May 26, 1936. S. I. S. FRIEDMAN ET AL 2,042,041

COMPOSING AND REPRODUCING DEVICE

Filed March 9, 1935 4 Sheets-Sheet 1

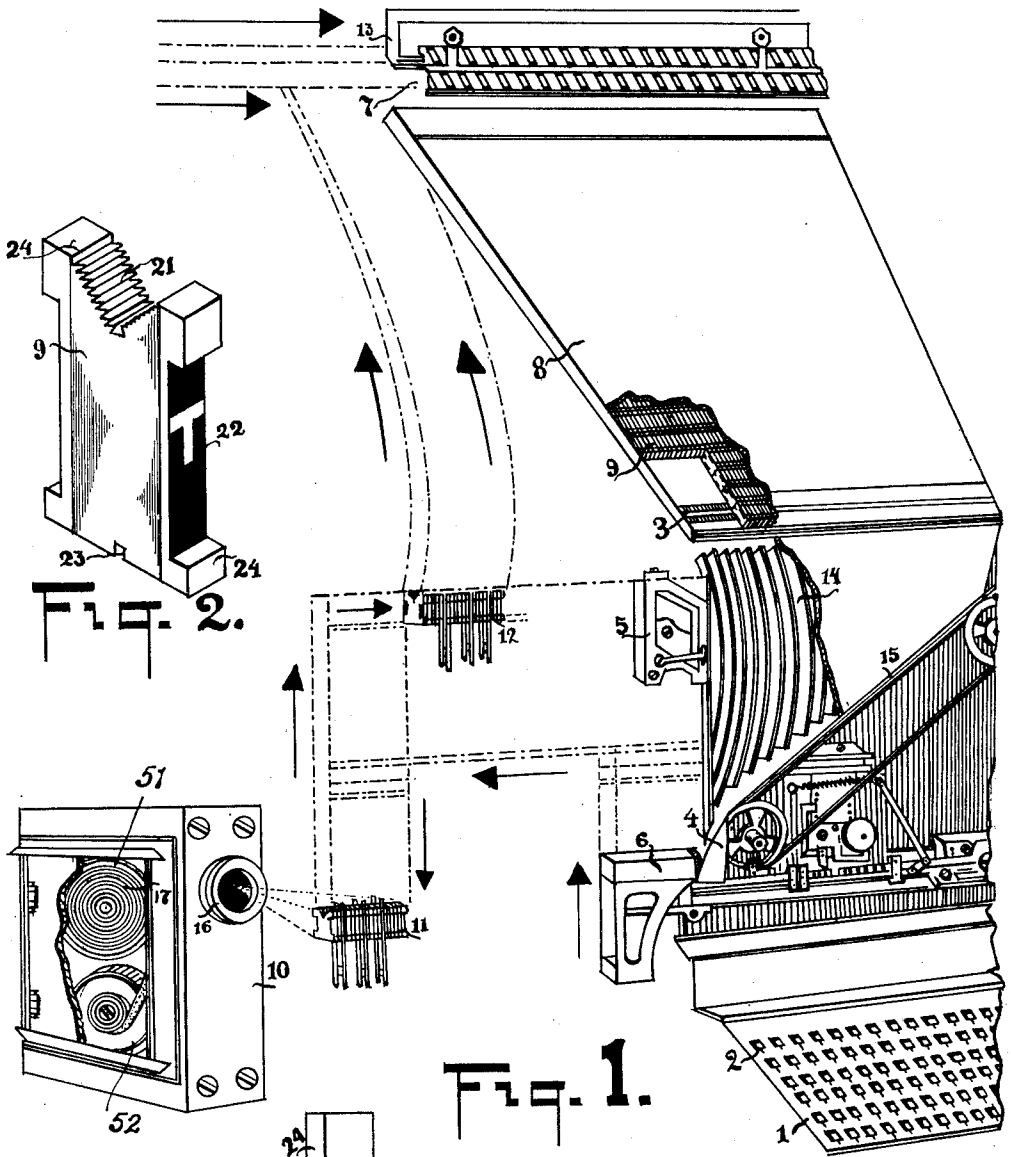


Fig. 1.

Fig. 2.

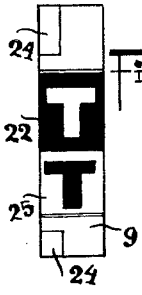


Fig. 3.

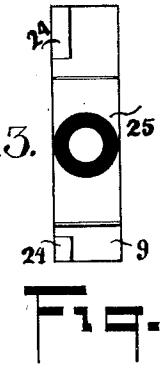


Fig. 4.

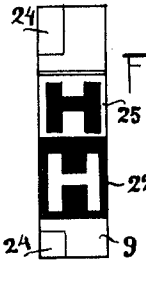


Fig. 5.

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COMPOSING AND REPRODUCING DEVICE

Filed March 9, 1935 4 Sheets-Sheet 2

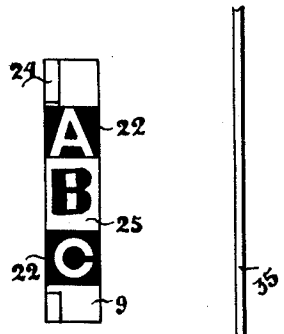


Fig. 6.

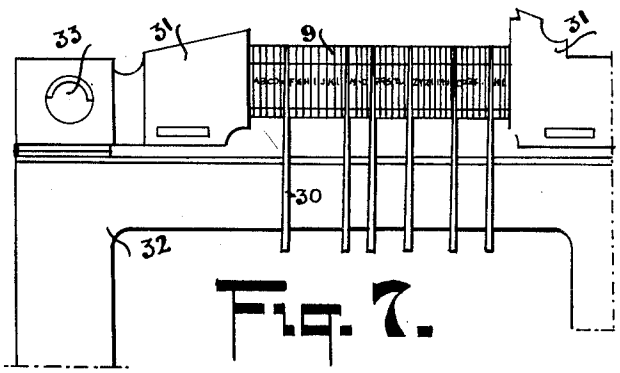


Fig. 7.

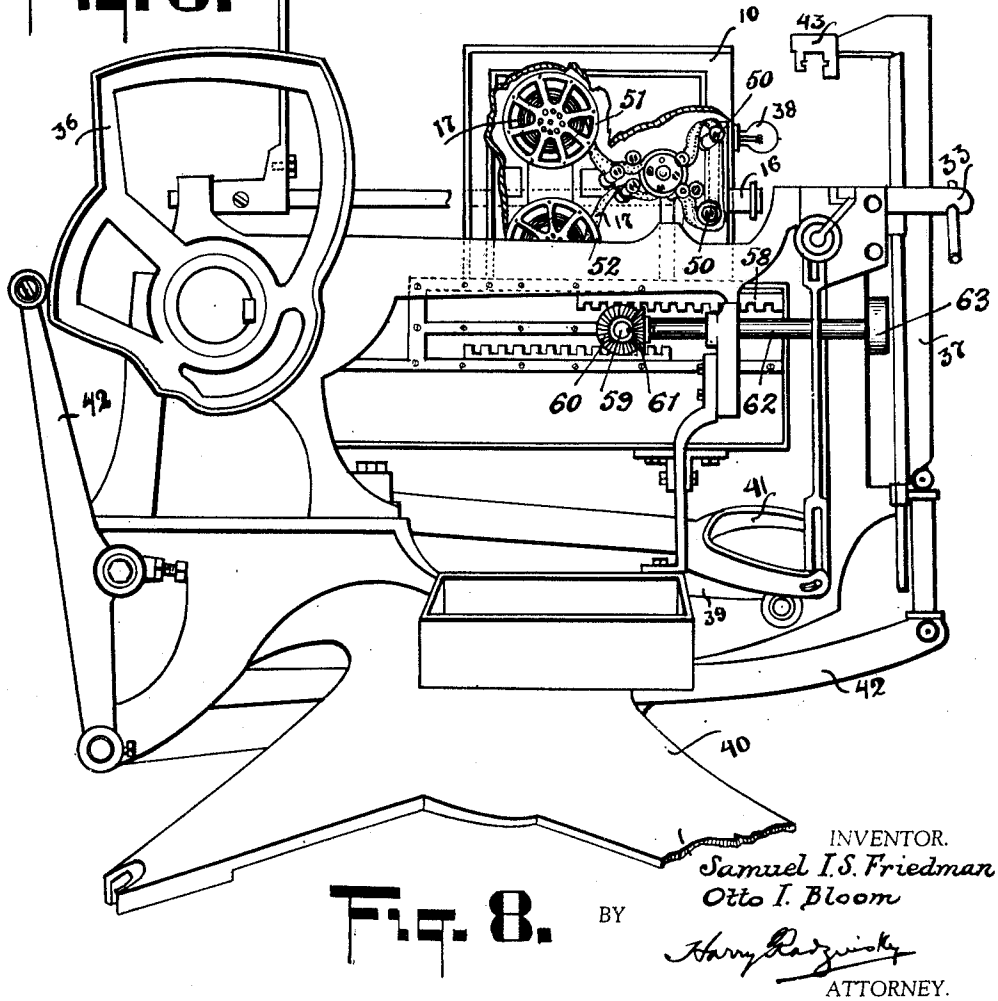


Fig. 8.

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COMPOSING AND REPRODUCING DEVICE

Filed March 9, 1935 4 Sheets-Sheet 3

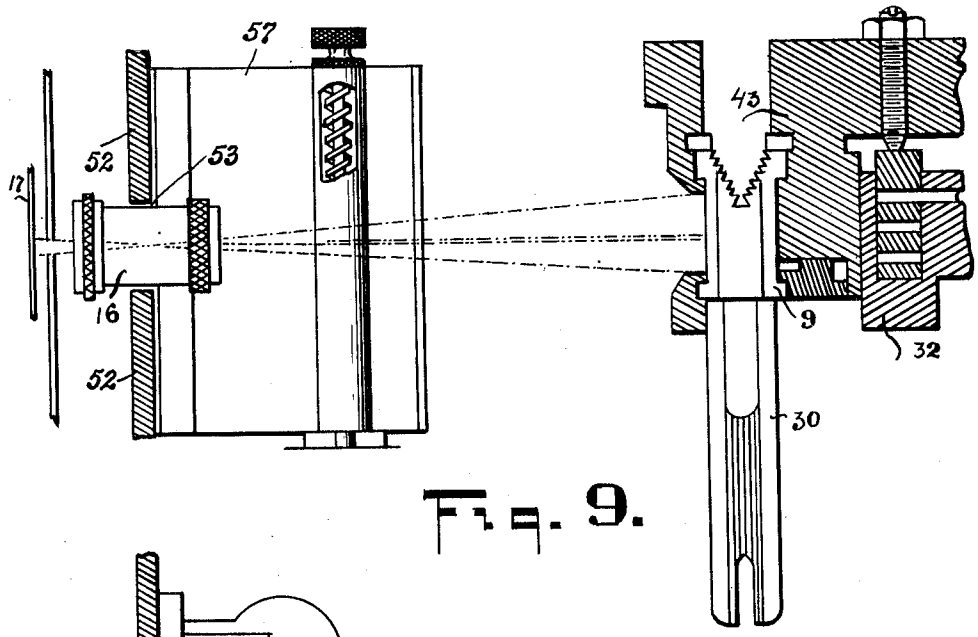


FIG. 9.

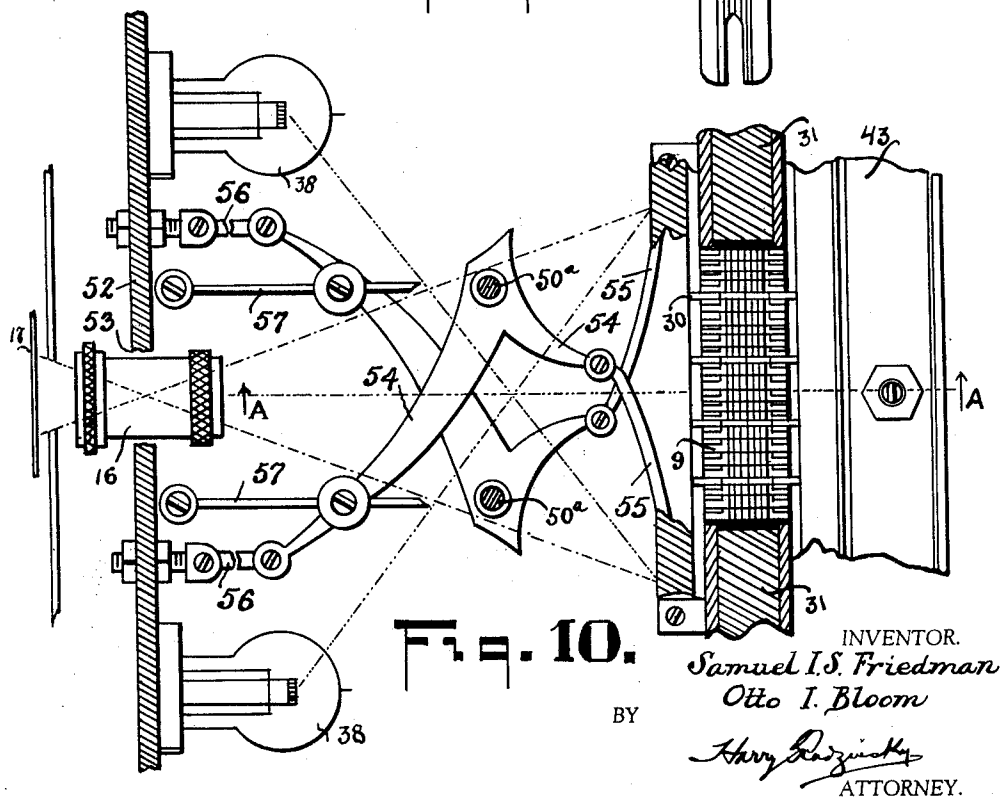


FIG. 10.

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COMPOSING AND REPRODUCING DEVICE

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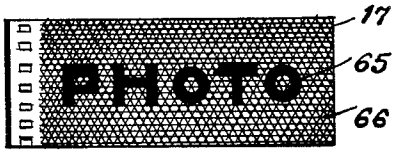


Fig. 11.

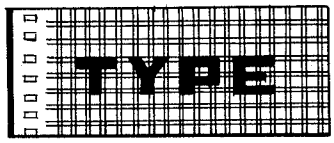


Fig. 12.

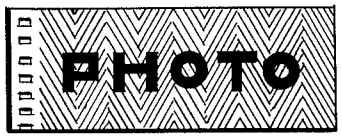


Fig. 13.

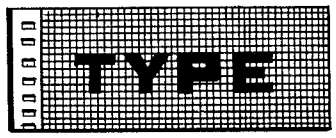


Fig. 14.

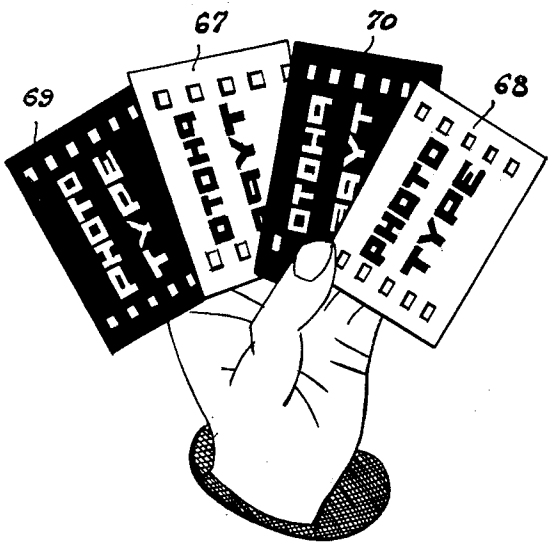


Fig. 15.

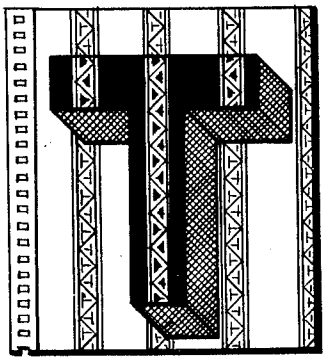


Fig. 16.

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Patented May 26, 1936 2,042,041

UNITED STATES PATENT OFFICE

2,042,041

COMPOSING AND REPRODUCING DEVICE

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New York, N. Y.

Application March 9, 1935, Serial No. 10,183

6 Claims. (Cl. 95—4.5)

Our invention relates to an improvement in the art of printing, particularly that branch of the art known as lithography.

Prior to this invention, offset lithography has suffered from one great disadvantage. Offset printing is done by means of metal cylinders which transfer a design onto a rubber cylinder from which the design is printed. There are four major methods of transferring the design on the plates, which are, first, by tracing the subject through carbon paper directly upon the plate; second, by drawing or writing the required material directly upon the plate by means of pen and ink, brush, crayon, or pencil; third, by typewriting directly upon the plate through a special ribbon; and fourth, by transferring the material previously prepared on a photographic film, directly onto the plate. The first three methods are limited in their use to particular and special subject matter and cannot, of course, be used to reproduce "straight" material, such as the continuous reading matter of a book, newspaper, or similar publication requiring the wide variety of type, justification and even spacing of lines required in commercial printing. The fourth method, the photographic film transfer, is the method most often used;—but in this method resides the weakness and handicap of the lithographic process. For, in order to be able to photograph straight type matter with lines properly justified and spaced and with the variety of sizes and styles of type required, it is necessary to have a "first" or printed copy from which to make a photograph. In other words before the process of offset lithography can be used, it is necessary first, to set up the reading matter in type, second, to print a proof from this type, and third to photograph this proof for transfer to the lithographic plate by the several means used in the commercial practice of photo-lithography. In this manner we are faced, at least in the beginning, with all the disadvantages inherent in the letter-press process of printing.

The problem of obtaining an immediate photographic reproduction of type elements set up in words, justified lines and columns or pages on a photographic film for direct use in photo-lithography without the need of an intermediate proof from cast metal type, is the problem which has been solved by our invention. Not only does our invention enable an operator to set up lines and columns for immediate transfer to lithographic plates, but it also enables him to accomplish this purpose with a speed hitherto impossible; it enables him to vary the size of type at will and to any degree in use by the simple manipulation of our apparatus; it enables him to obtain varying letter designs and backgrounds by means of interposition of special screenings; it enables him to reproduce type matter on photographic film, paper or any other photographically sensitized material previously prepared, and finally, it enables him to give to the art of printing flexibilities and advantages such as will later be set forth and arising either directly or springing inherently from the invention.

More particularly, the invention comprises a type-composing machine which delivers photographically reproducible characters in properly justified lines, and a means which photographically reproduces these justified lines of characters so delivered.

In the accompanying drawings, wherein an embodiment of the invention is shown, Fig. 1 is a diagrammatic view of the invention; Fig. 2 is a perspective view of one of the matrices; Figs. 3 to 6 inclusive show several forms of matrices which can be used in the machine; Fig. 7 is a front view of a line of justified characters ready for photographic reproduction; Fig. 8 is a side elevation of a line composing machine to which the invention has been applied; Fig. 9 is a sectional view on the line A—A of Fig. 10, looking in the direction of the arrows; Fig. 10 is a plan view, with parts in section of the means for adjusting the width of the lines of characters when moving the camera closer to or farther away from the characters; Figs. 11 to 14 inclusive show sections of photographic film or other sensitized material upon which various effects have been obtained; Fig. 15 shows four different effects obtainable by photographic treatment of the negative and with the use of a single set of matrices; and Fig. 16 shows a novel effect obtained by special matrices and photographic printing methods.

In the drawings, and particularly in Figs. 1 and 8, is shown a line-composing machine, which is, as far as its composing mechanism is concerned, of conventional construction. Said machine is provided with the keyboard 1 composed of the usual finger keys 2, which when selectively pressed cause the escapement 3 to operate and direct one or the other of the matrices 9 to descend through the slides 14 to the delivery belt 15 to be carried thereby to the assembler 4 for reception in the assembling elevator 6 together with space bands delivered by the space-band box 5. Elevator 6, moving in the direction of the arrows in Fig. 1 delivers the line of matrices 9 with space bands 30 inserted at the proper

points therein to the position shown at 11 where the line of matrices is received and held by the vise jaws 31 on vise frame 32, the vise jaws being closed and the line automatically justified by movement of the lever 41, as is well understood. When the line of matrices 9 and properly located space bars 30 are held in the jaws 31, the line of characters so held are in the position which they normally occupy when, in the ordinary line casting machine, the casting of the line of type takes place. It is at this point that the justified line is photographically reproduced upon a continuous ribbon or strip of film 17, or other photographically sensitized medium. To enable this to be satisfactorily done, the matrices 9 are of special design, the same being provided on their exposed face with characters in black and white, or in other tints, which photographically reproduce on the film or other sensitized medium 17. The matrices are provided with different characters and different arrangements as shown in Figs. 2, 3, 4, 5 and 6. Fig. 2 shows a matrice bearing one character, the letter T. Fig. 3 shows a matrice bearing two characters as indicated at 22 and 25, the character shown at 22 consisting of the letter T in white on a black background, and the character shown at 25 consisting of the same letter in black with a white background. The matrix shown in Fig. 4 shows the character provided as at 25 in Fig. 3, that is, a black letter on a white background. In Fig. 5, the positions of the characters are reversed from those in Fig. 3. In Fig. 6, the matrix bears three different characters. Regardless of the arrangement of the characters on the matrices, it will be understood that in each case the characters provided are photographically reproducible on a film or other sensitized medium which provides a first "copy" from which a zinc, metal, or other plate can be made for use in printing. The matrices 9 used in our invention bear upon their operative faces elements or type characters which are photographically reproducible, as distinguished from the conventional matrices of line or type casting machines which bear intaglio elements. In contour, however, they are similar to matrices ordinarily used in line-composing machines. That is to say, each matrix is provided with the usual notched combination 21, logs 24, and font distinguisher 23.

After a line of characters has been photographically reproduced on the film 17, the matrices are elevated as shown by the arrows in Fig. 1, in the conventional manner by the co-operating elevator elements 36, 37, 42 and 43, as is clearly understood by those familiar with composing machines, to a point where they are received in the second elevator 12 and moved upwardly to the distributor 7 and received on the distributor bar and restored to the magazine 8 in the conventional way.

The means for photographically reproducing the lines of matrices as fast as they are composed comprises a camera 10 properly positioned relative to the line of matrices, when such line is held in the vise jaws 31, to photograph the characters on the line of matrices across the film. The exact position in the machine of the matrices and of the camera at the time the matrices are photographed is not essential to all phases of the invention but inasmuch as the line of matrices are preferably photographed at about the position they would normally occupy while being cast in the ordinary casting machine it may be convenient to remove the casting box and substitute for it the camera. The camera thus is preferably stationed at normal casting box position in such a way that it is capable of being moved toward and away from the matrices as hereinafter described. The film 17 is fed with an intermittent movement by feed rollers diagrammatically illustrated at 50 in Fig. 8, the film being supplied from a feed reel 51 and wound up on the pick-up reel 52. The camera is provided with a lens or objective 16 in the conventional way. As the construction of this type of camera is well known in motion picture work, its specific construction is not described here in detail. Suffice it to say that the camera operates intermittently and has its shutter synchronized with the operation of the line-composing machine so that as fast as a line of type is set up in the jaws 31 in the position indicated at 11, the camera will be automatically operated to photograph the automatically justified line, so that a very high speed reproduction of successive lines of characters will appear on the film as fast as they can possibly be set into position by the operator. As a result of this, we obtain, in one continuous operation, from a single set of matrices, photographically reproduced justified lines of type characters of various sizes made up in pages or columns on a single continuous length of sensitized material, the number of lines of which may be so set and reproduced being limited only by the length of the sensitized surface, and the speed with which they may be set being limited only by human skill.

In Figs. 9 and 10 is diagrammatically shown means by which larger or smaller characters may be produced on the film without requiring different sets of matrices. There is shown a support 52 provided with an aperture 53 through which the lens or objective 16 of camera 10 projects. Support 52 may be part of a frame on which the camera 10 is mounted so that the camera is movable with said frame. A lazy tong arrangement, consisting of pivoted levers 54 connects the support 52 with the vise jaws 31. The levers 54 are pivoted at 50a and connect said jaws 31 through lines 55 and 56 with the frame 52. It will be obvious that when the support 52 carrying the camera 10, is moved toward the line of matrices to show an enlarged representation of the characters on said matrices on the film 17, the jaws 31 will be moved closer together to decrease the width of the line of characters so that the line of characters will not extend beyond the side limits of the film. In other words, while the representation of the characters themselves will be larger on the film, the width of the line will be maintained constant. Similarly, when the support 52 carrying the camera is moved further away from the line of characters, the levers 54 and connected links 55 and 56 will act to spread the jaws 31 further apart to widen the line of characters, so that while the representation of the characters themselves will be smaller on the film, the width of the line will be maintained constant.

At 38 is shown a pair of lamps utilized for illuminating the line of characters in jaws 31 during their photographic reproduction on the film 17. Adjustable light shields 57 prevent the light cast by the lamps 38 from striking the lens 16. The support 52 carrying the camera 10 may be moved by any suitable mechanism to and from the line of characters and for this purpose is shown (Fig. 8) a rack 58, which engages a gear on shaft 59, which shaft carries a bevel

gear 60 engaging another bevel gear 61 on the shaft 62 provided on its outer end with a knurled member 63. It will be obvious that by rotation of the knurled member 63, the rack 58 can be moved back and forth to any required extent to properly position the camera relative to the line of characters held in jaws 31. Any suitable calibrated indicator can be used to guide the operator in determining the proper size of character obtained on the film when the camera is in any selected position.

It will be clear from the foregoing that it is possible to secure on a lengthy strip of film or other sensitized material 17 a very great number of justified lines of characters simulating a printed page. As is clearly shown in Figs. 11 to 16 inclusive, various effects well known in the photographic art can be secured by either the interposition of screens of various kinds between the objective 16 and the row of characters or by double photographing. For example, in Fig. 11 the characters 65 are secured on the film 17 by photographing a line of characters appearing on matrices held in jaws 31. A cross hatched background 66 is there shown which can be obtained in many ways, as for example, first photographing the background on the film, rewinding the film in the camera, and then photographing the line of characters 65. A similar effect can be obtained by interposing a screen between the objective 16 and the line of characters appearing on matrices 9 held in jaws 31.

In Fig. 16 is shown a combination of effects possible to be obtained by use of screens and by a novel arrangement of characters on the matrices. In Fig. 15, four types of reproduction possible by film manipulation are shown. In ordinary offset printing, reverse type transfers are often required, such as shown, for example, at 67. When type in this form is composed on an ordinary line casting machine, it requires a special set of backwardly arranged letters. By manipulation of the ordinary film in the manner common to those familiar with photographic work, it is easy to secure an impression such as shown at 67. At 68 is shown the conventional impression secured on negative film by photographing characters such as appear at 22 in Fig. 2. That is to say, the characters appearing on the matrices are white with black blackground, resulting in black letters on white background on the negative film. A positive print secured from negative 68 results in the reproduction indicated at 69 where the letters appear in white on a black background. A positive reproduction of the negative appearing at 67 results in the white letters on black background as shown at 70. These and numerous other arrangements are secured by well known photographic film manipulation common to the photographic arts, and it will be apparent to those skilled in the art that from the securement of a single photographic impression on the film 17 or other sensitized material, such subsequent photographic manipulation can result in the formation of many novel type arrangements of justified lines of type enabling the copy thus secured to be very effectively used in printing.

From the foregoing, the manner in which the apparatus is used will be clearly understood. The composing machine operator operates the keyboard in the conventional way, selecting the required matrices according to his copy, and the matrices are delivered by the assembling elevator 6 to the point indicated at 11 where the characters are held in a justified line with inserted space bars in clamps 31 directly in front of the camera 10 to be photographed thereby. The camera photographs this line, the matrices of which are thereafter returned to the magazine 8 in the conventional way. As fast as the justified line of characters appear before the camera, they are photographed. The film feed and shutter of the camera are arranged to properly space the lines of type as required, this being merely a matter of camera design and regulation. The resultant film provides a continuous series of justified type lines representing in every way a printed page. This film representation being once secured, may be easily transferred to any other surface for reproduction. The film may be treated or handled in many ways to produce many novel effects as will be well understood by those familiar with the photographic arts. The characters on the matrices may be arranged in many ways and several characters may appear on one matrix, as clearly shown in the drawings. With this arrangement, the composing of type is very speedy and its reproduction on the film is likewise performed with great speed so that the reproduction of printed pages is performed expeditiously and at a minimum of expense.

While it is herein stated that the film reproduction is especially well suited for making "first copy" for lithograph printing, it will be understood that such film reproduction is suitable also for many other uses, as for example, moving picture film titles and text, animated or moving signs or advertising and the like.

What we claim is:

1. In an apparatus of the character described, a photographic camera stationed at normal casting box position in a line composing machine and replacing the usual casting box used thereat, a line composing machine including a set of opaque matrices bearing characters photographically reproducible as printed type impressions by said camera, said machine having means for delivering successive composed and justified lines of said matrices to the position which they would normally occupy in the conventional line composing and casting machine when being cast so that said lines may be successively photographed by the camera, said camera being provided with means for feeding a continuous strip of photographically sensitized material and having means for successively photographing the composed and justified lines of matrices in spaced relationship on said strip.

2. In an apparatus of the character described, a photographic camera located at and replacing the casting box of a line composing machine, whereby lines of matrices fed to normal casting position may be photographed by said camera, a set of matrices bearing characters photographically reproducible by the camera as printed type impressions, means for delivering successive composed and justified lines of said matrices to a position in the machine which they would occupy when being cast so that they appear before said camera in photographing position, said camera having means for directly and successively photographing said lines in successive relationship on a strip of photographically sensitized material, and means for feeding said strip of sensitized material through the camera.

3. In an apparatus of the character described,

a photographic camera for copying successive lines of composed and justified lines of type matrices, means for composing and delivering said composed lines of matrices to photographic position before said camera, jaws for holding a composed line of said matrices in position for photographing, a movable support for the camera, and connections between said support and jaws for causing the jaws to move toward one another to decrease the space available between them for the accommodation of the line of composed matrices as said camera is moved toward the jaws.

4. In an apparatus of the character described, a photographic camera stationed at the position of a casting box and replacing said casting box of a line composing machine, a set of opaque matrices bearing characters photographically reproducible as printed type impressions by said camera, means for composing and justifying lines of said matrices and delivering said lines to photographic positions relative to the camera, jaws for holding the composed lines of matrices in photographic position, a movable support for the camera, and means for causing the jaws to decrease the width of the line of composed matrices by movement of the camera support toward the line of matrices.

5. In an apparatus of the character described, a camera for holding and intermittently exposing a continuous strip of sensitized material, a set of opaque matrices photographically reproducible as type impressions, means for assembling successive lines of said type matrices, and means for shifting the sensitized strip in the camera to cause the assembled lines of matrices to be successively photographed line after line on said strip.

6. In an apparatus of the character described, a photographic camera in position to photograph lines of matrices fed to normal casting position, a set of matrices bearing characters photographically reproduced by the camera as printed type impressions, means for delivering successive composed and justified lines of said matrices to a position in the machine which they would occupy when being cast so that they appear before said camera in photographing position, said camera having means for directly and successively photographing said lines in successive relationship on a strip of photographically sensitized material, and means for feeding said strip of sensitized material through the camera.

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