Nov. 9, 1937. L. WENCZLER 2,098,928

JUSTIFICATION OF LINES OF TYPE MATTER IN PHOTOTYPE COMPOSING

Filed May 27, 1935 3 Sheets-Sheet 1

Fig. 1

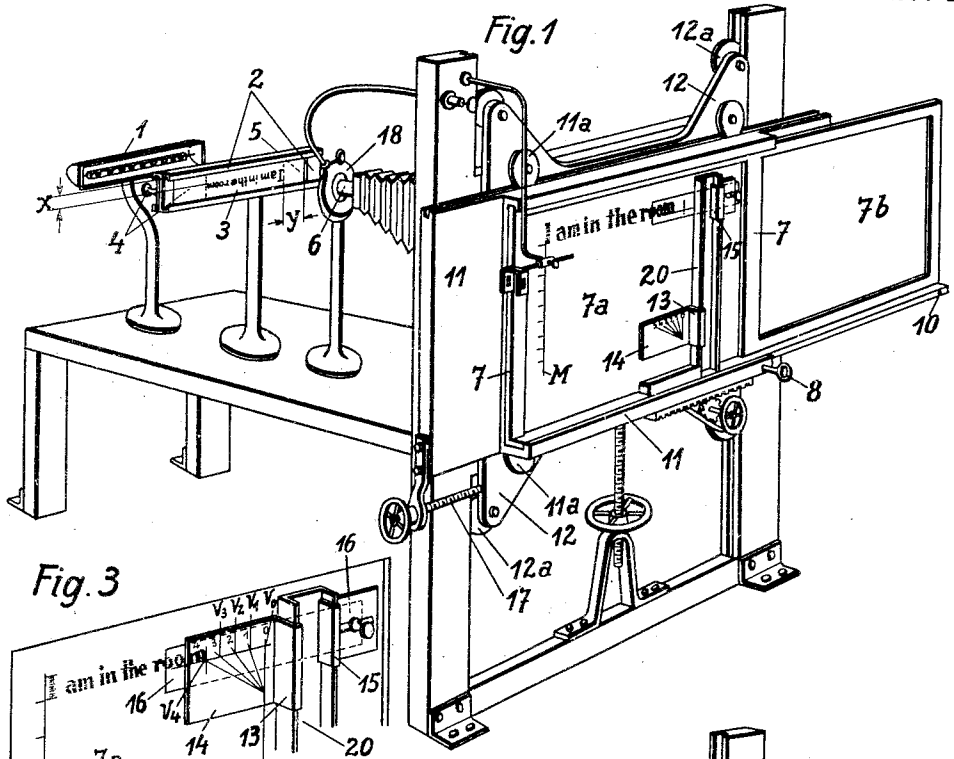
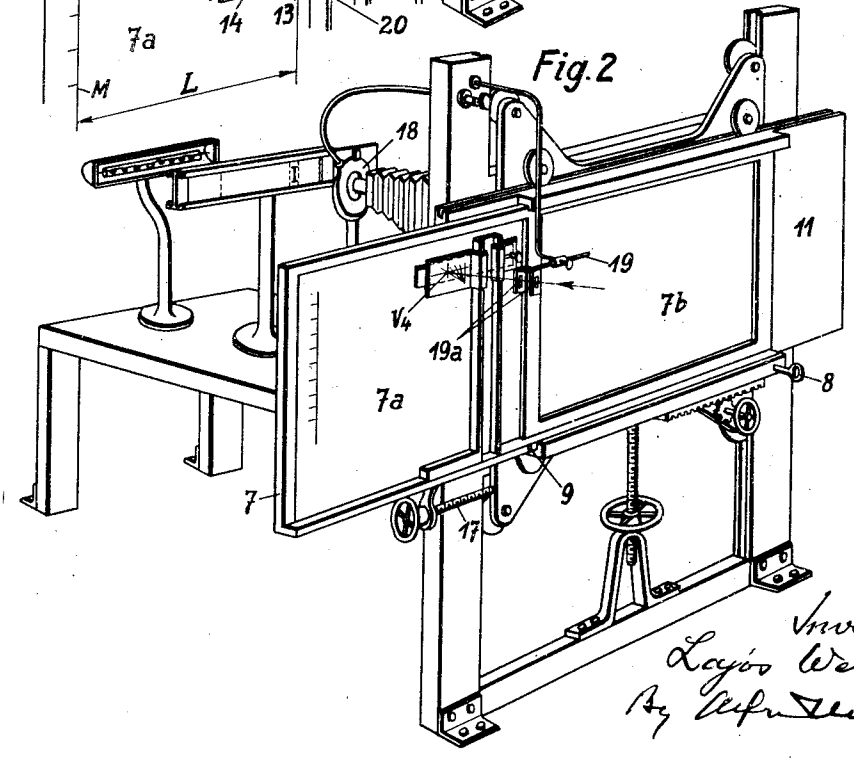


Fig. 3

Fig. 2



Inventor:
Lajos Wenczler
By Alfr. Hess
Atty.

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Fig. 8

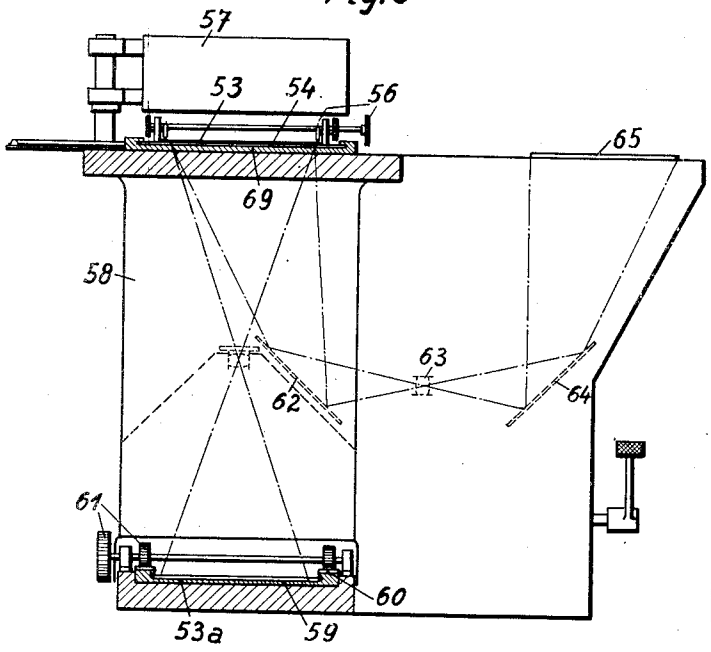


Fig. 9

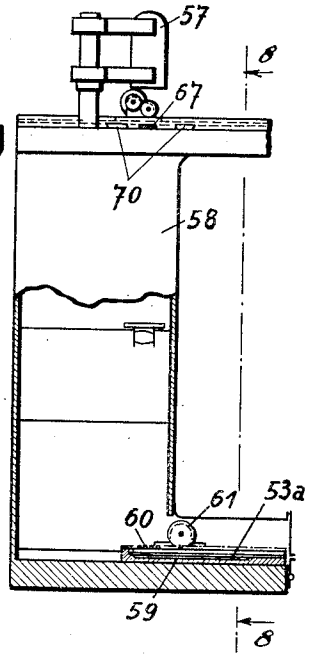


Fig. 10

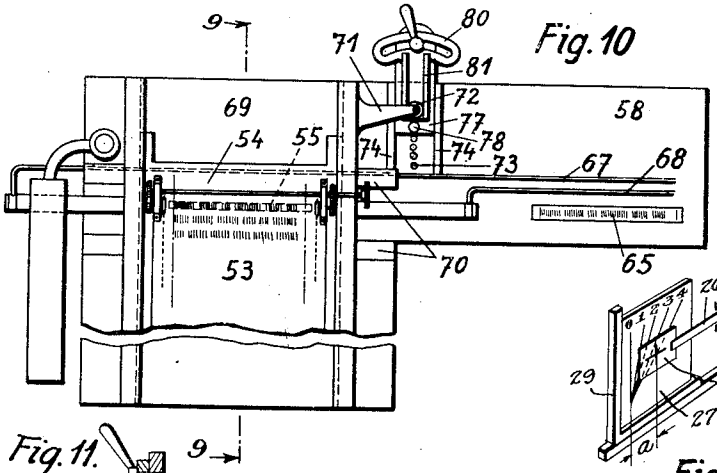


Fig. 4

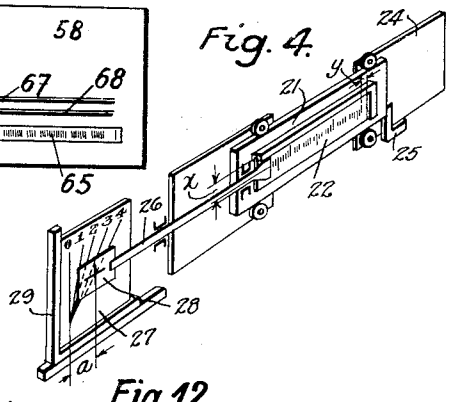


Fig. 11

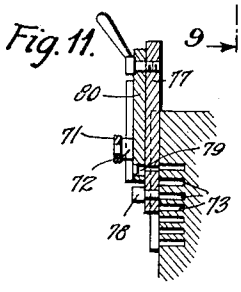
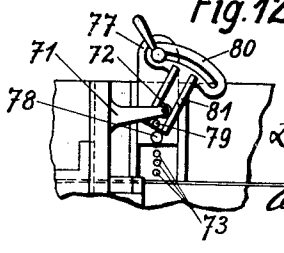


Fig. 12



Inventor:
Lajos Wenczler,
By
Attorney

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JUSTIFICATION OF LINES OF TYPE MATTER IN PHOTOTYPE COMPOSING

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Fig. 5.

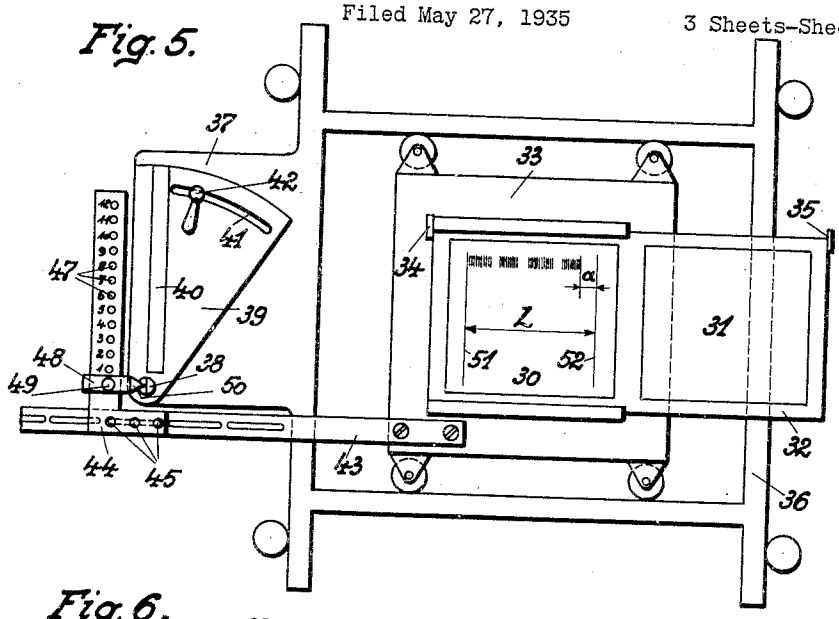


Fig. 6.

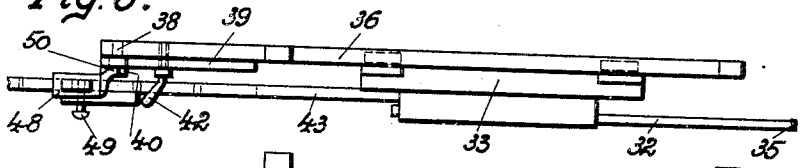
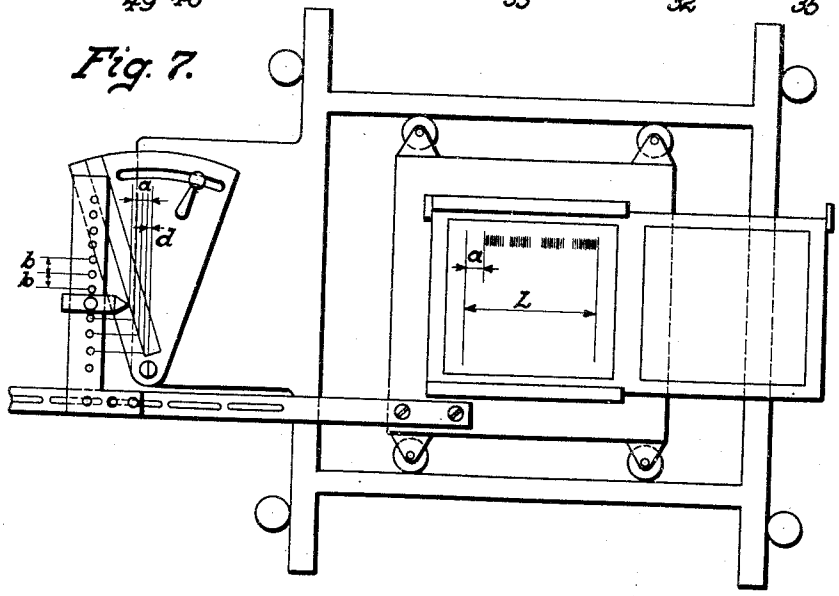


Fig. 7.



Inventor.
Lajos Wenczler
By
Atty.

Patented Nov. 9, 1937

2,098,928

UNITED STATES PATENT OFFICE

2,098,928

JUSTIFICATION OF LINES OF TYPE MATTER IN PHOTOTYPE COMPOSING

Lajos Wenczler, Augsburg, Germany, assignor to Uhertype Aktiengesellschaft, Glarus, Switzerland, a corporation of Switzerland

Application May 27, 1935, Serial No. 23,597
In Great Britain May 28, 1934

8 Claims. (Cl. 95—4.5)

My invention relates to type composition by photography and more particularly to the justification of lines of type matter.

It is a well known fact that one of the most difficult problems in photo-type composing is the justification of the line, i. e., the adjusting of all lines to the same length, which is effected by evenly widening or reducing the spaces between the words in each line, until the words and spaces in the line together reach the required total length.

In type-setting machines the individual loose matrices of the characters are set up side by side by the aid of a key-board, the words being spaced by the insertion of spacing members having variable widths, such as wedges by means of which the initial minimum word spaces can be evenly widened, or springs by the aid of which the initial maximum word spaces can be evenly reduced.

In hand composing the individual types are placed side by side by hand and the line, which is set somewhat shorter, is then justified by hand, by filling up the word intervals with evenly distributed insertions, until the line has the required length.

In the majority of photo-type composing machines, justification has to be carried out in two stages, only the widths of the letters set up being added up in the first stage which enables the setting up of the line to be terminated before the prescribed length of line has been attained, the remainder of the available length of line being divided up according to the number of word spaces, whereby the amount by which the word spaces originally provided are to be widened in order to make the line the prescribed length, can be ascertained, e. g., by the reading off in figures of the line remainder or the quotient resulting from dividing the line remainder by the number of word spaces. The line remainder can be set up and apportioned by the operator somewhere in the machine, or the measurement and division can be effected purely geometrically by means of suitable mechanism which automatically adds the apportioned part of the line remainder to each word space. In photo-type composing it is necessary to adopt this expedient because a line of type matter set up photographically on paper or on a film diapositive would first have to be broken at every word space, in order to enable the words to be moved apart from each other at all.

For the justification of unjustified photographically composed lines on paper and films it has been proposed first to divide the line into separate words, to attach the parts of the line to an elastic band, and then to stretch the latter. Another proposal is to reproduce the line through a special lens in such a way that the type matter can be enlarged, but only in the longitudinal direction.

The present invention has for its object to enable lines of non-justified type matter to be justified during reproduction in such a manner that it is unnecessary to subdivide or otherwise damage the paper or film serving as a pattern or to resort to methods producing optical distortion.

With this object in view the present invention consists in composing type matter photographically with the lines justified, or with the letters of one or more words spaced to fill a line, by photographing non-justified lines of type matter word by word or letter by letter, the remainder or line deficiency being apportioned to the individual word spaces or letter spaces and the sensitized carrier or the carrier for the non-justified lines of type matter being given a displacement corresponding to the apportioned line remainder or deficiency.

The images of the words or letters to be reproduced are located on the sensitized carrier in proper spaced relationship by means of a dividing device by means of which the line remainder, or deficiency can be measured and apportioned, the said dividing device preferably comprising a diagonal scale and a cooperating index member. The dividing device may be an optical one, comprising a diagonal scale provided on the supporting means for the sensitized carrier and a sighting device co-operating therewith and adjustably mounted on a fixed part of the machine: or the diagonal scale may be replaced by an adjustable angular increment or decrement apportioning device and co-operating with a stop on the supporting means for the sensitized carrier, or vice versa.

The invention also consists in the apparatus hereinafter described for carrying out the method.

The invention is illustrated by way of example in the accompanying drawings in which

Fig. 1 shows in perspective a reproduction camera with a dark slide and a ground-glass screen assembled in a displaceable frame;

Fig. 2 is a similar view as Fig. 1 showing the parts in a different position.

Fig. 3 shows a detail on an enlarged scale.

Fig. 4 shows a detail of a modified arrangement also in perspective;

Fig. 5 shows a further modification in elevation;

Fig. 6 is a top plan view of the arrangement shown in Fig. 5;

Fig. 7 is an elevational view of the arrangement shown in Fig. 5 showing the parts in another position;

Figs. 8 and 9 show another modification, Fig. 8 being a section along line 8—8 in Fig. 9.

Fig. 10 is a top plan view of the modification shown in Fig. 8;

Figs. 11 and 12 show details thereof.

In the drawings, 1 is a source of light, and 2 a holding frame of a film negative 3 bearing the nonjustified line, the line having been so composed that it is at a distance x from the edge of the film and the beginning of the line is at a distance v from the lateral edge of the film. 4 and 5 are slides, by the horizontal displacement of which the film can be shielded entirely or partially from the rays of the light. 6 is a projection objective and 7 a double frame, having on one side a ground-glass screen 7a, and on the other side a dark slide 7b. The film in the dark slide is of course covered at the front by a shutter, which can be slid in and out at will from the outside.

The frame 7 can occupy only two different positions on its support 11, on which it is arranged in such a way as to be horizontally displaceable. In one of these two positions a locating pin 8 engages a hole 9 in the frame shown in Fig. 2, while in the other position the same pin engages a notch 10, thereby securing the frame against movement. In the first case the ground glass and in the second case the dark slide is in front of the objective.

In the embodiment shown in Figs. 1 and 2 the support 11 is slidably mounted on guide rollers 11a on a supporting frame 12, so as to be horizontally adjustable for line spacing. The supporting frame 12 is in its turn vertically displaceable between rollers 12a.

An angular member 20 is displaceable horizontally over the ground glass into any position on the frame 7 and can be fixed in such a position by suitable means not shown in the drawings. The vertical portion of this angular member is made in such a way as to provide a guide for slides 13 and 15, which are vertically displaceable along its left-hand and right-hand edges respectively.

The slides engage round the edges of the vertical portion of the member 20 elastically in a similar manner as the cursor of a slide rule, so that they can easily be displaced, and, after displacement, remain in their adjusted position without being further secured. On the left-hand slide 13 there is a transparent plate 14 (Fig. 3), of celluloid for instance. A series of radiating lines is engraved on said plate 14 in such a way that a horizontal transverse line, for instance the top edge of the celluloid plate, is divided into sections of equal size at the intersections thereof with the radiating lines, these lines being numbered consecutively, the vertical line being marked zero.

The right-hand slide 15 is provided with a small and very thin celluloid plate 16, upon which is engraved only a single long horizontal line and a single shorter vertical line. This small celluloid plate 16 can be horizontally displaced on its slide 15, and is thin enough to enable the plate 14 to be easily moved over it.

The working procedure is as follows:

The first line negative is placed into the frame 2 (Fig. 1). This frame can be arranged in the machine only in one position. The distances x and y being the same in each film negative, the objective lens 6, when fixed, will always project the image of the line in the plane of the ground glass in such a way that the base line on which the lines are placed, and the beginning of the lines, will always be the same with respect to the immovable optical axis of the objective and with respect to the intersecting point thereof with the plane of the ground glass.

By means of the support 11 and the supporting frame 12 the ground glass screen 7a is then adjusted horizontally and vertically respectively, the frame 7 being in the position shown in Fig. 1, in which the first line appears on the ground glass at the correct desired height while the beginning of the line appears in the correct lateral position, as indicated by the vertical graduated line M marked on the ground glass screen. An adjustable stop pin 17, provided on the support 11 is so adjusted as to bear against the supporting frame 12. By this means the frame 7 can be automatically returned to the position in which the beginning of the line of any desired line film 3 occupies the correct lateral position relation to line M.

Thereupon the angular member 20 is adjusted on the ground glass in such a way that the distance of the vertical zero-line engraved upon the celluloid plate 14 from the beginning M of the line of type matter, represents the desired length L of the line. Now the slide 15 is displaced in the vertical direction until the horizontal line on the celluloid plate 16 coincides with the base of the line of type matter.

Thereafter the celluloid plate 16 is moved in the horizontal direction until the vertical line on this celluloid plate intersects the extreme right-hand point of the last letter as shown in Fig. 3. In this way the end of the type line is marked by the intersecting point of the horizontal and vertical lines. Now the number of word spaces is counted (in the instance shown there are four) and the slide 13 is pushed over the celluloid plate 16 in the vertical direction until the radiating line marked 4 on plate 14 crosses the intersecting point of the horizontal and vertical lines on the celluloid plate 16. Through this movement the line remainder is subdivided into four equal portions. This position of the two plates 14 and 16 relative to one another is to be seen in Fig. 3. The frame 7 is then moved to a position in which the dark slide advances into the axis of the objective, in which position the pin 8 engages the hole 10. The shutter 18 of the objective, which has been open until now, is closed, and the sliding shutter of the dark slide is pulled out laterally. The ground glass screen 7a is now opposite the sighting device 19, which can be displaced horizontally in a guide mounted on the immovable frame of the machine. The sighting device 19 is now adjusted in such a way that the plane traversing the two vertical sighting slits 19a of the sighting device 19, passes through the point $v4$ of Fig. 3.

The negative is now masked by the slides 4 and 5 in such a way that only the first word is illuminated, which word therefore is exposed when the shutter 18 is opened.

After the exposure of the first word, the entire frame 11 is moved to the left until the sighting plane of the sighting device 19 passes through the point $v3$ (Fig. 3). The negative 3 with the ex-

ception of the second word is then masked by the slides 4 and 5 and the second word is exposed. The same procedure is repeated, the frame 11 being again displaced until the sighting plane 10a passes through the point *v2* corresponding to the third word, the point *v1* corresponding to the fourth word, and the zero mark corresponding to the last word. By this procedure the words are spaced the required distance apart thereby justifying the line during reproduction. After the first line has thus been finished, the second type line can be placed in the frame 2. The frame 11 is drawn back into its initial position, in which the stop pin 17 again bears against the support 12. The dark slide is closed, and the frame 7 is again moved to the position shown in Fig. 1. The shutter 13 is opened again, while the slides 4 and 5 are completely pulled out. When thus the second line appears upon the ground glass, the support 12 is adjusted in the vertical direction a distance corresponding to the desired line spacing, whereupon the slides 13 and 15 are arranged for setting up the new type line.

In the embodiment shown in Fig. 4, the dividing device is arranged on the other side of the apparatus and is provided on the carrier frame 21 for the pattern-line negative, which is slidable up to a stop 25 to adjust the negative 22 to the beginning of the line. Besides the two slides 23 and 24, provided for masking the line, a slide member 26 is provided which is adjustable laterally, and by the aid of which the type line in question can be, so to speak, measured. If the stop 25 is adjusted to give the desired length of line, a vertical line on a celluloid plate 28 fastened to the left-hand end of the slide member 26 stands just on the zero line of a celluloid plate 27 on a rule 29. In order to ensure this, the rule 29 can be horizontally displaced and fixed in position.

In this case the pattern support 21 is displaced to apply the apportioned line remainder similar to the displacement of the support 12 in Fig. 2.

In order to avoid the necessity of removal of the pattern frame 21 (corresponding to the frame 2 of Figure 1) after each type line, a single frame can be provided having a spool at each side for the reception of a roll of film, the individual lines being set up in succession with adequate intervals between them. In this case there is no need to take out the frame 21 after each line has been set up, but only to wind the film, for each new line, from one spool to the other by the length of one line. In adjusting every new line it is necessary to strictly maintain the distance *y* (Fig. 1), by the aid of an indicator attached to the frame.

The slide member 26 is adjusted in such a way that its right-hand end just touches the last letter, whereupon it is fixed by means of a clamp not shown relative to the slide 21. The celluloid plate 27 is vertically adjusted on the rule 29 so that the radial line corresponding to the number of word spaces passes through the intersecting point of the horizontal and vertical lines on the plate 28, which in this case need not be transparent. The first word is then exposed, and after this operation the pattern support 21 is moved to the left until the intersecting point of the horizontal and vertical lines on the plate 28, travelling along with the support, meets the next radial line. As the last word is being exposed, the intersecting point meets again the vertical zero line on the plate 27. In this case, the justification is effected on the pattern side. The sensitive film, after each exposed line of type matter, must be vertically adjusted to insure the line spacing.

The apparatus shown in Figs. 5, 6 and 7 enables the invention to be carried out with the minimum use of the human eye. The ground glass 30 and the dark slide 31 are again united in one frame 32. This frame 32 can be moved in a support 33 from the end position shown, in which the ground glass 30 is in front of the lens, into the opposite end position, in which the dark slide 31 is before the lens. The frame 32 is arrested in these extreme positions by stops 34 and 35. The support 33 is horizontally movable in a frame 36, which in turn is vertically displaceable. A plate 37, which projects from the frame 36 at the left-hand side thereof, has a stud 38 fixed thereon which serves for rotatably supporting a sector-shaped plate 39. On this plate 39 a rail 40 is arranged so that its operative left-hand edge is in line with the centre of the stud 38. That portion of the stud 38 projecting beyond the plate 39 is semi-cylindrical, the left-hand half of the stud having been removed. The sector-shaped plate 39 can be moved into an inclined position between the limits determined by a slot 41 therein and the clamping screw 42 passing through said slot, by means of which the plate can be fixed in position.

A horizontal rail 43 is fixed to the support 33, and on this rail an angle piece 44 can be attached to any desired part thereof by means of screws 45 and longitudinal slots 46. The spacing of the screws 45 and slots 46 is such as to enable the part 44 to be screwed to the rail 43 in any position by means of at least two screws.

The vertical portion of the part 44 is provided with a row of equidistant holes 47, into any one of which holes a fixing pin 49 can be inserted to arrest the sliding stop 48 in different positions. A prism-shaped stop 50 is provided on the sliding stop 48. The first hole in the vertical portion of part 44 is so located that if the sliding stop 48 were to be arrested when the pin 49 is in said hole, the apex of the prismatic stop member 50 would be on a level with the centre of the stud 38.

The mode of procedure is as follows:

The part 44 is first removed. The first line negative is set up in the pattern window in a manner similar to that shown in Fig. 1. The support 33 is then laterally so adjusted that the beginning of the line image touches the left-hand vertical marginal line 51 of the column, which is marked on the ground glass. Now the angle piece 44 is screwed to the rail 43 so that the sliding stop 48 is in the zero position, with its stop 50 touching the stud 38. The right-hand line of the column is indicated by 52 in Fig. 5. It will be seen that the non-justified line is shorter than the desired length of line L by the distance *a*. The support 33 is therefore moved to the left until the end of the line touches the right-hand line 52 of the column. The part 44 is thereby moved to the right through the same distance. The number of word intervals, e. g. four, is counted. Then the sliding stop 48 is raised and set with the pin 49 in the fourth hole further up. Now the sector-shaped plate 39 is swung to the left until the rail 40 touches the stop 50. In this position plate 39 is fixed by the aid of the clamp 42. This stage is shown in Fig. 7. The line in the pattern support is now masked, excepting the last word,

and the dark slide 31 is moved into the place of the ground glass, whereupon the last word is exposed. The sliding stop 48 is lowered by one hole, and the whole support 35 is moved to the right, until the point of stop 50 touches the rail 40 again. It will be seen from the preceding description and from Fig. 7 that the support 33, together with the dark slide, has now been moved to the right by one quarter of the remainder *a* of the line; and the last word but one is exposed. The stop 48 is again lowered by one hole position, the support 33 is displaced to the right until stop 50 bears against the rail 40, and the last word but two is exposed. The procedure in exposing the last word is the same.

The arrangements according to Figures 1, 2 and 5 to 7 have the disadvantage that the frame in which the ground-glass screen and the dark slide are arranged has to be displaced, according as the ground-glass screen or the dark slide is to be brought into the axis of the objective lens. In the arrangement according to Figure 4 the lamp has to be displaced, since otherwise it disturbs the compositor in his work. Now in Figures 8–11 a further embodiment is shown, in which both these disadvantages are obviated. In this case a ground-glass screen is likewise provided, by the aid of which the compositor can effect the requisite adjustments. This ground-glass screen, however, is permanently fixed outside the optical axis of the lens, and the image of the line to be photographed is transmitted to it by the aid of two mirrors, placed at an angle to one another, and a lens.

An unjustified column film 53 lies upon a plate 54, which contains a window 55 (Fig. 10). The film 53 is fed forward by means of a film-feeding mechanism 56. The central plane of the optical system passes through the window 55. The rays of a lamp 57 illuminate the film 53 and pass through the aperture 55 and through a second aperture (not shown) located thereunder in the lid or top of a box 58, into the interior of the said box. They throw an image on to a sensitized film 53*a* in a dark slide 59, which can be fed forward by means of a feed screw 60 and a feed mechanism 61. An image of the line is also transmitted by the aid of a mirror 62, a lens 63 and a mirror 64 to an observation hole or window 65, behind which the compositor is seated. In this observation window likewise a ground-glass screen is preferably arranged. The compositor can now observe the particular line image adjusted upon this ground-glass screen and can effect the requisite subdivisions. He can mask the pattern-line by the aid of rod mechanisms 67 and 68 (Fig. 10).

The frame 54 admits of being shifted perpendicularly to the direction of the line in guiding rails 69 and in the direction of the line by the aid of transverse rails 70. The justifying appliance corresponds essentially to the arrangement illustrated in Figures 5 to 7, only what is provided here is not a slider shifted along a rail provided with equally spaced holes, but a lever 71, equipped with a roller 72 and corresponding to the sliding stop 48 of Figure 5, this lever being here fixedly mounted upon the pattern frame 69, and consequently only being displaceable in the direction of the line along with this frame. Upon the casing 58 is furthermore arranged a rail guide 74, and likewise a row of equally spaced holes 73 at right angles to the line direction. Now along the vertical guide 74 there can be displaced a slide 77, provided with a pin 78, which can be inserted, according to its position, in one of the holes 73. In a bore in the slide 77 there engages a pin 79, forming a pivot for a body 80, which is provided with a rail guide 81, which can slide relatively to the roller 72. Now the slide 77, with the pin 78, is moved as many hole spaces away from the uppermost hole of the row 73 as there are spaces between words in the line. The pivot 79 of the slide 80 is thereby also moved the same distance from the roller 72. If the pattern frame 69, and with it the roller 72, are now displaced in the line direction by the length of the line residue, the body 80, with the rail guide 81, passes into the inclined position shown in Fig. 11. The individual words are now exposed separately in succession, as described above, the line portions not to be photographed on each occasion being masked, and after the photographing of each word the pattern frame 69, together with the roller 72, is displaced to the left which is accomplished as follows: the slide 77, after the pin 78 has been pulled out of the corresponding hole 73, is displaced one hole space upwards. The frame 69 has accordingly been displaced through a corresponding fraction of the line residue, so that the second word can now be exposed.

It will thus be seen that not only can short lines be extended but also lines which have been composed too long can be shortened. Further it is obvious that by the same method the characters in a word can be evenly spaced to extend the length of the whole line.

I claim:

1. In photographic type-composing, the method of justifying the non-justified lines of type-matter to be photographically reproduced, which comprises separately exposing each individual element or part of the pattern line in a reproduction camera while at the same time masking all the other parts of said line, and advancing between each two successive exposures the carrier of the sensitized layer a distance corresponding to the amount by which the spacing between consecutive type-matter must be varied so as to obtain the required length of line.

2. In photographic type composing apparatus a device for photographically justifying the non-justified lines of type-matter, comprising in combination with a holding frame for the negative of the line to be reproduced, a source of light therefor and an objective lens, a member adapted to be shifted relatively to the line and the optical axis both horizontally and vertically so as to adjust the beginning and the base of the line of type-matter relatively to a marking, a means operatively connected with said member for measuring and sub-dividing the line remainder so as to enable said member to be shifted in the direction of the line after the exposure of each part thereof a distance required for the attainment of the prescribed length of line, and means for masking parts of the line.

3. The combination as specified in claim 2, in which said means for measuring and subdividing the line remainder comprises two transparent plates bearing geometrical lines and markings adapted to cooperate with each other for measuring and subdividing the line remainder, and movable slides carrying said plates.

4. The combination as specified in claim 2, including a support for said member and said measuring and sub-dividing means adapted to be displaced horizontally in the direction of the line of type-matter and a supporting frame for said

support adapted to be displaced vertically relatively to the line of type-matter, and a dark slide carried by said support containing the sensitized plate or film.

5. The combination as specified in claim 2, including a support for said member and said measuring and sub-dividing means adapted to be displaced horizontally in the direction of the line of type-matter, a supporting frame for said support displaceable vertically relatively to the line of type-matter, a dark slide carried by said support containing the sensitized plate or film, an adjustable stop for said support for fixing its position relatively to the line of type-matter, and a sighting device provided to cooperate with said dark slide.

6. The combination as specified in claim 2, in which said member comprises a frame, a translucent glass and a dark slide for the sensitized plate or film carried by said frame, a horizontally movable support for said frame, and a vertically displaceable supporting frame for said support, and in which said measuring and subdividing means comprises a rail disposed at an angle relatively to the direction of the line of type-matter and having equal graduations, a movable pin adapted to be shifted along said rail, and a rocking member, said pin and said rocking member being arranged to be moved away from each other, on the one hand, along said rail by a number of graduations corresponding to the spaces between the individual portions of type matter on said line of type-matter and, on the other hand, in the direction of the line of type-matter by the length of the line remainder, said rocking member, for the purpose of sub-dividing the line remainder, being positioned obliquely to said rail, the distance between said movable pin and the pivot of said rocking member being diminished in steps by one graduation between each two exposures.

7. The combination as specified in claim 2, in which said member comprises a frame, a translucent glass and a dark slide for the sensitized plate or film carried by said frame, a horizontally movable support for said frame, and a vertically displaceable supporting frame for said support, and in which said measuring and subdividing means comprises a rail disposed at an angle relatively to the direction of the line of type-matter and having equal graduations, a movable pin adapted to be shifted along said rail, and a rocking member, said pin and said rocking member being arranged to be moved away from each other, on the one hand, along said rail by a number of graduations corresponding to the spaces between the individual portions of type matter on said line of type-matter and, on the other hand, in the direction of the line of type-matter by the length of the line remainder, said rocking member, for the purpose of sub-dividing the line remainder, being positioned obliquely to said rail, the distance between said movable pin and the pivot of said rocking member being diminished in steps by one graduation between each two exposures, and stops on said support for arresting the same in its end positions.

8. The method as specified in claim 1, including the step of reflecting the negative of the line of type-matter to be photographically reproduced laterally outside of the optical axis with the aid of mirrors disposed at an angle relatively to each other onto a translucent screen.

LAJOS WENCZLER.