(No Model.) 2 Sheets—Sheet 1.

C. SEARS.

JUSTIFYING MATRIX LINES.

No. 508,186. Patented Nov. 7, 1893.

FIG. 1

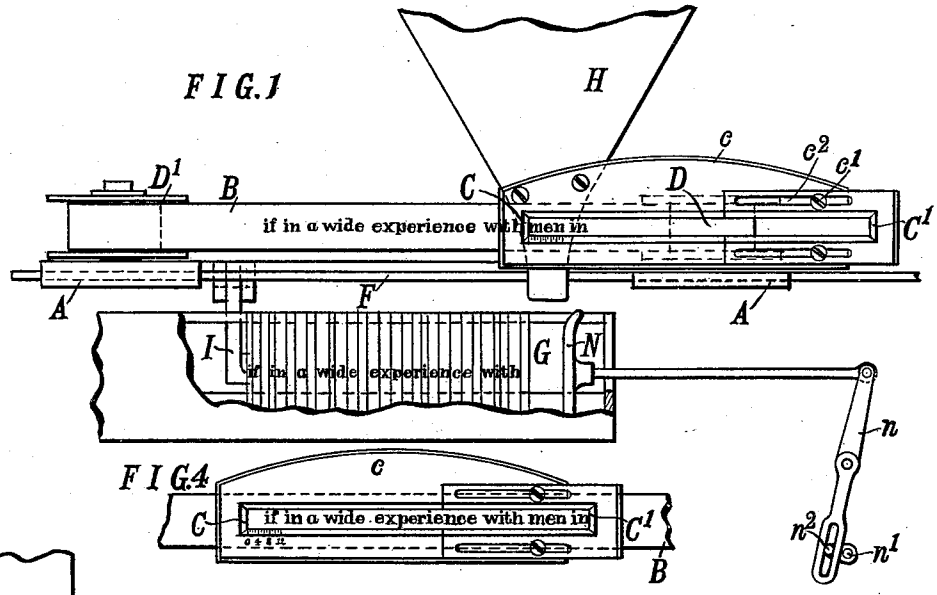


FIG. 4

FIG. 3

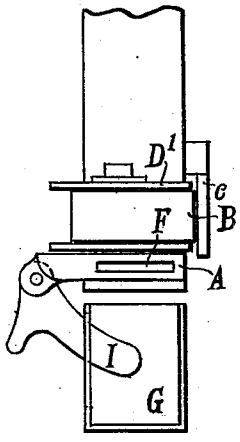
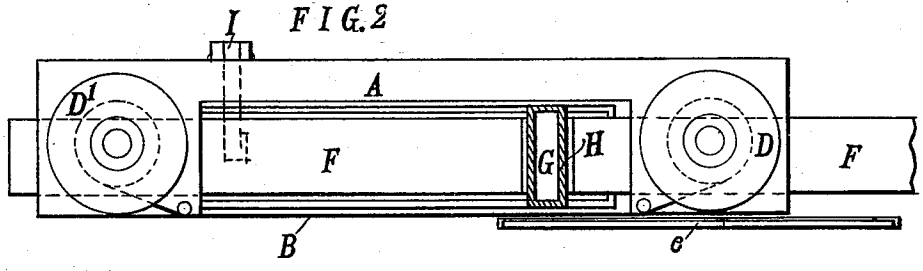


FIG. 2



WITNESSES.

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(No Model.) 2 Sheets—Sheet 2.

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JUSTIFYING MATRIX LINES.

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FIG. 5

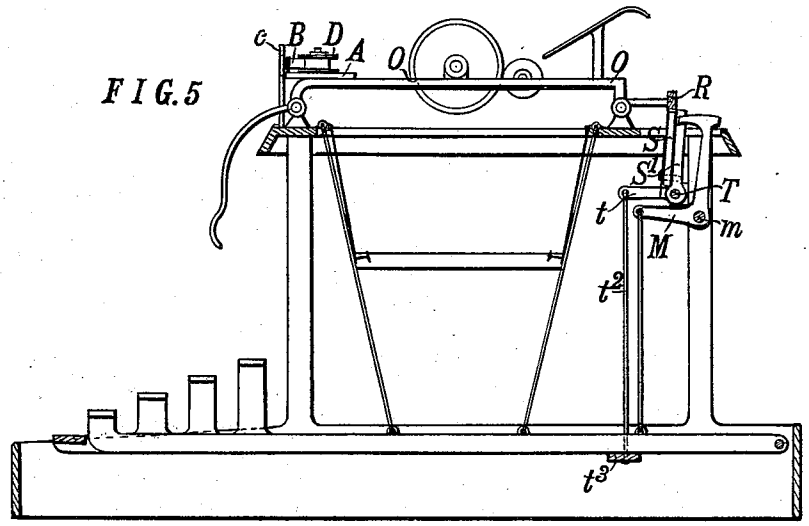


FIG. 6

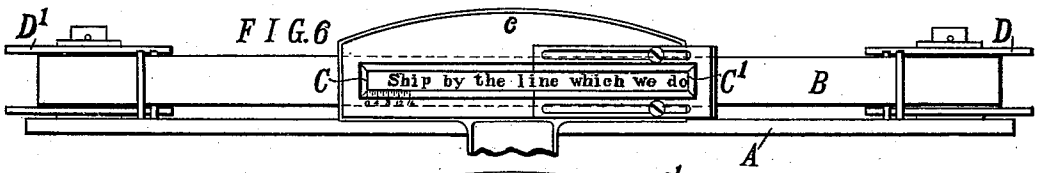


FIG. 7

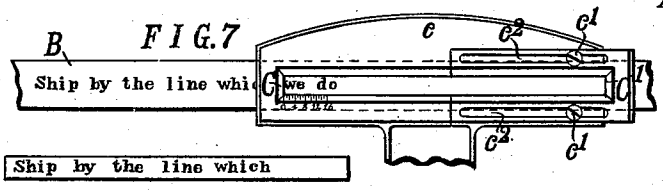


FIG. 8

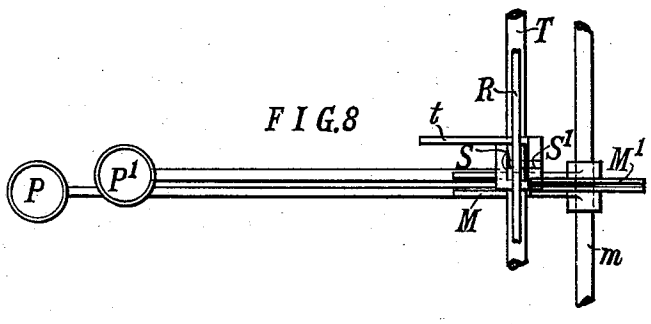
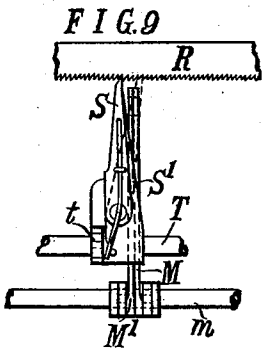


FIG. 9



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JUSTIFYING MATRIX-LINES.

SPECIFICATION forming part of Letters Patent No. 508,186, dated November 7, 1893.

Application filed July 18, 1892. Serial No. 440,359. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SEARS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Methods of and Mechanism for Justifying Matrix-Lines; 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.

One serious obstacle to the practical success of mechanical type setters, matrix assembling machines, and matrix making machines has been the want of satisfactory mechanism for "justifying" the lines. Expanding spacers operated by wedges are, so far as I am aware, the only means which have as yet been found to answer the purpose in the matrix assembling machines; and the successful use of these spacers involves the employment of more or less complicated operating-mechanism which adds to the cost of the machines, and increases the necessary labor of the operator. With mechanical type setters, I believe the justification is still done by hand; and with the matrix impressing machines it is only accomplished by the more or less educated guess work of the operator.

The object of my invention is to provide a system or method of justifying matrix lines and type lines and a very simple mechanical attachment for the machine for assembling or making matrices whereby, with comparatively little care on his part, the operator may justify the line as he forms it; that is to say may be able to add as he goes along, the necessary extra spaces to make every line when finished of the same standard length.

My method will be readily understood from the following description of the same, and of the mechanism shown in the drawings by which it may be practiced.

In the drawings, Figure 1 is a front elevation of the assembling rail or trough, and parts adjacent thereto, of a matrix assembling machine which is provided with the necessary attachments for the practice of my invention. Fig. 2 is a plan view of the mechanism shown in Fig. 1; and Fig. 3 is an end view of the same. Fig. 4 is a front view of the copy and the gages showing their relative position preparatory to beginning the formation of a matrix line. Fig. 5 is a side view of another variety of machine—viz., a matrix making or type writing machine provided with the necessary attachments for the practice of my invention. Fig. 6 is a front view of the copy, copy carriage and gages, showing the relative position of these parts preparatory to beginning to form a matrix line. Fig. 7 is a front view of the copy and gages showing their relative position when the matrix line has been partly formed but wholly justified, and also showing the matrix when in the condition described. Fig. 8 is a plan view of the differential spacing devices, and Fig. 9 is an enlarged front view of the differential spacing mechanism.

My method is equally applicable to the two principal types of machines which are employed to make line matrices, viz:—first, those which assemble independent matrices from their magazines to a common composing point; and, second, those which impress the letters, one at a time, into the matrix material. It is also applicable to use with type setting machines which, so far as their relation to my invention is concerned, differ from matrix assembling machines only in the character of the type assembled. It is also applicable to type writing machines which, as they relate to my invention, differ from matrix making machines only in that the letters are impressed one by one onto instead of into suitable impression receiving material. Indeed the form of machine illustrated in Figs. 5 to 9 is rather a type writing machine than a matrix making machine, and it was selected for the purpose of illustrating the application of the invention to this general type of machine because it could be shown in more simple form than could a matrix making machine.

It may be admitted that the practical utility of my invention when used in connection with a type writing machine is very slight, but that does not affect the fact that it can be so used if desired; and the applicability of the invention to this class of machine is as fully illustrated by the drawings as it would be had I shown a more complicated matrix making machine.

In order to simplify the following description, I shall use the term "matrix line" in

speaking of a line of assembled matrices or type, as well as of a line formed by impressing the letters one by one either on or into suitable material.

For the most successful practice of my invention, it is necessary that the type, matrices or dies as the case may be, shall be constructed on a unit system; that is to say, in type or matrix assembling machines, each type or matrix and space shall be equal in width to the selected unit or some multiple thereof; and in matrix impressing machines or type writers, the carriage which supports the impression receiving material shall be moved in each feed movement a distance equal to the selected unit or some multiple thereof. The standard line,—that is the required length of every line—will be some multiple of the selected unit. Therefore if the total number of units in the matter which is to appear in one line is not equal to the total number of units in the standard line, the matrix line can, if means are provided for adding single unit spaces, be made of exactly standard length by the addition of the required units of space. It is also necessary that the copy which is provided for the operator of the machine shall be type written, and that each letter on this copy shall occupy the same space which the corresponding type or matrix will occupy in the matrix line to be made. It is also necessary to provide two gages which are separated from each other a distance equal to the length of the standard line, and to place the copy behind said gages, and then to feed the copy forward simultaneously with each increment in the length of the matrix line being assembled or made, and a distance exactly equal to such increment. When the copy is placed behind the gages, its end,—that is to say the last letter in the matter which will form one matrix line, is placed against or in line with the right hand gage. The distance between the first letter in the line of copy and the left hand gage represents exactly the amount which the copy line is shorter than the standard, and consequently represents exactly the amount of extra spacing which must be added to the matrix line to make it standard length; and small extra spaces are added by the operator between words as he forms the matrix line until the total extra spacing required has been added. When each letter and space is added to the matrix line, the copy is moved to the left, a distance equal to the width of such addition; consequently with the addition to the matrix line of each additional space, the letter on the copy corresponding with the letter about to be added to the matrix line is, by so much, brought nearer to the left hand gage. Therefore, when, by the addition of extra spaces, the left hand edge of the letter on the copy which corresponds to the letter about to be added to the matrix line is opposite to or in line with the left hand gage, the operator knows that he has justified his matrix line, and he then finishes it by merely adding the letters and the same spaces employed on the rest of the copy.

I will now describe the mechanism shown in the drawings, by means of which my method of justification may be practiced.

A represents a movable copy-holding carriage which is placed at some convenient point where the copy it carries may be readily seen by the operator.

B represents the copy which is printed on suitable paper (preferably in the form of a tape) with letters which occupy the same space in the line which corresponding letters will occupy in the matrix line, and with normal spaces between the words.

C C′ represent respectively vertical gages which lie in front of the copy and at a distance apart equal to the length of the standard line. In the form shown these gages are the vertical edges of a slot in a plate *c* through which slot the copy may be seen. The plate is in two parts one of which slides upon the other, whereby the distance between the two gages may be varied and thereby adapted to use when it is desired to change the length of the matrix line. The screws *c′* which pass through slots c^2 are provided for fastening the two parts together. The carriage has two rolls D D′ on one of which, D, a long tape containing considerable prepared copy may be wound. The copy is wound up on the other D′, as each line thereof is set up on the machine. In beginning the formation of a matrix line the carriage A is moved to the extreme right; the copy is placed with the right hand letter of the matter which will constitute a matrix line, opposite or in line with the right hand gage. The plate *c*, at the lower edge of the slot through which the copy shows, is graduated, the unit of graduation being the unit upon which the matrices or dies are made; and when the copy is in position as described, the number of units between the left hand letter and the left hand gage C can be read by the operator, who will know then how many extra units of space must be added to justify the line. This graduated edge is not absolutely essential to the successful practice of the invention, but it is obviously of great advantage to the operator to know beforehand how many units he must add to the line, because he can calculate on adding about the same amount of extra space between all words in the line.

To complete the specific description of the mechanism shown in the drawings it will be necessary to refer separately to the two forms thereof illustrated. In the form shown in Fig. 1 the carriage A moves backward and forward on the guiding bar F which is supported in a substantially horizontal position by any suitable means. The plate *c* is attached to the spout H out of which the matrices drop into the assembling trough G. On the left hand end of the carriage, an arm I is pivoted, the end of which enters a slot in the

rear wall of the trough G, whereby its end may lie against the foremost matrix in the line.

N represents a plunger which lies in the trough and is moved back and forth, after each matrix and space is dropped into the trough, by the rocking of lever n, which is rocked through a definite path of the revolution of the crank shaft n'. A crank pin n^2 on this shaft enters a slot in the lever as shown. The plunger therefore moves forward to the same point in every movement. Preparatory to beginning the forming of a matrix line, the carriage is moved to the right until the arm I is at the point which the plunger reaches in its forward movement. Then the matrices and spaces are dropped from the spout H one by one. The plunger moves forward after the fall of every matrix and spacer thereby moving it and all of the other matrices and spacers which have been assembled in the line, the arm I, the carriage A and copy B forward a distance equal to the width of the said matrix. After each word the operator adds a space wider than a normal space, thereby, by so much, bringing the first letter of the word on the copy which is about to be added to the matrix line nearer to the left hand gage C. And this addition of extra space is continued until the justification is completed, and this is shown to have been accomplished when the letter on the copy about to be added is in line with the left hand gage C.

Although I have stated that the copy moves to the left while the left hand gage remains stationary, it is clear that it is the relative movement of these two parts which is material. I have also shown mechanism for moving the matrix line after each letter and space is added, but since the extra spaces are always added between words the desired result can be accomplished if the matrix line is moved forward after the completion of each word and the addition of the spaces which immediately follow it. Then, when the line is justified, the fact will appear when the first letter of the word next to be added is in the line with the left hand gaging edge.

I will illustrate the operation of the invention by particular reference to the drawing.

Fig. 4 shows the copy line "If in a wide experience with men" behind the plate c and in position to begin the formation of a matrix line. Each of the letters on the copy occupy the same space in the line that corresponding matrix letters will occupy, and the spaces between words are two units wide. The last "n" in the copy line is in line with the right hand gage. From the graduated edge of the slot in the plate it appears that the copy line is six units short of standard length. A glance shows that there are more than six words in the line. Therefore the operator forming the matrix line adds after each word an extra unit of space; that is he uses spaces three units wide, until after he has set up "If in a wide experience with" and has added the three unit space after "with" he sees that the first letter in the next word "men" is in line with the left hand gage. From this fact he knows he has completed his justification; and in completing his matrix line he puts between the words "men" and "in" a two unit space the same as in the copy. The arm I is pivoted to the carriage, and when the matrix line is completed this arm may be swung out of the way and said matrix line pushes along the trough to another part of the machine.

In the form of the matrix making machine shown in Figs. 5 to 9 inclusive, each letter and the normal space occupies just four space units. I could as well employ one of the machines already invented having differential letter spacing mechanism, but the principle and mode of operation of my invention would be in no wise affected. In the machine which I do show I provide means for adding at any desired place either a single unit space, or a double unit space, whereby I may add as I please as many extra units of space as I desire.

In the drawings, the copy carriage A is shown attached to the platen carriage O and therefore the feed movement of both must be equal. The plate c having the gaging edges C C' is rigidly fixed to the machine in suitable relation to the copy carriage. On the carriage O is a rack R with which the pawls S S' engage. The pawls S S' are fixed on a rock shaft T which is rocked by means of the arms t rigidly connected therewith, the bar t^3 which lies under all the keys and the links t^2 which connect said bar and arms t. Therefore when any key is depressed the rock shaft T is operated. The pawl S' is rigid but the pawl S is pivoted to it on a pivot at right angles to the axis of the rock shaft, and is moved, when free to move, by a spring. When the rock shaft is rocked by the depression of any key the rigid pawl engages with the rack, and the spring pawl S, released from such engagement, is moved by its spring to the right a distance equal to four notches in the rack. When the key is released the rock shaft returns to its normal position and the pawl S engages with the rack. Immediately the spring or weight which operates the carriage moves said carriage to the left until the pawl S comes into line with the pawl S', which position is the limit of the movement of said pawl S to the left. So much of the feeding mechanism as is above described is not new, being substantially the same as the mechanism now in common use on the Remington type-writing machine,— the only difference being that the divisions on the rack are so small that the backward movement of the pawl S is equal to four divisions in the rack instead of one as with the Remington machine.

m represents a rod on which are pivoted two bell levers M and M'. One arm of the lever M is connected with the half space or two unit key P and one arm of the lever M' is

connected with the quarter space or one unit key P′. When the key P is depressed the lever M is rocked and its upper end brought behind the pawl S. When said pawl is released from the rack it springs back and strikes said arm of the lever M, and the backward movement is only equal to two divisions of the rack. When the said space is released and the rock shaft returns to its normal position the carriage moves forward through two units of space. When the space key P′ is depressed one arm of the lever M′ is moved behind the pawl and acts as a stop to prevent the said pawl from moving backward a distance greater than one division on the rack. Therefore, when the said key is released, the carriage moves forward a distance equal to one unit. Means are therefore provided for adding between words extra spaces equal to either one or two units, and these extra spaces may be added with the same result as in the machine first described. When a sufficient number of extra spaces have been added, the letter on the copy corresponding with the letter about to be added to the matrix line (which is the "w" of "we" as shown in Fig. 7 of the drawings) is in line with the left hand gage C, and the operator knows his line is justified.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The herein described method of justifying matrix lines, which consists in (first) preparing a copy having letters which occupy the same space which corresponding letters will occupy in the matrix line and having normal spaces between words; (second) placing this copy behind two gages which are separated a distance equal to the desired length of the matrix line, with the last letter in the copy line opposite or in line with the right hand gage; (third) forming the matrix line letter by letter and space by space; (fourth) moving the copy toward the left hand gage distances exactly equal to the increments in the length of the matrix line which is being made, (fifth) adding extra spaces between words until the letter on the copy corresponding with the letter about to be added to the matrix line is opposite or in line with the left hand gage; and (sixth) finishing the matrix line without the addition of extra spaces.

2. In machines for forming matrix lines, a copy-holding carriage, two gages which are separated a distance equal to the length of the matrix line to be formed, and are adapted to lie in front of the copy on said carriage, and means for moving the said carriage to the left a distance exactly equal to the increment to the length of the matrix line being formed, substantially as and for the purpose specified.

3. In machines for forming matrix lines, a movable copy-holding carriage, a plate *c* having a graduated edge, two stationary gages which are separated a distance equal to the length of the matrix line to be formed and are adapted to lie in front of the copy on said carriage, and means for moving said carriage to the left a distance exactly equal to the increments to the length of the matrix line being formed, substantially as and for the purpose specified.

4. In machines for forming matrix lines, a movable copy-holding carriage, two gages adapted to lie in front of the copy on the copy-holding carriage, means for varying the distance between said gages, and mechanism for moving said carriage to the left a distance exactly equal to the increment in the length of the matrix line which is being formed, substantially as and for the purpose specified.

5. In machines for forming matrix lines, a movable copy-holding carriage, a fixed plate adapted to lie in front of the copy on said carriage, and having a horizontal slot through which the copy may be seen, graduations on one horizontal edge of said slot, means for varying the length of said slot, and mechanism for moving said carriage to the left a distance exactly equal to the increment in the length of the matrix line which is being formed, substantially as and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES SEARS.

Witnesses:
E. L. THURSTON,
M. S. INGHAM.