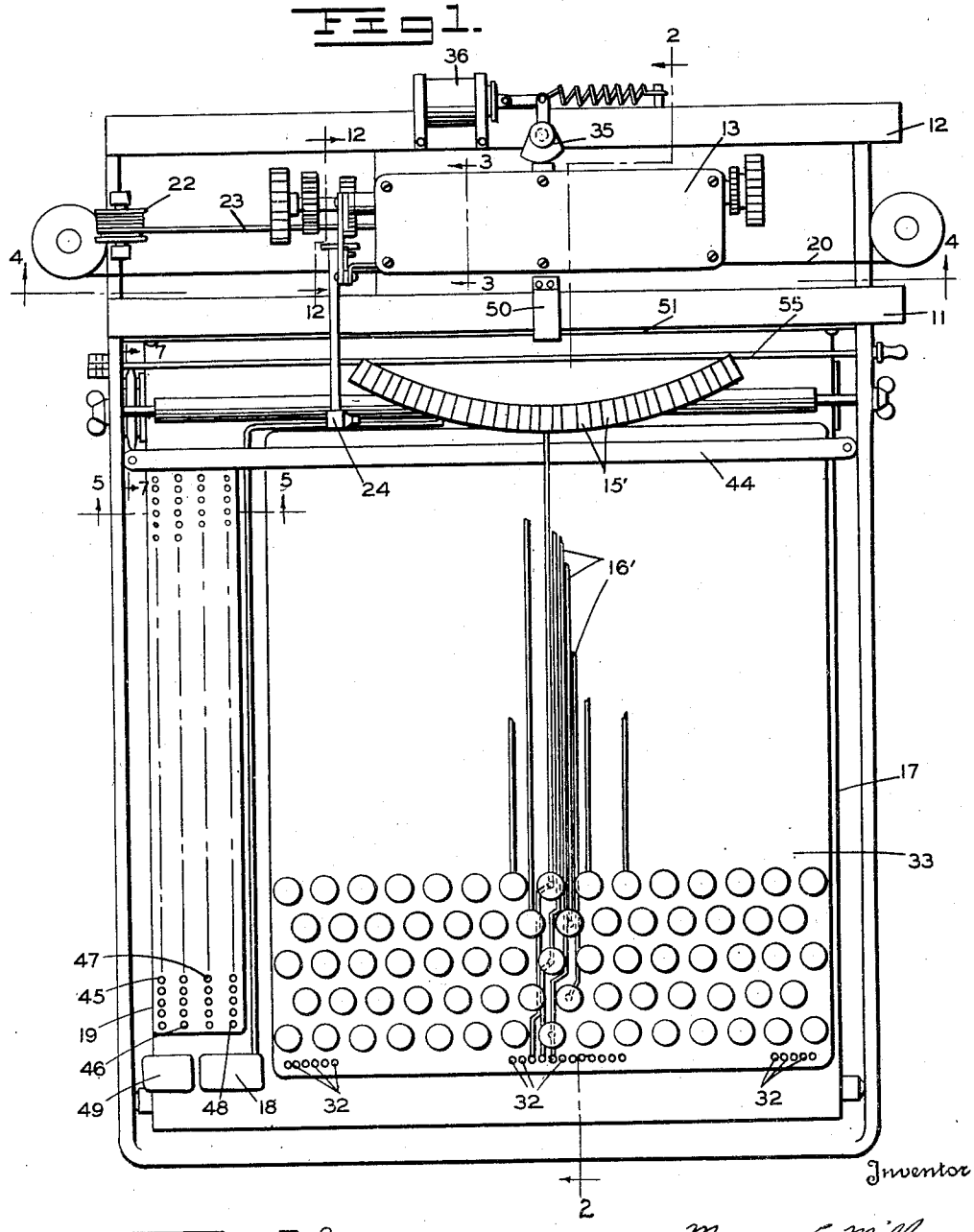
July 17, 1951 M. E. MILLER 2,561,216

STENCIL CUTTING DEVICE FOR PHOTOCOMPOSING APPARATUS

Filed Dec. 15, 1948 4 Sheets-Sheet 1

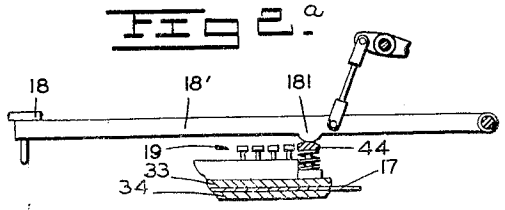
Fig 1.



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Fig 2.a



By

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STENCIL CUTTING DEVICE FOR PHOTOCOMPOSING APPARATUS

Filed Dec. 15, 1948 4 Sheets-Sheet 2

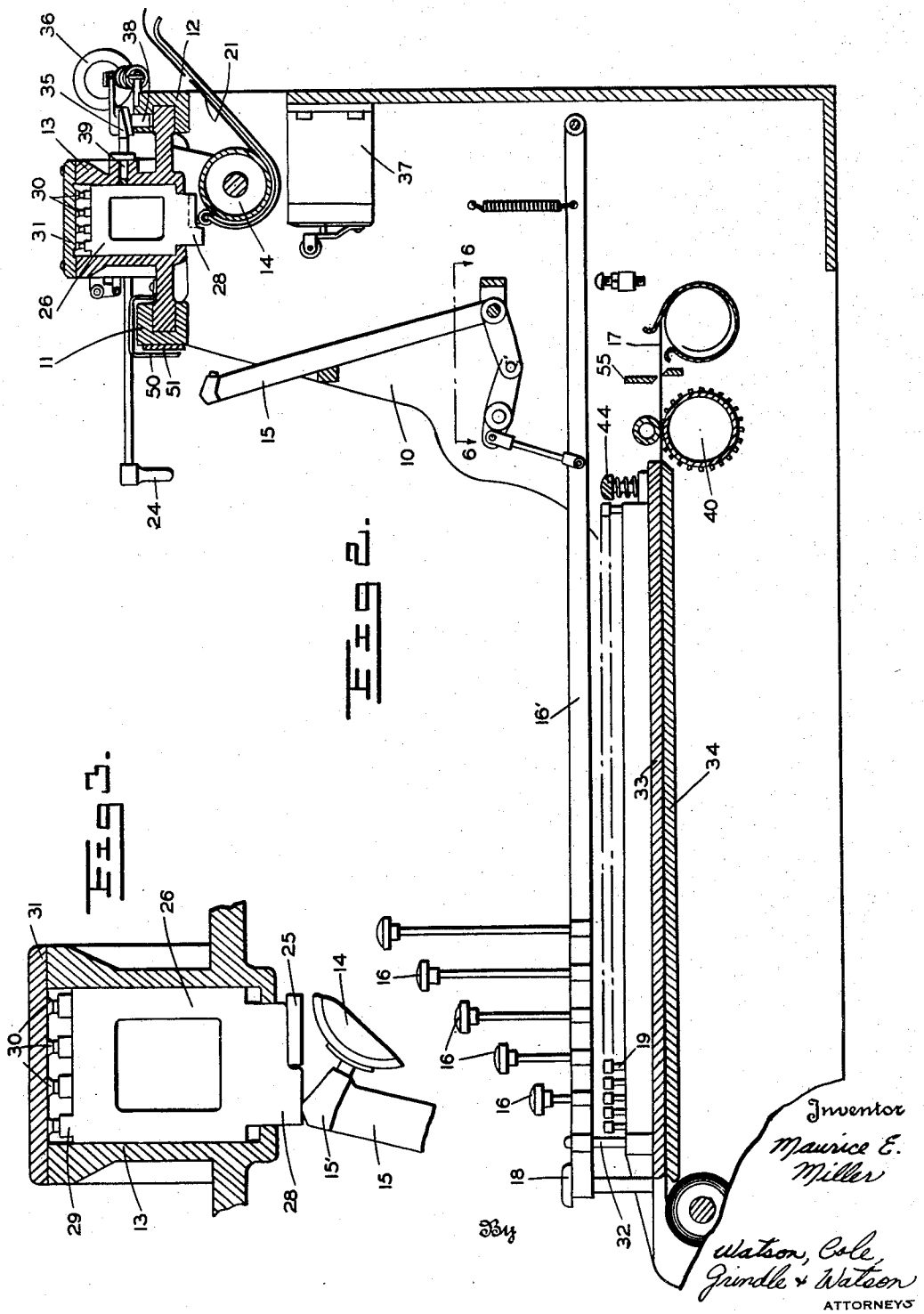


Fig. 2.

Fig. 3.

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STENCIL CUTTING DEVICE FOR PHOTOCOMPOSING APPARATUS

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Fig 4.

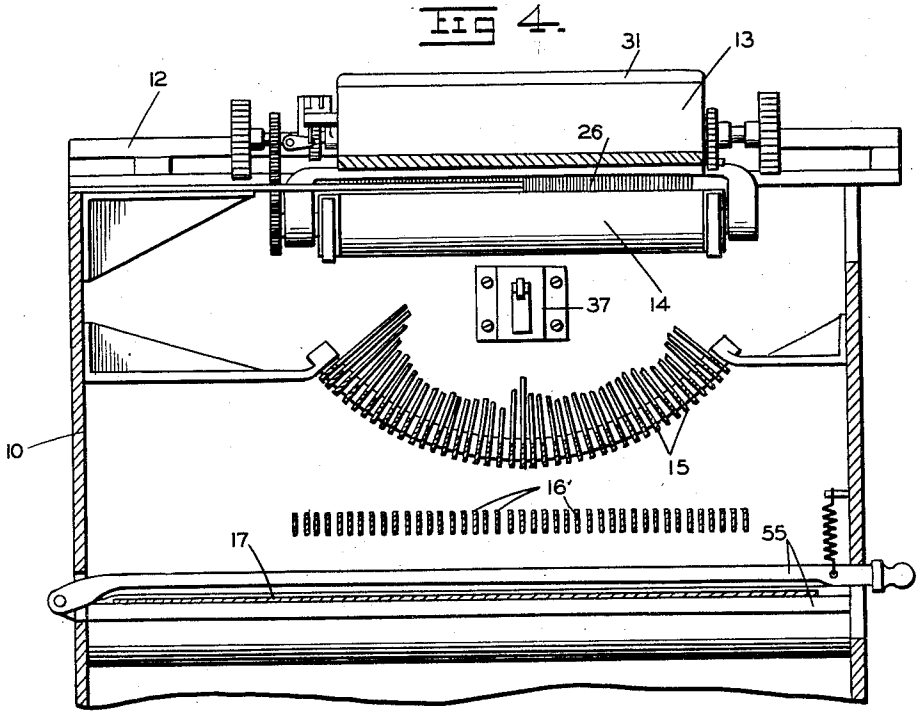


Fig 5.

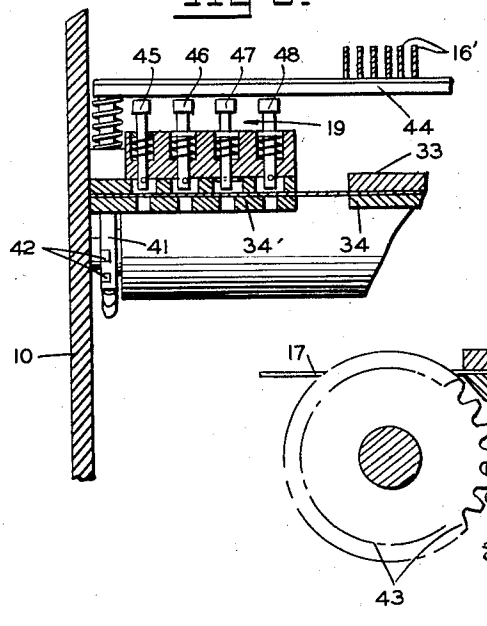


Fig 6.

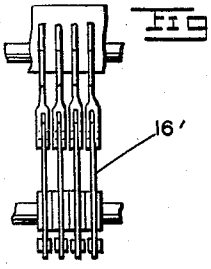


Fig 7.

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STENCIL CUTTING DEVICE FOR PHOTOCOMPOSING APPARATUS

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Fig 8.

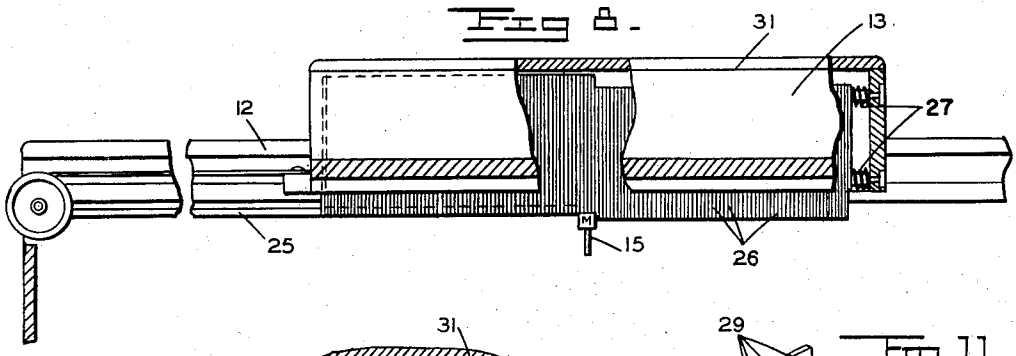


Fig 9.

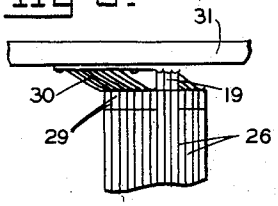


Fig 10.

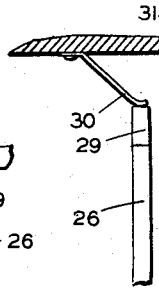
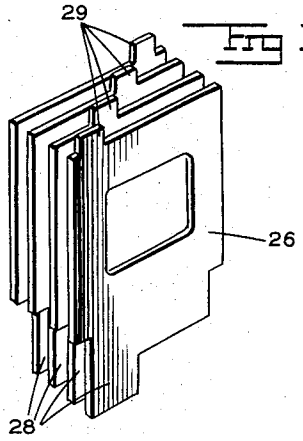


Fig 11.



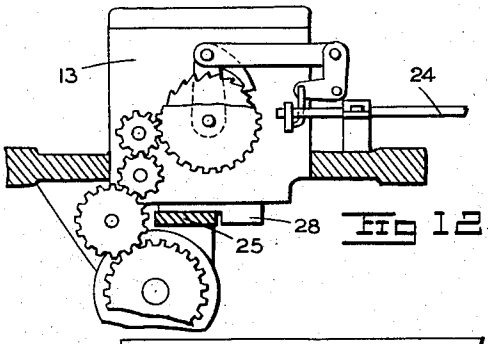
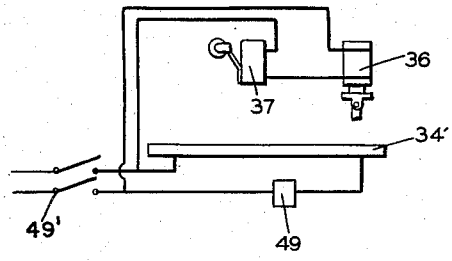


Fig 12.

Fig 14.



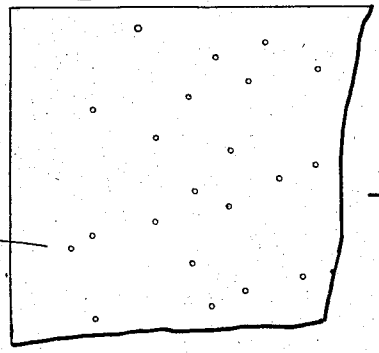


Fig 13.

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Patented July 17, 1951 2,561,216

UNITED STATES PATENT OFFICE

2,561,216

STENCIL CUTTING DEVICE FOR PHOTO-COMPOSING APPARATUS

Maurice E. Miller, Addison, N. Y.

Application December 15, 1948, Serial No. 65,336

4 Claims. (Cl. 164—112)

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The present invention relates to lithographic or offset printing, and more particularly to the production of a photographic image of the finished composition to be printed, without the use of hand-set or machine-set type. In the production of any such composition, photographically and without the use of actual type, a most serious problem consists in "justifying" the lines, or in other words, in so spacing the letters and words that each line is even in appearance and ends exactly at the right-hand margin of the column. By the apparatus of the present invention this may be easily and precisely accomplished.

As is well known, printer's type of any particular font vary in width according to the width of the characters represented. Therefore, in producing a photographic image of line of printing, without the use of actual type but by individually photographing the characters onto a film which is advanced intermittently, it is necessary that each movement of the film shall exactly correspond to the width of the last image photographed thereon. According to the present invention this is accomplished by controlling the movements of the film by means of a carriage provided with a plurality of movable stop members, adapted to cooperate with a fixed stop member, the extent of each movement of the carriage being limited according to the number of movable stop members which are moved out of alignment with the fixed stop member. The number of movable members affected in each instance is in turn governed by the width of the character to be photographed, through the medium of a plurality of members of varying widths which are selectively engaged with said movable stop members to elevate them out of alignment with the fixed stop member. The members of varying widths may conveniently take the form of type hammers, generally similar to those of a typewriter, arranged in a semicircular bank, and each bearing the representation of a character or a blank representing a space. Upon the same movement of a type hammer which determines the extent of the next movement of the carriage, the face of the type hammer may be automatically photographed onto the aforesaid film.

In order to effect the automatic operations aforesaid, it is convenient to employ a stencil which is cut on a separate unit of the apparatus, which must also make provision for justifying the lines. To accomplish this, a similar arrangement of movable carriage and bank of type

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hammers is employed, the type hammers in this instance being manually actuated to simultaneously cut the stencil and to produce, on a sheet of proof paper supported on a platen secured to the movable carriage, a printed or typed proof of the material being set up. Here again, the type hammers vary in width according to the characters which they bear, and means are provided for moving both carriage and stencil between words, together with means for justifying the stencil at the end of each line of proof, the amount of additional space to be inserted between words being determined by comparing the typed proof line with a fixed scale. Means are provided for altering the stencil, at the completion of each line of composition, by inserting additional space between words as may be necessary.

The present application is directed particularly to the carriage-control mechanism used both in the stencil-cutting and photographic units.

Accordingly, it is the general object of the present invention to provide apparatus of the type described in the foregoing paragraphs, and more specifically, to provide apparatus as defined in the appended claims. Other and further objects and advantages will be apparent from the description which follows, taken in connection with the accompanying drawings in which

Figure 1 is a plan view of the stencil cutting unit of the present invention;

Figure 2 is a section on line 2—2 of Figure 1;

Figure 2a is a detail view showing the means for bringing about an increased advance of the stencil when the word space key is pressed;

Figure 3 is an enlarged fragmentary section on line 3—3 of Figure 1;

Figure 4 is a section on line 4—4 of Figure 1;

Figure 5 is a fragmentary section on line 5—5 of Figure 1;

Figure 6 is a fragmentary section on line 6—6 of Figure 2;

Figure 7 is a fragmentary section on line 7—7 of Figure 1;

Figure 8 is a view partly in elevation and partly in section of the spline carriage of the device of Figure 1;

Figure 9 is an enlarged sectional view of a portion of the spline and spline carriage of Figure 8;

Figure 10 is a sectional view illustrating a single spline in the spline carriage of Figure 8;

Figure 11 is a perspective view illustrating a

group of splines arranged as in the carriage of Figure 8;

Figure 12 is a section on line 12—12 of Figure 1;

Figure 13 is a partial plan view of a stencil cut by the device of Figures 1–12; and

Figure 14 is a circuit diagram for the device of Figures 1–12.

In order to facilitate an understanding of the invention, reference is made to the embodiments thereof shown in the accompanying drawings, and detailed descriptive language is employed. It will nevertheless be understood that no limitation of the invention is thereby intended and that various changes and alterations are contemplated such as would ordinarily occur to one skilled in the art to which the invention relates.

Referring to Figures 1–14, inclusive, the stencil-cutting device, which in many respects resembles a standard typewriter, comprises generally a frame 10 which may take any suitable form and includes longitudinal, transverse and vertical supporting and retaining members as required; a fixed guideway consisting of guides 11 and 12 supported on the frame 10; a carriage 13 movable in the guides 11 and 12 and carrying a platen 14; a bank of type hammers 15 each bearing a printing character such as a letter, numeral, space or punctuation mark, etc., and each adapted to be operated by a key 16; means beneath the bank of keys 16 for intermittently advancing a stencil 17 which may consist of paper of suitable strength and texture; means associated with said keys and hammers for puncturing said stencil with a series of apertures corresponding to the keys struck; a space bar 18, having means for puncturing said stencil to indicate word spaces and which also operates a type hammer having a blank face corresponding to a wordspace; and a bank of space plungers or punch rods 19 for puncturing or punching said stencil to indicate additional spaces between words for the purpose of "justifying" the lines of print in the final photographic film.

In the operation of the stencil-cutter the type hammers 15 serve, with the aid of the usual typewriter ribbon 20, to record on the proof paper 21 the sequence of characters struck and, therefore, the nature of the stencil which is simultaneously cut. An important difference from the conventional typewriter, however, resides in the fact that the type hammers 15 vary in width according to the width of the characters which they bear, just as in the case of printer's type. Therefore, the characters recorded on the proof paper 21 are evenly spaced as in printing rather than unevenly spaced as in typewriting. This feature, of course, requires unequal movements of the carriage 13, which are brought about in the manner to be described.

The carriage 13 is, as described above, movable between the guides 11 and 12, and is biased to the left by means of a spring 22 and tape 23. Return of the carriage to its right-hand position is accomplished by pressure on the lever 24 which also, in the conventional manner, simultaneously advances or rotates the platen 14 to the extent of a line space. Control of the leftward or writing movements of the carriage 13 is secured by the cooperation of a fixed stop member 25 (Figures 3, 8, 12) which is in the form of an elongated flat bar paralleling the guides 11, 12, and a large number of thin, plate-like movable stop members 26 supported within the carriage 13, which movable stop members,

for convenience, will hereinafter be referred to as splines. The form of the individual splines 26 is best seen in Figure 11.

The splines 26, each of which is of a thickness corresponding to a multiple of a printer's "point" (.014") are supported within the carriage 13 as best seen in Figures 2, 3 and 8, and are maintained in close relationship under slight pressure by springs 27 (Figure 8). Each spline is formed with a depending tongue 28, and an upwardly projecting lug 29 (Figure 11). The tongues 28 are uniformly located for cooperation with the end of the fixed stop 25, while the lugs 29 are staggered as seen in Figure 11, for cooperation with leaf springs 30 (Figures 9 and 10) secured to the cover 31 of the carriage 13, for maintaining the splines 26 normally in their lowermost position. At the beginning of a line, i. e., when carriage 13 is in its extreme right-hand position, all of the splines are in lowered position and the leftwardmost spline is in contact with the right-hand end of fixed stop member 25, restraining the carriage from movement to the left.

Each type hammer 15 has a head portion 15' which is of a thickness also a multiple of a "point," and is adapted, when elevated into a position where a character is struck on the proof paper 21, to engage the tongues 28 of a certain number of splines corresponding to the thickness of the hammer, raising those splines, within the carriage 13, until the tongues are clear of the stop member 25, thus permitting the carriage to move leftward to the extent of the thickness of the affected splines. At the same time, by virtue of the punch rod 32, one of which is associated with each lever 16', a hole is punched in the stencil 17 corresponding, by its lateral position, to the character which is printed on the proof paper. To facilitate the punching operation, the stencil 17 passes between upper and lower guides 33, 34 each of which is apertured to receive any one of the punch rods 32 as it is depressed by pressure on its corresponding key 16.

In order to ensure smooth operation of the device, it is desirable to employ means to prevent the carriage from moving during that portion of the type hammer stroke while the hammer is in contact with the splines. Likewise, it is necessary to ensure that the affected splines remain in raised position after the hammer recedes and while the carriage is moving to the left. To this end, I employ a solenoid actuated cam 35 (Figure 1), the solenoid 36 being energized through the operation of a switch 37 which is closed by the type hammer as the latter approaches contact with the platen 14 (Figure 2). The cam 35 exerts pressure on two braking devices, 38 (Figure 2), which acts on the carriage 13, and 39 which acts on the newly raised splines. The cam 35 is so shaped that the pressure on the brake 38 is both applied and released slightly before the equivalent effects upon the brake 39.

Advance of the stencil sheet is accomplished by means of teeth on the roll 40 (Figure 2) which engage feed holes in the edge of the stencil sheet, the roll 40 being rotated the space of one tooth by each actuation of a type hammer. The plunger 41 (Figure 7) is provided with two pawls 42 adapted to engage teeth 43 on the opposite end of roll 40 to that which engages the feed holes of the stencil.

The plunger 41 is surmounted by a rod 44 which extends laterally of the machine so as

to be acted on by any lever 16' which may be depressed, whereby the plunger is lowered to the extent that, upon its return movement, the roll is rotated to the extent of one tooth 43. Upon actuation of the space key 18, however, and for reasons to be hereinafter explained, the plunger 41 is depressed further, by contact with the projection 181 of the space bar lever 18' (Figure 2a), so that its return motion rotates the roll 40 to the extent of two teeth 43, wherefore the stencil 17 is advanced twice the normal distance. The space key 18 is provided with a punch rod which punctures the stencil 17 in a location which indicates a normal space between words.

The justifying apparatus comprises four rows of punch rods generally indicated at 19 (Figure 1), the rows being designated 45, 46, 47 and 48, respectively, the rows corresponding to 1-point, 2-point, 3-point and 4-point spaces. The stencil guides 33 and 34, which underlie the rods 19, are provided with holes corresponding to each of the rods of the rows 45, 46, 47 and 48, and the guide 34 is electrically wound so as, when the winding is energized, to constitute an electro-magnet for attracting the steel punch rods 19. A convenient key 49 (Figure 1) actuates a switch 49' (Figure 14) which controls the electro-magnet circuit.

As previously described, each actuation of the space key 18 punches the stencil to indicate a word space, advances the carriage 13 a corresponding distance, and also advances the stencil double the normal distance. Therefore, when a line of text has been punched in the stencil there will be a certain number of space apertures in the stencil, each of which will underlie one of the rods of the row 48. If, now, the key 49 is depressed, the guide plate 34 will be magnetized and each of the rods 19 which corresponds to one of the word-space holes in the stencil will be drawn down through the corresponding hole, thus indicating the location of the word-spaces. The operator now has recourse to a fixed pointer 50 (Figure 2) and scale 51 on the carriage 13, by means of which he may ascertain the number of "points" of space necessary to "justify" the line. Assuming that the line of text consists of seven words, there are six word-spaces and assuming that thirteen "points" of additional space are necessary to justify the line, it is apparent that five of the word-spaces must be increased by two points each, and the sixth by three points. For this purpose, each rod 19 of each row 45—48 is serially numbered. In order to insert an additional two-point space between each contiguous pair of the first six words, the operator will depress each next lower numbered rod of row 46 than the rods of row 48 which indicate the word spaces in question. To insert a 3-point space in the last word-space he will depress a rod in row 47 which is serially numbered one number lower than the last depressed rod in row 48. By this action the additional holes are punched in the stencil, in appropriate location, to indicate the required additional points of space to justify the line. The strip of stencil may now be severed by the knife device 55 (Figure 4) preparatory to feeding it to the photographic apparatus. By reference to the typewritten proof the operator may ascertain if any errors have been made and, if so, may discard the stencil and reset the line of text.

The photo-compositor, like the stencil cutter, comprises a bank of type hammers of varying widths, and a carriage whose movements are controlled by means of the cooperation of a plurality of movable splines with said hammers. Unlike the stencil cutter, however, the photo-compositor is wholly automatic, once the controlling stencil has been introduced. The type hammers are provided with faces corresponding to all of the hammers 15 of the stencil cutting device, including blank faces corresponding to 1-, 2-, 3- and 4-point spaces or multiples thereof. A fixed camera serves to photograph each type face, as it is elevated into focus, upon a movable film from which, according to known methods, the printing plate is subsequently produced. The general construction of the splines and spline carriage is the same as in the case of the stencil cutting device, and therefore, need not be described.

Since the stencil has been punched to insert the proper amount of space between words to justify each line of proof, the photographically composed lines will likewise be exactly justified in the automatic operation of the photo-compositor.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In apparatus of the character described, in combination, a typewriting machine having a movable carriage, a bank of type hammers of varying widths corresponding to the widths of the characters represented, means associated with said type hammers for controlling the movements of said carriage according to the width of the type hammer actuated, means for actuating said type hammers, means associated with said last means for advancing a stencil sheet and for perforating the same in accordance with the character represented by the type hammer actuated, and a space key associated with said stencil advancing means and adapted when struck to actuate a type hammer, to perforate said stencil and to actuate said advancing means to advance said stencil twice the distance it is advanced when another type hammer is actuated.

2. In combination with the apparatus of claim 1, a plurality of rows of punch rods overlying said stencil, each of said rows corresponding to a different width printer's space, and means for causing a rod of one of said rows to enter each perforation made in said stencil by actuation of said space key after a line of printing has been cut in said stencil, thereby indicating the location of word spaces therein, the rods of said other rows being operable to form additional perforations in said stencil to indicate additional spaces required to justify said line.

3. In combination with apparatus according to claim 1, line-justifying means comprising an electro-magnet having a plurality of rows of holes formed therein, a plurality of rows of punch rods supported above and in registry with said holes, means for positioning a previously cut stencil with its word-space perforations in registry with one of said rows, and means for energizing said magnet to cause the rods corresponding to said word-spaces to descend through said perforations, said remaining rods being operable to form additional space perforations in said stencil.

4. In apparatus of the character described, a carriage movable along a fixed guideway, means for moving said carriage, means for controlling the said movement including a bank of type

hammers, means for moving said type hammers comprising finger tabs and linkages connecting said tabs and said hammers, means for intermittently advancing a stencil sheet beneath said linkages, punch rods associated with said linkages and adapted to perforate said stencil when said tabs are depressed, and a space key associated with said stencil advancing means and adapted when struck to actuate a type hammer, to perforate said stencil and to actuate said advancing means to advance said stencil twice the distance it is advanced when another type hammer is actuated.

MAURICE E. MILLER.

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