever in a justifying typewriter with several normal terminal segments.

The functional diagram of the type of end-of-line justifying typewriter to which as an example the application of the invention will be described, is shown in Fig. 2. In typewriters of this kind, a spring and a stop-stub (not shown) impose on the justifying lever, pivoted at O on the rack *Cr*, a determined inclination outside the stages of justification. It is precisely under this inclination, called "rest inclination," that L is shown in Fig. 2. The strap or belt W, withdrawing the carriage-rack ensemble towards the left, is attached to the rack *Cr*.

The carriage *Ch*, mounted to slide on *Cr*, is provided with a slot F coinciding with the lever L when this latter is at rest. The connection between L (i. e. the rack *Cr*) and the slot F (i. e. the carriage *Ch*), is assured by a pin A engaged in a longitudinal groove G of L. The pin A is, for instance, carried by a slider C which is movable in the slot F for setting and can be locked in F after the setting. Thus one with the carriage, the pin A displaces itself by the same amount as the carriage during the justifications, while the pivot O displaces itself by the same amount as the rack.

In the course of the displacements of the rack character by character, the justifying lever L comes into contact at a given moment with a stop k of the frame, a stop the position of which has been adjusted with the purpose of making the justification start at a chosen vertical of the page.

If, at the time of the justification setting, the pin A has been placed in line with the pivot O of the justifying lever L (Fig. 3), the displacements AA′ of the carriage are identical with the displacements OO′ of the rack and the typing is normal. If the pin A has been set above O, for instance in A_1 (Fig. 4), the displacements A_1A_1' of the carriage are less than those OO′ of the rack and the typing is contracted. Finally, if the pin A has been set on this side of O, for instance in A_2 (Fig.5), the displacements $A_2A'_2$ of the carriage are greater than those OO′ of the rack and the typing is dilated.

The number of normal terminal segments of which the use can be foreseen on an end-of-line justifying typewriter is not limited theoretically. Assuming, however, on the one hand, that with a normal terminal segment of about 30 characters, the justifications already conveniently satisfy aesthetic demands, and on the other hand, that with a normal terminal segment of 50 to 60 characters, the widths of the characters differ only very little from the normal width, and yet less from the widths in complete justification, there is no need to increase the number of normal terminal segments beyond reason. To begin with, a justifier with only two normal terminal segments will be described as an example.

In order easily to understand what is going to follow, it is necessary to explain the theory of the setting in the end-of-line justification. This will be stated in quite general terms, assuming that the shorter normal terminal segment of the typewriter with two normal terminal segments under consideration comprises n characters, and that this typewriter must be able to cope with terminal segments of $n-a$ to $n+a$ characters.

In ordinary typewriters, the rack and the carriage form one block which displaces itself character by character after each impression. Actually, since the escapement works with a two stroke action in the majority of typewriters, it can happen that the block in question is released by the first stroke a moment before the impression, but, this moment being extremely short, the block has materially no time to advance before the character is printed. From a practical point of view, therefore, the advances of the ensemble of the carriage-rack character by character occur without fail after the impressions.

In the end-of-line justifying typewriters with a carriage sliding on the rack, the rack still displaces itself by one character after each impression, but the carriage, longitudinally freed from the latter at the beginning of the justifications, can moreover move in relation to it, in either direction, by the small amount necessary for the justification.

A terminal segment of $n-a$ characters to be stretched to a length of n characters will give rise to $n-a$ depressions of the keys, hence to a displacement of $n-a$ characters of the rack. However, as the displacements of the rack and carriage subsequent to the impression of the last character of the terminal segment do not count as regards justification, this latter being then finished, the necessary relative advances of "a" characters of the carriage on the rack will be obtained in the course of the first $(n-a)-1$ depressions of the keys for this segment. Similarly, a terminal segment of $n+a$ characters will result in $n+a$ depressions, and the carriage will have to have receded by "a" characters in relation to the rack in the course of the first $(n+a)-1$ depressions of the keys for this segment.

This observation made, the setting diagram for justifications on a normal terminal segment of n characters can be drawn as follows (Fig. 6) in the typewriter, taken as an example, with justifying lever pivoting on the rack.

The straight line Ok represents the justifying lever L under the inclination to rest position at the beginning of justifications, i. e. at the moment where it has just come into contact with the stop k of the frame. The pivoting axle O of L describes the horizontal of the figure passing by O, and the vector OO′ represents at any given moment the displacement of the rack. A line Q parallel to Ok is then drawn through the point O′ of the abscissa of $n-1$ characters, marking the course of the rack up to the precise moment of the impression of the nth character of the normal terminal segment of n characters. The straight line Q constitutes the locus of the positions that the linking pin A (represented by A_1 or A_2 on the figure) will occupy at the exact moments that the last character of the terminal segments is printed, whatever the number of characters of the latter. Indeed, A, integral with the carriage and coming from Ok, represents the carriage in the diagram, while O represents the rack.

For a terminal segment of $n+a$ characters, the justifying lever L, proceeding from Ok, will arrive in L_1 after a course of $OO_1=(n+a)-1$ characters of the rack, i. e. at the exact moment of the impression of the $(n+a)$th and last character of the terminal segment. L_1 cuts Q at $A'_1 \cdot A'_1$, recalled horizontally to A_1 on Ok, gives the setting for such a segment. Indeed, $A_1A'_1=n-1$ characters, the course which must be that of the carriage in order that the $(n+a)$th and last contracted character of the terminal segment falls in the place that an nth normal character would have occupied. The setting A_1 of A in the slot (F) of the carriage coinciding with Ok is called "$+a$" because the terminal segment had "a" characters in excess.

Similarly, for a terminal segment of $n-a$ characters, the justifying lever L, still coming from Ok, will arrive in L_2 after a course $OO_2=(n-a)-1$ characters of the rack, i. e. at the precise moment of the impression of the $(n-a)$th and last character of the terminal segment. L_2 cuts Q at $A'_2.A'_2$, recalled horizontally to A_2 on Ok, gives the setting for such a segment. Indeed, $A_2A'_2$, as previously $A_1A'_1$, equals $n-1$ characters, the course which must again be that of the carriage in order that the $(n-a)$th and last dilated character of the terminal segment falls in the place that an nth normal character would have occupied. The setting A_2 of A in the slot

(F) is called "$-a$" since the terminal segment lacked "a" characters. If $a=4$ characters, the number of the setting positions of A is 9 for any given normal terminal segment.

In an end-of-line justifying typewriter with two normal terminal segments, if the shorter normal terminal segment comprises n characters, it is better to make the longer comprise a number of characters equal to $2n-1$. Indeed, the cases of terminal segments of $n+a$ and $2n-1+b$ characters, to justify respectively over n and $2n-1$ characters, will then be likely, as they will be shown to correspond with each other from the point of view of contractions and dilations, for certain pairs of values of a and b.

At the precise moment of the impression of the last character of these segments:

For the segment of $n+a$ characters, the rack will have been displaced by $(n+a)-1=n-1+a$ characters and the carriage by $n-1$ characters;

For the segment of $2n-1+b$ characters, the rack will have been displaced by $(2n-1+b)-1=2(n-1)+b$ characters and the carriage by $(2n-1)-1=2(n-1)$ characters.

The courses of the carriage being in the ratio 1:2, in order that the setting of the justifier is the same in the two cases, the courses of the rack must also be in the ratio of 1:2, i. e. $2(n-1)+b=2(n-1+a)$ or $b=2a$. Thus, the number of setting positions of A will be reduced.

In less general terms, if the shorter normal terminal segment comprises, for example 28 characters ($n=28$) and the longer normal terminal segment comprises 55 ($2n-1=55$), the setting -1 (in Arabic figures) corresponding to the justification of a terminal segment of $28-1=27$ characters ($a=-1$) will equally satisfy the justification of a terminal segment of $55-2=53$ characters ($b=-2=2a$); it will then be possible to indicate this setting by —II (in Roman figures), to avoid any confusion with the setting -2 of the series of settings for the normal terminal segment of 28 characters. Actually, for the first of these justifications, the necessary relative advance of 1 character of the carriage on the rack will be acquired in the course of the typing of the first $27-1=26$ characters, in order that the 27th and last dilated character falls in the place of a 28th normal character; for the second justification, the necessary relative advance of 2 characters of the carriage on the rack will be acquired in the course of the typing of the first $53-1=52$ characters, in order that the 53rd and last dilated character falls in the place of a 55th normal character. As $52=26\times2$, the setting —II for this last justification will certainly be the same as the setting -1 of the previous.

In the same way, the setting of the terminal segment of 26 characters (-2) will serve equally well for a terminal segment of 51 characters under the designation —IV.

Similarly, the settings for 29 ($28+1$) and 57 ($55+2$) characters will be identical, and the settings for 30 ($28+2$) and 59 ($55+4$) characters will also be identical.

Finally, the settings for 28 and 55 characters both corresponding to the neutral of the justifier, the 18 setting positions of A which should be necessary if two normal terminal segments with arbitrary lengths in relation to each other were employed, are reduced to 13. The notches marking these positions can then all the better be cut on a single rule since the notches relative to the longer normal terminal segment fit in regularly between those for the shorter terminal segment when they do not coincide with them. For normal terminal segments of arbitrary lengths in relation to each other, on the contrary, two separate setting scales, and therefore two setting systems, or at least two systems for the locking in setting positions, would be necessary.

Fig. 7 gives, as an example, the diagram of the setting of a justified with normal terminal segments of 28 and 55 characters respectively, the character being still, to have a fixed basis, the standard pica with a width of 2.5 mm. The justification play is 4 characters each way, thus allowing the typewriter to cope with terminal segments of 24 to 32 characters on the one hand, and of 51 to 59 characters on the other.

For a terminal segment of 59 characters, the course of the rack after the impression of the 59th character is 147.5 mm. For preference, the distance of the stop k from the horizontal described by the pivot O of L, as well as the rest inclination of L, are chosen so that the sector described by L is symmetrical with regards the vertical of the diagram containing k. In the particular case, the rest inclination of L is 30° and the vertical of k is 73.75 mm. from O.

The graduations 51 . . . 55 . . . 59 represent the courses of 50 . . . 54 . . . 59 characters of the pivot O, i. e. the rack, from the commencement of the justifications to the precise moments of the impression of the last character of terminal segments of 51 . . . 55 . . . and 59 characters respectively. The distance of the origin O to the graduation 55 thus measures not $55\times2.5=137.5$ mm., but 135 mm. only. The straight line Q_{55}, parallel to L, corresponding to the straight line Q of Fig. 6, the positions —IV to +IV marked on L on both sides of O represent, according to the mechanism explained above, the settings for the terminal segments in question. For instance, the setting +IV is obtained by recalling horizontally on L the intersection with Q_{55} of the straight line L_{59} joining the stop k to the graduation 59.

The graduations 24 . . . 28 . . . 32 represent the courses of 23 . . . 27 . . . 31 characters of the pivot O from the beginning of the justification to the precise moments of the impression of the last character of terminal segments of 24 . . . 28 . . . and 32 characters respectively. The straight line Q_{28}, parallel to L, playing again the role of the straight line Q of Fig. 6, the positions -4 to $+4$ marked on L on each side of O represent the settings for the terminal segments in question. For example, the setting position $+4$ is obtained by recalling horizontally on L the intersection with Q_{28} of the straight line L_{32} joining the stop k to the graduation 32.

The relation of the following settings, as was foreseen, is well verified:

-2 and —IV
-1 and —II
$+1$ and +II
$+2$ and +IV

The justification settings are not effected on the justifying lever L, but, as has been said, on a slot (F) of the carriage placed above L and parallel to the rest position of L. The straight line L of Fig. 7 thus represents the axis of the slot F.

Practically, the setting positions -4 to $+4$ (for justifications on a normal terminal segment of 28 characters) and —IV to +IV (for justifications on a normal terminal segment of 55 characters) may be materialized by notches made in a small rule R (Fig. 8) secured along the slot F; the locking finger d (Fig. 11), mounted on the slider C which moves in the slot F in carrying the linking pin A, engages itself with the notches. As the intermingling of two series of notches may confuse the typist, various measures are eventually taken to facilitate their intuitive separation by series. For instance, the notches corresponding to the normal terminal segment of 28 characters may be deeper than the others, although offering the same profile for contact with the locking finger d, or may be prolonged by a stroke. Again, in the case where colored labels are used to identify the various notches of a series, the labels for one series may be systematically clearer than for the other series, although of the same tone, that is to say: a light green for —III and a dark green for -3, or a light blue for +II and a dark blue for $+2$, etc.

Such arrangements will be particularly helpful for those works which permit the occasional switching from one mode of justification to another, mainly, as already stated: the setting up of rather large columns for photographic reproduction, columns justified at the first attempt on the shorter normal terminal segment, with eventual recommencement of the justification, for a few lines only, on the larger terminal segment. It is then of great advantage to have the greatest differentiation possible between the two intermingling series of notches, in order that the switching from one series to the other requires but the minimum of reflection.

Usually, however, the same normal terminal segment is used throughout the work; it is then preferable that the series of notches corresponding to the terminal segment in question should be the only one the typist has under her eyes. To this end, a removable mask K (Figs. 9 and 10) is provided, which allows only the notches in use to be seen and covers the remainder of the rule.

The mask K, laid down on the rule, centers itself upon it since its mounting holes, *o* and *o'*, have the same diameter as the heads *c* and *c'* of the fixing screws of the rule. Moreover, it is secured on the rule by a spring-pin E, the bent ends of which engage the grooves *g* and *g'* of the heads of the screws. Its width is the same as that of the rule; on the other hand, it slightly exceeds this latter at both ends, in order to be grasped easily. One of the edges of the mask comprises a longitudinal cutting or recess *e* intended to uncover only the series of notches —IV to +IV of the rule. The numerical graduations or identification marks of the notches in question appear along the edge of this cutting, forming, for instance, the front of the mask (Fig. 10). The other edge of the mask carries notches or recesses such as *e'*, corresponding to the series of notches —4 to +4 of the rule, the metal between these notches covering the unnecessary notches of the other series. The identification of the notches —4 to +4 appears at the back of the mask (Fig. 9). For switching from one mode of justification to another, it is enough to take out the spring-pin E, to turn the mask over the rule and put the spring-pin E back in place again. Other systems of removable mounting of the mask upon the rule can obviously be designed without departing from the spirit of the invention.

The arrangement just described forms the simplest way of putting the invention into practice.

Fig. 11 represents schematically the plan-view of a form of construction of such a justifier, set for the justification of a terminal segment of 26 characters, the locking finger *d* of the setting slider C engaging the notch —2.

When the reunion of the two series of setting notches on a single scale is not possible—either (*a*) that the smallness of the charactore employed, by bringing the notches nearer each other, would prevent in practice their being cut in the metal of the rule, or (*b*) the lengths of the terminal segments not being in the ratio of *n* to $2n-1$, certain notches of a series might impair certain notches of the other series, two setting scales become necessary. These are then, for preference, placed on both sides of the slot F. In these conditions, a double locking system of the pin A in its various setting positions is generally necessary: a system to work each of the scales, and, when one of them is used for a given work, the other must be rendered inoperative. Such systems do not offer any special difficulties from the point of view of construction, but they increase the cost price.

There are, however, arrangements which permit the operation of two distinct setting scales by the same locking system. They are those in which the locking part may switch from one scale to the other by a movement of a certain nature, and the locking results from a movement of another nature, or in another plane.

As an example, Fig. 12 illustrates diagrammatically a construction of this kind. The locking part of the slider C carrying the linking pin A is a plate-spring *l*, articulated at *i* on C. 1, operated by means of the knob *b* which must be pulled or pushed for moving the slider C in the slot F, supports the locking finger *d*. The two setting scales assuming the form of two series of holes: on the one hand —4 to +4, on the other —IV to +IV, made along the edges of the slot F, the typist passes from one series to the other by a rotation of *l* around the vertical axis *i*, and the locking is obtained by allowing the elasticity of *l* to recall the finger *d* in the desired hole, a movement equivalent to a rotation around an axis perpendicular to the previous one.

The invention concerning in its general form the use of any number of normal terminal segments, an arrangement will now be described in which these segments will be, for instance, four in number, the said segments having, as a concrete example, 28, 42, 56 and 70 characters respectively, it being well understood that the lengths in question might just as well be any other. Then, in the texts intended to emerge on columns of 28 to 41 (42—1) characters, only the last 28 characters (on average) of each line are the object of the contractions and dilations necessary to the justification; in the texts intended to fit columns of 42 to 55 (56—1) characters, only the last 42 characters (on average) of each line are concerned by the contractions and dilations necessary for the justification etc. Whatever normal terminal segment is used, therefore, and in compliance with the very principle of the end-of-line justification, a certain number of characters are typed in a normal way at the beginning of the lines.

Such an increase in the number of normal terminal segments available obviously permits the length of the normal terminal segment to be better adapted to the justification width imposed, i. e., to carry, in certain cases, the contractions and dilations on greater portions of the lines than two segments only would make it possible.

If it is possible, with two normal terminal segments only, to consider occasionally the use of two distinct setting scales operated by a double locking system, a greater number of these segments obligatorily brings back to the conception of a single locking system working as many scales as there are segments: in the specific case, four.

A first process consists in fitting the justifier with two removable small rules, each rule serving for two normal terminal segments through the cutting of a setting scale on each of its edges. For example, one rule has on one of its edges the notches for the normal terminal segment of 28 characters, together with, on its front face, the corresponding numerical graduations or identification marks, and, on the other edge, the notches for the normal terminal segment of 42 characters, together with the corresponding numerical graduations or identification marks at the back. The other rule, set up in a like way, serves for the normal terminal segments of 56 and 70 characters.

Each rule may be secured on the plate T of the justifier in a way similar to that in which previously the mask K of Figs. 9 and 10 was fixed on the rule R, that is to say, by the means of two centering stubs and a clamping pin.

Another process consists (Figs. 13 to 15) in cutting the four series of notches at the edges of a prism with a square section, each series concerning only a part of two adjacent faces of the prism, for instance, the third of the reading face relative to that series and, for the adjacent face, only the depth necessary for the engagement of the locking finger.

The prism P is extended by two prismatic teats, *p* and *p'*, resting without play in two U-shaped supports, *u* and *u'*, the openings of which are turned upside; *u* and *u'* are secured on the plate T of the justifier by screws *v* and *v'*. The prism P, grasped by its protruding ends *p* and *p'*, may be inserted in the supports *u* and *u'* in such a way that any of its faces may be turned upwards, thus showing the numerical graduations or identification marks of a series of notches. The securing of the prism in this position is assured in any manner whatever, in itself without significance from the point of view of the invention, for instance, by a plate-spring *z* which presses upon its reading face and which may be set aside with one hand while the other puts P in its right place.

In end-of-line justifying typewriters with several normal terminal segments, the justifying lever is naturally longer than in typewriters with one segment only, and its actuating stop *k* at a greater distance from the frame. When the typewriter is used as an ordinary one, it is preferable to decrease the space occupied by the justifying lever, a part projecting outwardly in a slant fashion and provisionally useless. To this effect, the lever is made foldable, or provided with a removable end, either of these arrangements having numerous ways of realization.

For instance, in the case of folding (Fig. 16), the justifying lever L may comprise an end L' articulated rather stiffly at *a*, and foldable in L'' along the carriage. A nose *b*, integral with L', effects the locking in extended position, with regards to the efforts in the direction of the arrow. As another example, in the case of sectioning (Fig. 17), the removable end L' may simply penetrate, for preference slightly by force, into an ad hoc housing D of L. Provided that the stiffness of the mounting L—L' is sufficient and the contact L'—*k* warranted in due time, the engagement depth of L' with D at the time of jointing does not matter too much. These two arrangements are only mentioned as examples of what the quite current practice may achieve in this field.

As to the stop *k*, it is simpler to remove it than to fold its carrying arm. In Fig. 18, an example of construction of such a stop for end-of-line justifying typewriters with long justifying lever, *k* is mounted at the end of an arm *h* of a convenient length, integral with the slider *c* moving on the rail *r* fixed on the frame; *c* may be locked to *r* by means of the milled nut *m*. Removing

the slider when the typewriter must be employed as an ordinary one is more practical than organizing the folding of the arm *h*.

For the sake of clarity, the present description should necessarily refer itself to a given kind of end-of-line justifying typewriter. It is to be understood, however, that the applications of the invention are not limited to this sort of typewriter, but that they embrace, on the contrary, all end-of-line justifying typewriters of the various kinds.

I claim:

1. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a finger on said slide, and a rule alongside said slot and having a series of notches, said finger adapted to fit into said notches.

2. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a finger on said slide, and a rule alongside said slot and having two series of notches, said finger adapted to fit into one or the other of said series of said notches.

3. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a finger on said slide, a rule alongside said slot and having two series of notches, said finger adapted to fit into one or the other of said series of said notches, and a removable mask fitted onto said rule to blank out one or the other of said series.

4. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a finger on said slide, a rule alongside said slot and having two series of notches, said finger adapted to fit into one or the other of said series of said notches, a removable mask fitted onto said rule to blank out one or the other of said series, and spring means for retaining said mask on said rule.

5. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a finger on said slide, a rule alongside said slot and having two series of notches, said finger adapted to fit into one or the other of said series of said notches, and a removable mask fitted onto said rule to blank out one or the other of said series, said mask having recesses on opposite edges thereof.

6. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a plate pivoted on said slide, a setting scale along said frame, a finger and holes on said plate and scale and means for inserting said finger into one of said holes.

7. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a plate pivoted on said slide, a plurality of setting scales along said frame, a finger and holes on said plate and scale and means for inserting said finger into one of said holes.

8. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a finger on said slide, a rule alongside said slot and having a series of notches, said finger adapted to fit into said notches, and a second similar rule alongside said slot.

9. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a finger on said slide, and a rule alongside said slot and having a series of notches, said finger adapted to fit into said notches, said rule having a geometric cross-section, said notches being along a plurality of edges thereof.

10. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification including a finger on said slide, a rule alongside said slot and having a series of notches, said finger adapted to fit into said notches, said rule having a geometric cross-section, said notches being along a plurality of edges thereof, and means for presenting one of said edges to said finger.

11. In a typewriter having a rack and a carriage, end-of-line justifying means comprising a frame on said carriage, a slot in said frame, a slide in said slot, a justifying lever pivoted on and slidable in relation to said slide, a stop on said typewriter adapted to be contacted by said lever to automatically start the justifying, a pivot rotatably supported by said rack, said pivot being secured to said lever, and means for adjusting the position of said slide in said slot to alter the amount of justification, the end of said lever being movable relative to the body thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

2,196,437	Handley	Apr. 9, 1940
2,303,686	Edison	Dec. 1, 1942