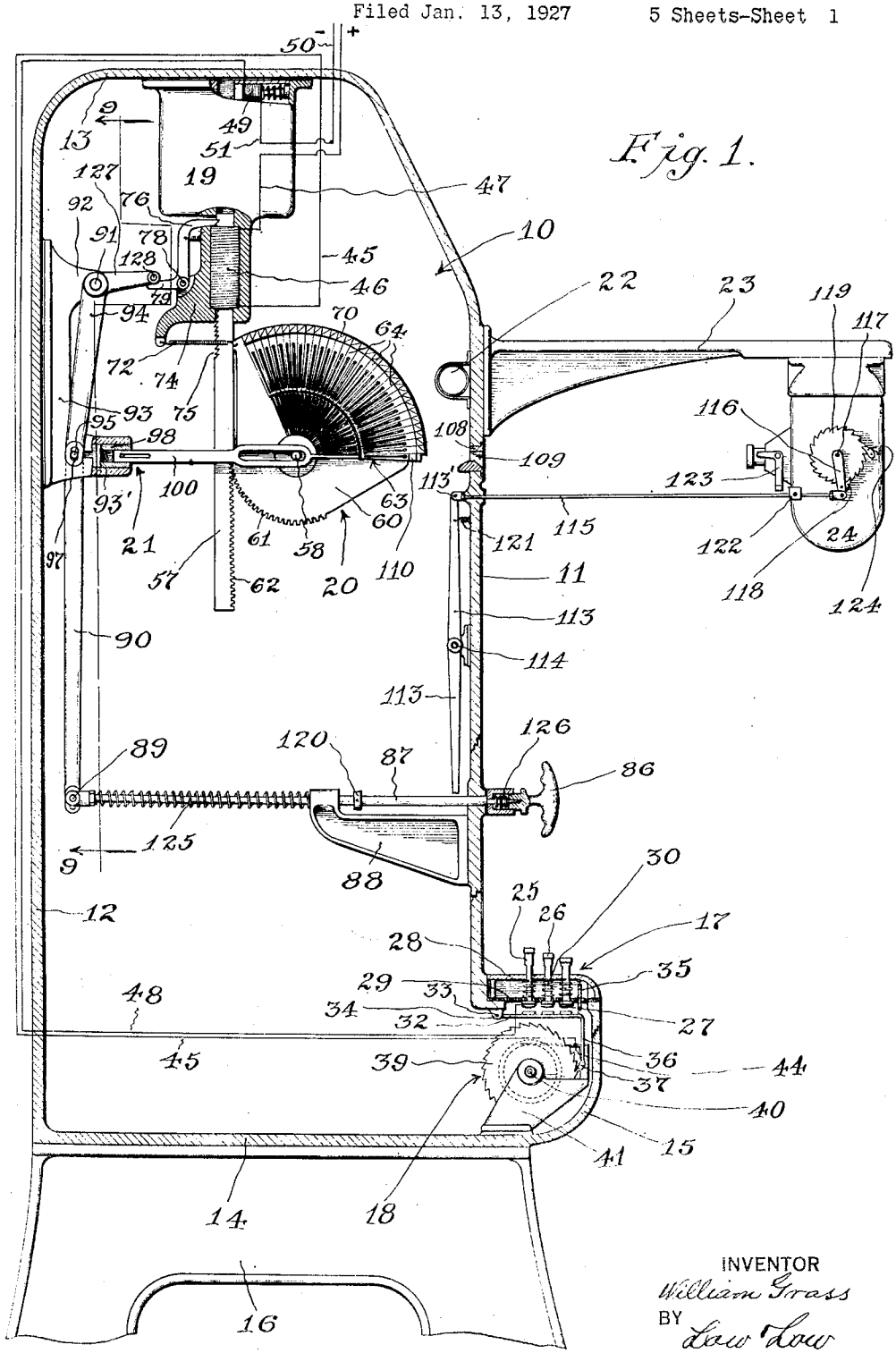
Sept. 1, 1931. W. GRASS 1,821,466

METHOD AND APPARATUS FOR PREPARING LITHOGRAPHIC PRINTING PLATES

Filed Jan. 13, 1927 5 Sheets-Sheet 1

Fig. 1.



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METHOD AND APPARATUS FOR PREPARING LITHOGRAPHIC PRINTING PLATES

Filed Jan. 13, 1927 5 Sheets-Sheet 2

Fig. 2.

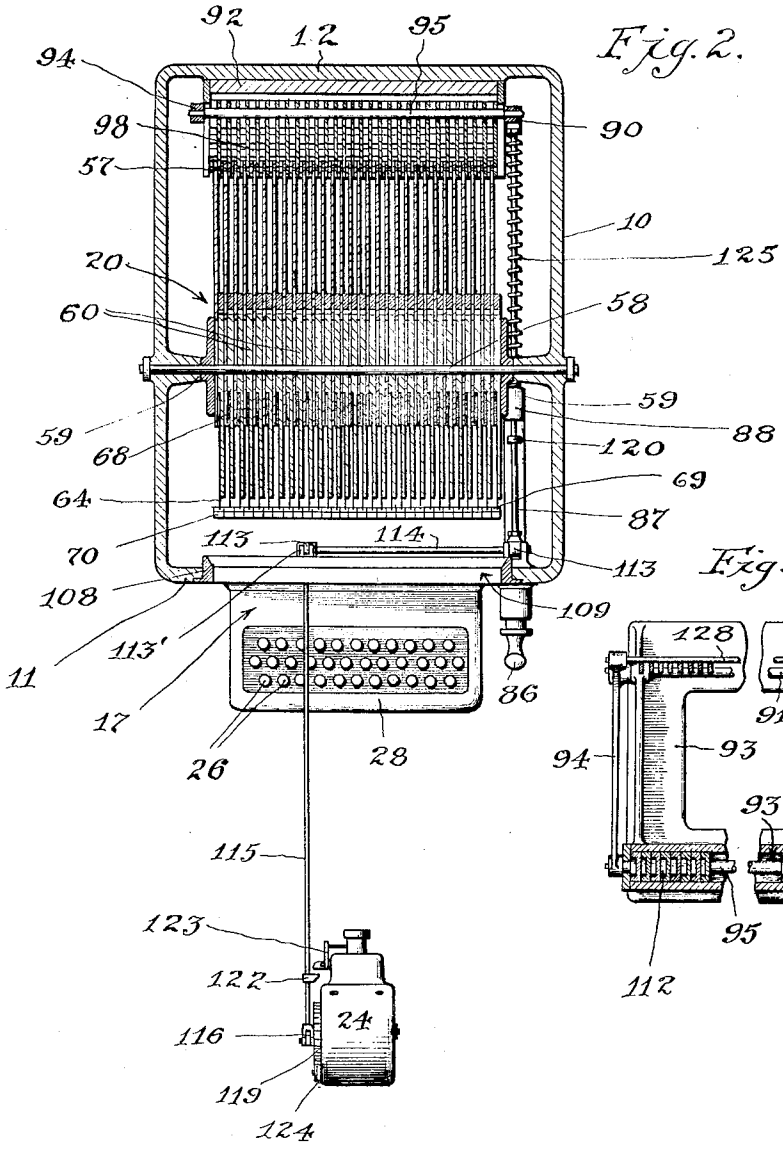
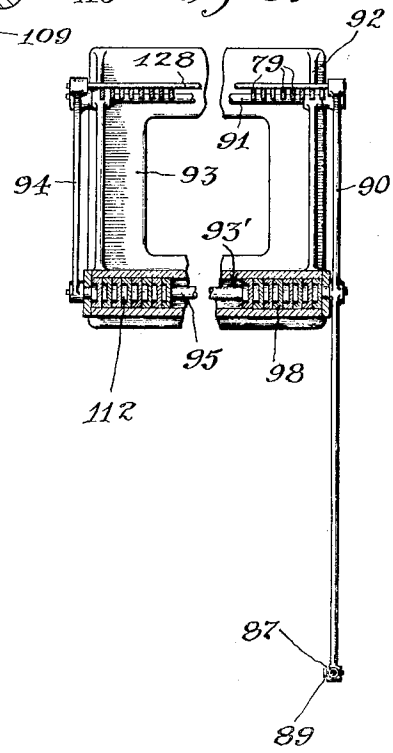


Fig. 9.



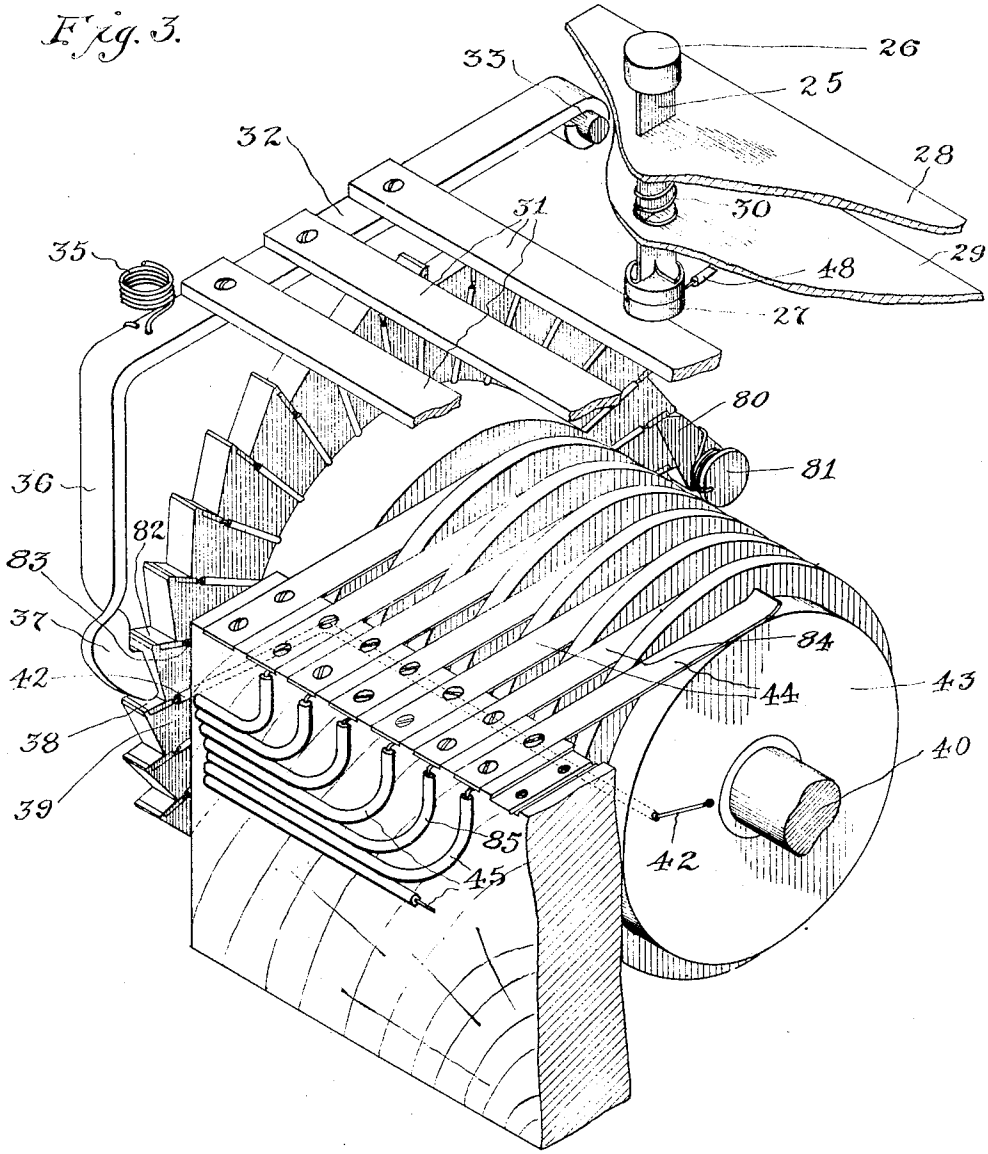
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METHOD AND APPARATUS FOR PREPARING LITHOGRAPHIC PRINTING PLATES

Filed Jan. 13, 1927 5 Sheets-Sheet 3

Fig. 3.



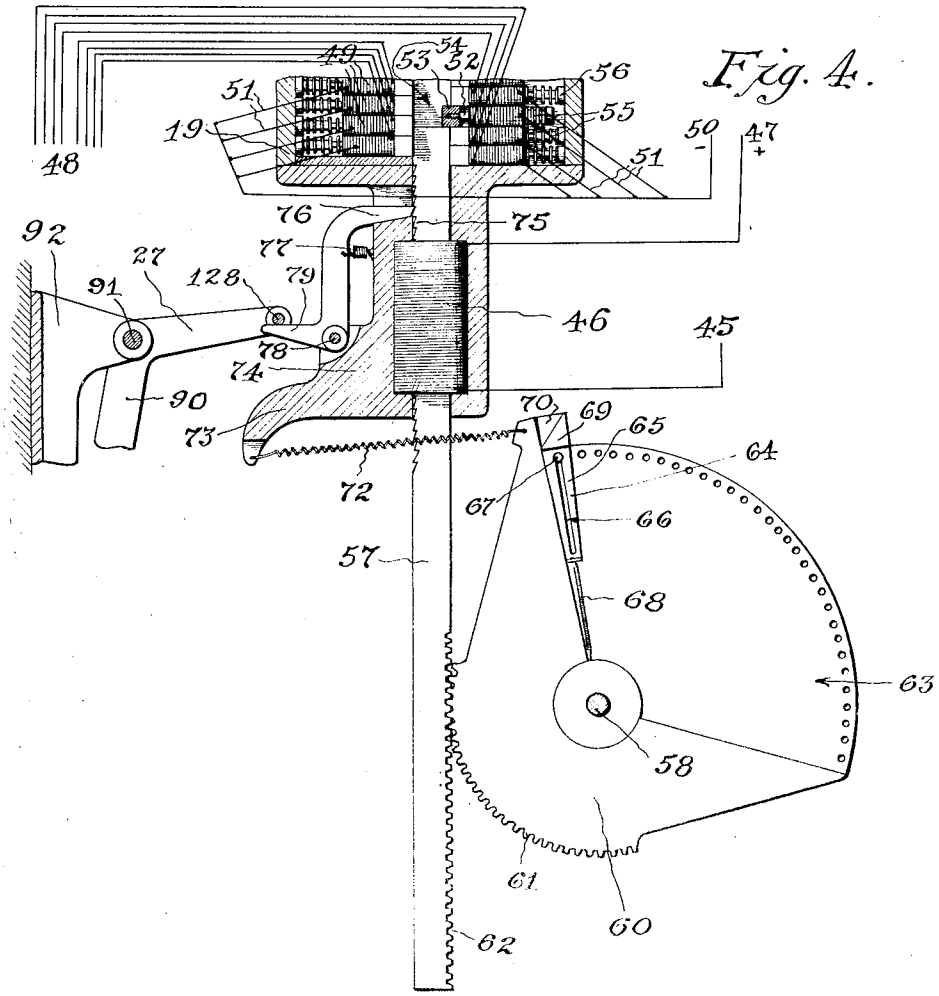
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METHOD AND APPARATUS FOR PREPARING LITHOGRAPHIC PRINTING PLATES

Filed Jan. 13, 1927 5 Sheets-Sheet 4

Fig. 4.



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METHOD AND APPARATUS FOR PREPARING LITHOGRAPHIC PRINTING PLATES

Filed Jan. 13, 1927 5 Sheets-Sheet 5

Fig. 5.

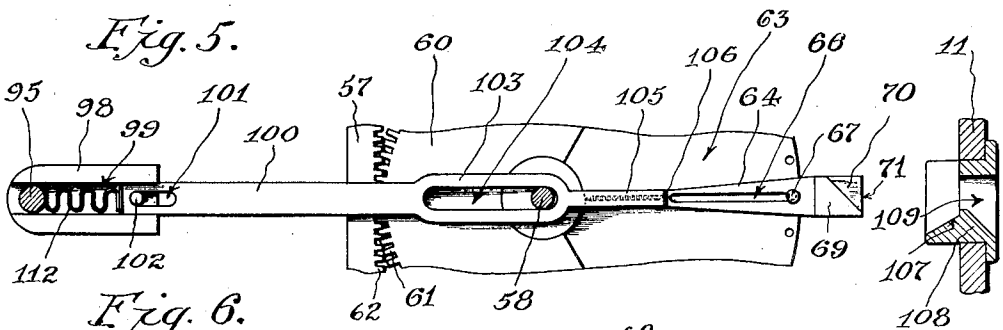


Fig. 6.

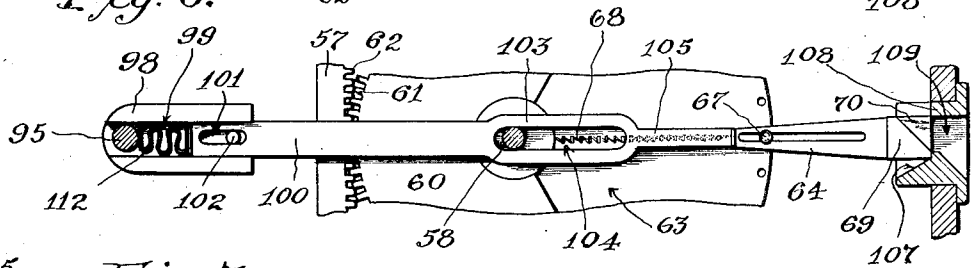


Fig. 7.

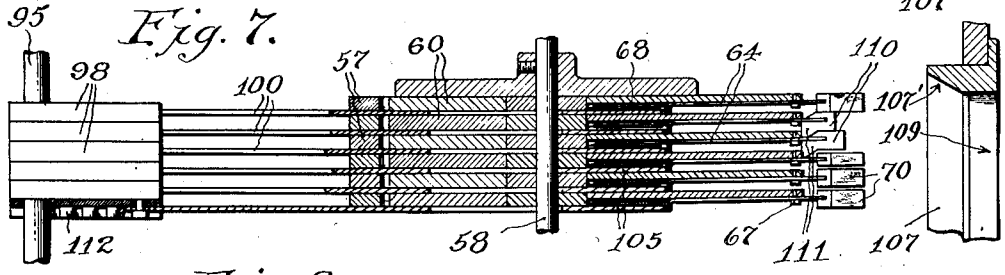


Fig. 8.

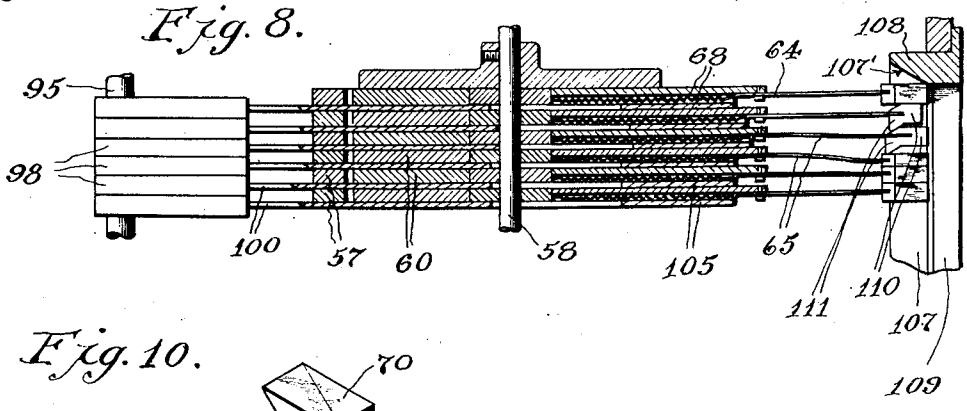
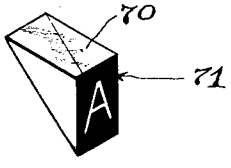


Fig. 10.



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1,821,466

UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR PREPARING LITHOGRAPHIC PRINTING PLATES

Application filed January 13, 1927. Serial No. 160,949.

The invention relates to a method of and apparatus for the production of printed matter and more particularly to the method of an apparatus for producing the photographic negative to be used in a known manner for the making of an intaglio printing plate.

The making and use of such a plate is set forth in Jacob Grass patent Reissue No. 14,802, granted February 10, 1920, and a manner of producing the preliminary negative from set-up type by photography is described in my Patent No. 1,562,324, granted Nov. 17, 1925.

By my present invention the same ultimate result is or may be attained, but in a different manner and more perfectly and with new and improved apparatus by which the light, preferably a reflected light, is transmitted through the type to the camera and negative.

By the present invention the type are brought into and removed from operative position at will and the operation of distributing is eliminated, each type retiring after use to its appointed place ready to be used again, and the light is transmitted to the camera and sensitive negative element therein with much intensity and clearness, so that the photographing of any undesired object or surface is prevented and only the desired letters themselves appear on such negative.

For illustration I may say that the operation is a kind of typewriting by light, each type impressing its character by the aid of light on said negative.

In carrying out the invention I prefer to bring into operating position a line of the type sufficient in length for the width of the page or newspaper column to be printed, and then to pass the light, say from a Cooper-Hewitt tube or other suitable source, through all of the type of said line and into the camera at one instant, as by the opening at will of a rotary shutter of the camera. On the closing of the shutter the film in the camera (preferably a band arranged on delivery and take-up rolls) is advanced a step, from one line of reading matter to another, and the type of the set-up line are all restored to inoperative position. Then the operation is repeated until the reading matter has all line by line been accumulated in light-impressions on the roll of film. Then the film is developed in the usual manner, cut into suitable pages or columns, and the several parts of the film used to produce the intaglio printing plate or plates.

After a film of desired length has been completed, which may consist of one or more pages, it is removed from the camera, the exposed film being cut from the unexposed film, and is developed. This developing is very simple due to the single degree of intense light, portions of which are individually concentrated in each type, to which the film has been subjected. Substantially one hundred per cent of the light which passes into the type elements passes through the outlines of the letters of the type and into the lens of the camera.

The negative is then dried and applied and adhered to a transparent master sheet in the proper place. Pictorial negative films may also be applied on this sheet. When the master sheet is made up it is laid on the sensitive colloid film of a zinc plate and exposed to light to transfer the subject of the master sheet to said plate-film. The plate-film if then developed and proceeded with as set forth in said Jacob Grass patent, or in other equivalent or suitable manner to produce an intaglio printing plate for direct or off-set lithographic printing.

This process is suitable for newspaper, magazine, book, job and other printing, with rapidity and economy and perfect result.

In illustrating a preferred form of apparatus, I have indicated a mechanism associated with a keyboard similar to the ordinary linotype keyboard, and the keys thereof operate to correctly position a line of type which is illuminated for photographing on a sensitized film as hereinbefore described. The mechanism herein disclosed therefore is of a complete or self-contained unit whereby correct operation of the keyboard results in a volume of printed matter made according to the will

of the operator. It should be understood however that I do not desire to limit myself to a compact and sef-contained unit as herein shown. I may also use my invention in connection with suitable mechanism which will be actuated by the keys of the keyboard to not only position one set of type in the machine associated directly with the keyboard, but by electrical connection with a plurality of similar machines associated for example with one master keyboard. This plurality of suitable mechanisms may be located at great distances from the master keyboard and in various relative positions to one another. By the use of such a master keyboard and a plurality of type positioning and photographic units, it will be possible to distribute the subject matter under the control of the operator at the master keyboard to various places throughout the country. Such an adaptation of my invention to a plurality of machines would be highly desirable in newspaper work, where the press items distributed by one central control station would be quickly and efficiently prepared as printed matter for use by newspaper stations situated at various points throughout the country.

The various elements connected with the proper setting of the type and the photographing thereof and the subsequent translation of the exposed film on to the proper printing medium is all done in a mechanical way without the need of highly trained or expert help.

As a means for more clearly illustrating the invention I have discosed in the drawings the preferred embodiment of a machine for most satisfactorily carrying out the invention as far as I have at this point developed the same, and reference should be had to the drawings wherein

Fig. 1 is a cross-sectional view through the complete type setting and photographing mechanisms, the latter being illustrated in outside elevation.

Fig. 2 is a cross-sectional top plan view of the machine shown in Fig. 1, the view being taken substantially on the broken line 2—2, Fig. 1.

Fig. 3 is a perspective fragmental view of a portion of the unit selecting device, whereby the properly aligned type carrier is actuated in proper relation to the actuation of the keyboard.

Fig. 4 is a fragmental sectional view of a portion of the letter selecting mechanism, the view illustrating one of the type carrying elements, the parts being broken away to more clearly illustrate the invention.

Fig. 5 is a detail partly in section, illustrating one of the type carrying elements and the associated type positioning mechanism, this view illustrating the type in first or selected position.

Fig. 6 is a view similar to Fig. 5, illustrating the type in extended or photographic position.

Fig. 7 is a cross-sectional detail of a number of type units in first or selected position.

Fig. 8 is a view similar to Fig. 7, illustrating the type in final or photographic position.

Fig. 9 is a cross-sectional fragmental view taken substantially along the line 9—9—Fig. 1.

Fig. 10 is a perspective detail of one of the light reflecting type elements.

While all of the various operating parts of the apparatus disclosed in the drawings are closely associated one with the other, for the purpose of description, the machine will be roughly divided into the following units.

General supporting structure.
The keyboard.
The letter selecting control stop.
The letter selecting positioner.
The adjacent letter unit control.
The line spacing and filling mechanism.
The line placement mechanism.
The type illuminant.
The photographic unit.

These units roughly refer to associated mechanisms for carrying out the various steps relating to my invention, although it should be evident that a great many of these units must of necessity overlap each other, the classification being made merely for the purpose of more clearly describing the associated mechanisms.

General supporting structure

As clearly illustrated in Fig. 1, the various operating parts of my mechanism are mounted for convenience upon or within a casing 10. This casing consists of a front panel 11, a rear wall 12, a top 13, a bottom 14 and a forward extension 15. The said casing 10 is carried by suitable supporting legs 16. Mounted upon the extension 15 is the keyboard generally designated as 17. Beneath this keyboard and contained in the extension chamber 15 is the adjacent letter unit control 18. Supported by and depending from the cover 13 is the letter control stop mechanism 19, while directly beneath this and mounted on a transverse shaft extending out of the casing 10 is the letter selecting positioner mechanism generally indicated at 20. Partially mounted upon the rear wall 12 of the casing 10 and positioned about the transverse shaft of the letter selecting positioner mechanism, is the line placement mechanism indicated at 21. 22 designates the type illuminant which is contained within the upper and forward part of the casing 10, and is mounted upon the front panel 11 thereof. Exterior of the casing 10 and projected therefrom is a bracket 23 which carries at its outer extremity the photographic unit generally designated as 24.

The keyboard

The keyboard 17, as clearly illustrated in Figures 1 and 2, consists of the ordinary bank of keys arranged in any suitable predetermined relation, such for example as the regulation linotype keyboard arrangement well known in the art of printing. As illustrated in Fig. 3, each key consists of a vertical movable sliding bar or key stem 25, terminating in a head 26 (this numeral being also used to refer generally to the key) the lower end of the bar 25 carrying an electric contact button 27 insulated therefrom. Each key is held in vertical alignment between the outer casing 28 and the lower plate 29 mounted upon the extension 15. A coil spring 30 surrounds each bar 25, the lower edge of the spring 30 resting upon the plate 29 and the upper edge of the spring passing into the bar 25. This spring normally holds the bar 25 of the key in raised position.

The letter selecting control stop

As illustrated in detail in Fig. 3 of the drawings, each key 26 upon being depressed, engages one of the three bars 31, the particular bar 31 being determined by the position of the key relative to the keyboard, there being illustrated three banks of keys. The bars 31 are supported upon pivoted levers 32, one lever being illustrated in Figs. 1 and 3. The rear end of each lever 32 is bent about a pivotal rod 33, held in lugs 34 formed on the lower extremity of the panel 11. The two side levers 32, carrying the bars 31 thus form a compact frame pivoted at the rear end upon the rod 33 and move about the said pivot point when any of the keys 26 is depressed. This frame normally is held in raised position by means of coil springs 35 connected between the levers 32 and the casing 28. The lever 32 which is on the left of the keyboard as viewed from the front in Fig. 3, is provided with a downwardly extending arm 36, terminating in a pawl 37, while the lever 32 not shown, which forms the right hand side of the frame is not provided with the arm 36 and the pawl 37.

As the lever 32 carrying the arm 36 and the pawl 37 is depressed, the lower end of the pawl 37 engages a plate 38 embedded in a toothed ratchet wheel 39 carried upon a horizontal shaft 40 journaled in brackets 41 mounted within the extension chamber 15 of the bottom plate 14—see Fig. 1. The said ratchet wheel 39 and its associated mechanism form the adjacent letter unit control which will be hereinafter more fully described. The ratchet wheel 39 is made of insulated material such as bakelite, hard rubber or other non-electrical conducting material. The plates 38 embedded within the said ratchet wheel 39 are connected by a wire 42 to a disk 43 mounted upon the shaft 40, and on each there is positioned a brush element 44 connected by a wire 45 that passes into the wiring of a solenoid 46 comprising an element in the letter selecting positioner which will be hereinafter more fully described. The opposite end of the wiring of the said solenoid 46 (Fig. 4) connects with a wire 47 that leads to a suitable source of electrical power, such as a generator or battery, not shown—see Fig. 1. As shown in Fig. 3, the contact button 27 positioned at the bottom extremity of each key 26 is connected with a wire 48 which passes as shown in Fig. 1, into the windings of a solenoid 49 positioned within the letter selecting control stop 19. The opposite winding of the solenoid 49 communicates with a wire 50 by a wire connection 51 which passes to the opposite side of the source of electrical power.

Upon depression of a key 26, the electrical circuit is closed through the solenoid 49 by reason of the following communications. Wire 50 from one side of the source of electrical supply through wire 51 and the solenoid 49 out through the wire 48, contact button 27, bar 31, lever 32, arm 36, pawl 37, plate 38, wire 42, disk 43, spring brush 44, wire 45, solenoid 46, wire 47 to the opposite side of the source of electrical power.

It should be understood that there are a series of solenoids 49 associated with each solenoid 46. Each solenoid 49 is controlled by an individual key 26 and an individual wire 48 passes into one side of each solenoid 49. The wire from each solenoid 49 opposite to the individual wire 48 connects with the main lead wire 50 as previously described, by means of each individual wire 51. As clearly shown in a diagrammatic way, in Fig. 4, there is an individual wire 51 for each solenoid 49 and the different wires 51 connect with the one single wire 50.

It should be understood that the single solenoid 46 with its wire connections as described, and the plurality of solenoids 49 with their respective wire connections, constitute a single unit which corresponds to a given position in the line of type that is to be printed. By means of the adjacent letter unit control mechanism which will be hereinafter described, after a single character has been selected in the type selecting operation by means of the actuation of an individual key, all of the parts constituting this single unit, comprising the solenoid 46 and the plurality of solenoids 49 and the various wires associated therewith, are completely disconnected from the operation, and an entirely new unit comprising a different solenoid 46 and associated solenoids 49 with their associated wirings are brought into control. The description therefore now being given of the letter selecting control stop relates to a cycle of operations which will be repeated

until all of the various individual units have been properly selected for a given line.

Upon the closing of the circuit as described, through one of the solenoids 49, the armature 52 of that particular solenoid is caused to be moved laterally and carries a stop block 53 positioned upon the end of the armature 52 into a channel 54 formed centrally in the control stop mechanism 19. This position of the block 53 is clearly illustrated in Fig. 4, and the movement of the same has taken place against the yielding action of a compression spring 55 surrounding the extremity of the armature 52 which is opposite to the block 53 and held by a head 56, the said spring surrounding the armature 52.

This projecting of the block 53 into the channel 54 takes place instantly upon the depression of the key 26 and the closing of the circuit through the solenoid 49 and 46 as previously described.

The letter selecting positioner

Simultaneous with the energizing of the solenoid 49, the solenoid 46 is energized and this causes its armature bar 57 to be lifted. The solenoid 46 being larger than the solenoid 49 and its armature bar 57 being heavier and operating with more resistance than the actuating parts of the solenoid 49 causes the projecting of the block 53 into the channel 54 to take place at a period of time in advance of the full movement of the armature 57. With the block 53 therefore in position and the armature 57 rising, the latter continues its upward travel until stopped by the block 53. Inasmuch as each key 26 and its connecting wires as described, actuate a different solenoid 49, and inasmuch as the solenoids are positioned in different horizontal planes, the contacting of the armature 57 with the block 53 selectively causes the armature 57 to be positioned at a pre-determined place relative to the character actuated upon the keyboard.

As illustrated in Fig. 2 of the drawings, a transverse shaft 58 is fixedly secured at 59 into the side walls of the casing 10, and extends in a horizontal plane in front of and spaced from each armature 57 of each solenoid 46. Arranged upon said shaft 58 and positioned side by side are a plurality of type carrying segment frames 60—see Fig. 4. There is provided, one frame 60 for all of the type elements connected with the proper positioning of the selected type character in a single space within the line of type. Each frame 60 is mounted for rotation about the shaft 58 and gear teeth 61 are cut into a segment of the frame at the rear part thereof. The said teeth 61 mesh with a rack 62 formed in the forward and lower side of the armature 57. The forward side of each frame 60 is recessed as at 63 to form a fan shaped pocket for a series of type carriers 64. There is provided on each frame 60 a sufficient number of type carriers 64 to correspond with the number of characters contained in the keyboard of the machine. Each type carrier consists of a body 65 formed of flat spring stock and the body is slotted at 66 as clearly shown in Fig. 4, 5 and 6. A headed pin 67 passing through the slot 66 is secured to the inner face of the frame 60 within the recess 63, and this prevents accidental displacement of the type carrier 64. A small coil spring 68 secured at the inner end of the type carrier normally holds the said carrier in inner position such as shown in Fig. 4 and 5, this spring being positioned radially of the said type carrier and fixed at the inner end to a portion of the frame 60 adjacent the shaft 58. For the purposes of clear illustration I have removed all but one of the type carriers 64 from the frame 60 as shown in Fig. 4, but it should be understood that the entire recess 63 is completely filled with type carriers radially disposed to the axis 58 and forming a complete compact drum when all of the type are in their normal or inner position. Each type carrier is formed with a head 69 on which is glued or otherwise secured a prism 70 on the outer face 71 of which is formed the proper character comprising the so-called type. This prism is illustrated in detail in Fig. 10. It should be understood that the character designated upon the face 71 of the prism 70 is outlined by an opaque background, this leaving the character outlined in the clear glass or other material which forms the prism.

By the construction of the type carrier 64 and its associated mechanism, it should be evident that upon a vertical movement of the armature 57 of the solenoid 46 that this movement is transmitted through the rack 62 and gear 61 of the frame 60. According to the amount of rotation of the said frame about its axis 58 the properly selected type is positioned in a horizontal line as clearly illustrated in Fig. 5. This lifting of the armature 57 and the partial rotation of the frame 60 takes place against the action of a coil spring 72 interposed between the frame 60 and a bracket 73 formed as a portion of the casing 74 of the solenoid 46. The rear upper end of the armature 57 is formed with ratchet teeth 75, there being a tooth for each horizontal position of each of the solenoids 49. The said teeth 75 are engaged by a dog 76 held by a spring 77 in contact with the said teeth 75. The dog 76 is pivoted at 78 to the casing 74 and is formed at its lower extremity into an extension 79, the purpose of which will be more fully hereinafter described. Owing to the shape of the teeth 75 and the dog 76, the armature 57 is permitted to rise to its selected position under any particular key, but the shape of the said teeth and dog prevents the armature return-

ing after the same has reached its uppermost position.

By the mechanism just described it should thus be evident that the letter selecting control stop is actuated by the depression of a particular key in the keyboard and that the letter selecting positioner automatically operates to partially rotate the type carrier frame into proper position with the selected type this being the horizontal plane passing through the shaft 58.

The adjacent letter unit control

When one of the frames 60 has been actuated to position the proper type 70 for the beginning of the line which is to be set up by my improved mechanism, it is necessary to transfer to the type associated with an adjacent unit the proper electrical impulses actuated by the same keyboard that is used in the operation of selecting the type in the first unit as just described. The mechanism for accomplishing this result is clearly illustrated in Fig. 3. Upon depression of any key 26, not only is there an electrical contact formed, but the ratchet wheel 39 is rotated about its axis 40 a distance equal to the length of one tooth thereof. After the selecting of the type and the proper positioning of the same according to the operations just described, the finger is released from the key and the springs 35 lift the lever 32, the arm 36 and the pawl 37 and causes the pawl 37 to move out of contact with the plate 38 and to pass upwardly across the face of the tooth formed in the ratchet wheel 39. The face of the wheel being made of insulating material no current flows through the connections as described. The ratchet wheel during the movement of the pawl 37 across the tooth of same is prevented from rotation by means of a spring dog 80 (Fig. 3) pivoted at 81 and insulated from the frame of the machine, the said dog operating in the teeth of the ratchet wheel 39. This upward movement of the pawl 37 across the face of a tooth of the ratchet wheel 39, positions the pawl 37 into the next higher tooth—see Fig. 3. In this position the lower end of the pawl is in contact with a new plate 82 associated with the tooth above. The said plate 82 is connected by a wire 83 which is similar to the wire 42, and this wire in turn communicates with a disk insulated from but adjacent to the former disk 43. This second disk in turn is in contact with a brush 84 similar to the brush 44 and is connected by means of a wire 85 which is similar to the wire 45 and passes in the same manner to the second unit of the letter selecting control stop, consisting of solenoids identical in construction and relative horizontal position to the solenoid 49 previously described. Depression of any of the keys in the keyboard results in the same electrical operations as previously described which finally results in the proper positioning of a type character adjacent the type character previously positioned, this proper position being in a horizontal plane passing through the shaft 58. It should be understood that all of the various operations connected with the proper positioning of the type take place automatically without any effort upon the part of the operator other than the depressing of the proper key in the keyboard. This operation continues until a complete line of type characters has been positioned in a horizontal plane passing through the shaft 58. When these various type characters have been properly positioned it is then necessary to project them from the type carrier frame 60 into a position to be further utilized in another step of my invention which will be hereinafter more fully set forth.

The line placement mechanism

After the entire line has been set up and the various type units composing the same have been properly positioned in the horizontal plane passing through the shaft 58, mechanism is provided for projecting all of the adjacent type units composing the line from their respective positions in their type carrying frame forward into illuminated position. This mechanism consists of an actuating handle 86 projecting outwardly from the front panel 11 of the machine and secured to a sliding bar 87 supported in the panel 11 and in a bracket 88 which is rearwardly projected from the panel 11. The sliding bar 87 is connected at 89 to a vertical lever 90 fixed to a rock shaft 91 oscillating in lugs 92 formed on the bracket 93 secured to the back casing 12—see Figs. 1 and 2, also 9. On the end of the rock shaft 91 opposite to the lever 90 is secured a second lever 94, the two levers 90 and 94 being secured to the same rock shaft 91 are moved in unison and move therewith a shaft 95 operating in slots formed in the lower part of bracket 93. The rod 95 is slottedly connected in the lever 90 and in the lever 94 as shown at 97. As the handle 86 is drawn forward away from the panel 11 the levers 90 and 94 and the shaft 95 are carried forward a slight distance. As clearly illustrated in Fig. 5 and 7 there is disposed a series of blocks 98 arranged side by side and carried by the said shaft 95 and sliding in guideways 93′ formed in the bracket 93. Each block 98 is provided with a channel 99 in which is positioned the end of a bar 100 provided with a slot 101 engaging a pin 102 carried by the block 98. The forward end of the bar 100 is enlarged as at 103 and is provided with a slot 104 which engages the shaft 58. Forward of the shaft, the bar 100 terminates in a projection 105 which engages a hook 106 formed in the end of each of the type carriers 64. By this con-

struction it should be evident that one of the bars 100 is positioned between each of the type carrier frames 60 and is held in a horizontal plane passing through the shaft 58, the forward end of the projection 105 normally clearing the hook 106 of each type carrier 64 carried by each type carrier frame 60 during the selecting of the type and the proper positioning of the same. Upon the forward actuation of the block 98 through the influence of the handle 86, the sliding bar 87, the levers 90 and 94, shaft 95 and blocks 98, the bars 100 are moved forward to project the selected type carriers 64 with the proper type characters on the face 71 of the prism 70, from the position illustrated in Fig. 5 to the position illustrated in Fig. 6. In the latter position the line of type carriers 64 move across an inclined shelf 107 and the forward face 71 of the prism 70 engages the face of a frame 108 enclosing a slot 109. This slot 109 forms an opening through the front panel 11 of the casing 10.

The line spacing and filling mechanism

In order to properly fill a line of type regardless of the width of letters used, I have devised a wedging action for the spaces occurring in between the various words forming the line. This mechanism will now be described and reference should be had to Figs. 7 and 8. I have provided in the keyboard as one of the regular characters or keys and operated in the same manner, a key corresponding to the space between words in the line. These various spaces as they occur in the line and as actuated by the space key of the keyboard are properly positioned in the horizontal plane passing through the shaft 58, in the same manner as any other character is positioned. The space wedges however are formed differently from the regular type of the other characters. Two of these spacing units are illustrated in Figs. 7 and 8. These spacing characters consist of heads 110 carried upon the forward end of the regular type carrier bar 64. The forward face of each head 110 is normally back a slight distance from the face of the other type members, as shown in Fig. 7. Each head 110 is formed with a rear extension 111, the side walls of which are at an angle to the side walls of the adjacent type. The face and the entire head 110 are composed of opaque material which will not reflect light. As the line of type consisting of a certain amount of spacing heads 110 is moved forward to the position illustrated in Figs. 6 and 8, any space left between the various letters or characters composing the various type is filled up by the various space blocks used in the line. These space blocks are moved forward a sufficient amount to uniformly and completely close the spaces between the various characters of type elements. The type carrier body 65 consisting of spring metal permits a slight lateral shifting of the type and the spacing heads in the line filling action. This further movement of the spacing heads is permitted by reason of a spring connection interposed between the end of each bar 100 and the shaft 95, this spring connection consisting of a spring 112 interposed between the end of each bar 110 and the shaft 95 and confined within the channel 99. The operation of filling or spacing the line is as follows: The positioned type characters and spaces are brought forward from their respective recesses 63 in the type carrier frames 60 until the forward face of the type carriers engage the frame 108, which prevents further movement of the same. In reaching this position the outside type are definitely positioned laterally by engagement with another inclined surface 107′ of the frame 108, this surface being a continuation of the bottom inclined surface 107. At this time the shaft 95 is moved forward sufficiently to position the face of each type character against the frame 108 without compressing the spring 112. Further movement of the shaft 95 therefore causes each of the springs 112 associated with each of the type characters to be compressed as shown in Fig. 6. This compression must take place, inasmuch as the type character cannot move further forward. The spacing heads 110 however, not being in engagement with the frame 108 are permitted to move under the further movement of the shaft 95 and under the influence of their respective springs 112 until the entire line is completely filled. This is accomplished by the separating of the various type characters to permit the forward movement of the spacing heads. In this way I automatically and completely fill every line so that the opening 109 is completely covered by the type characters and the spacing heads associated therewith.

The type illuminant

As clearly shown in Fig. 1, the frame 108 against which the set up line of type is positioned is directly beneath the illumination element 22 which is any suitable sort of electric light sufficiently powerful to obtain the results desired. This light may be of the ordinary Hewitt-Cooper light, making use of mercury vapor or any other form of illumination. The light rays pass from the lamp 22 and strike the top surface of the prism 70. This light passing into the prisms is reflected from the bottom surface thereof and is projected outwardly through the slot 109 of the frame 108. Only the form of light corresponding to the transparent character outlined by the opaque surface 71 of the prism 70 passes outward through the opening 109. I have found that a prism formed

according to my method reflects practically all of the light striking it and therefore transmits the characters formed by the transparences in the opaque face of the prism with great brilliancy. Inasmuch as the slot 108 is positioned in the front panel 11 of the casing 10, it is possible to inspect the illuminated line of characters. The next step in my invention therefore contemplates photographing the line of character so presented through the slot 109.

The photographic unit

As clearly illustrated in Fig. 1, I have provided a photographing element 24 having its lens in the horizontal plane passing through the slot 109 and therefore arranged for photographing the illuminated line of characters presented through the said slot. Any form of camera may be used provided it is arranged to carry a roll of films sufficient to contain a number of lines of exposed characters. I have provided a mechanism for automatically opening the shutter to permit proper exposure of the illuminated line of characters when the handle 86 is operated in withdrawing the rod 87 from its position within the casing 10. For this purpose I have provided a vertically disposed double lever 113 fixed on a shaft 114 pivoted to the inside wall of the front panel 11. The upper part of the lever 113 is connected at 113′ with a sliding rod 115 connected to a rock arm 116 pivoted at 117 to one side of the camera 24. The lever 116 carries at its lower end a spring pressed dog 118 adapted to co-operate with a toothed ratchet wheel 119 carried on the pivot center 117. The said ratchet wheel 119 is connected internally with the sensitized film in a manner not shown. Upon movement of the ratchet wheel 119 the film is correspondingly moved. As the handle lever 86 in its outward movement approaches the end of the outward stroke, a collar 120 secured thereto strikes the lower end of the lever 113 which moves the upper end of said lever away from the panel 11 against the action of a coil spring 121. This movement also causes the rod 115 to move toward the left as viewed in Fig. 1 and a collar 122 secured to said rod strikes a bell crank 123 associated with the shutter of the camera and causes the said shutter to be opened for a length of time sufficient to make the exposure of the illuminated line of characters appearing through the opening 109 of the frame 108. During this movement of the rod 115 the dog 118 passes over the teeth of the ratchet wheel 119, the latter being held from rotation by the spring pressed dog 124. By this means the exposure of the single line of characters composing the type elements is thus made by actuation of the handle lever 86 without further effort upon the part of the operator. When the handle lever 86 is moved inwardly by the operator or is permitted to be moved inward by the action of the coil spring 125 surrounding the rod 87, the spring 121 operates to restore the lever 113 into normal position and this movement causes the rod 115 to move toward the right as viewed in Fig. 1, this movement causing the ratchet wheel 119 to rotate and thus to move the exposed section of the film from the photographic field and to present a new portion of the film for the next exposure.

One complete cycle of operations of my machine is made by using one line of characters as a unit during the interval of time from the first operation of the proper key in the keyboard to the last operation of depressing the handle that finally restores the parts to normal position, a single line of characters has been impressed upon the sensitized photographic film. The cycle therefore is repeated as long as there are any further lines to be made in connection with the exposing of the negative film. The operation of the various mechanisms in proper sequence, composing one cycle of operations and the restoration of the parts to normal position is herewith described.

The proper key 26 corresponding to the first character of the line of characters being composed by my machine is depressed against the action of the spring 30 associated with the key, and this pressure causes the contact button of the key to engage one of the bars 31 which causes the levers 32 to move about their pivot point 33 against the action of the springs 35, this movement carrying the pawl 37 into contact with the plate 38, causing the ratchet wheel 39 to be moved about its axis 40 a distance equal to the length of one tooth. Contact of the button 27 with the bar 31 and contact of the pawl 37 with the plate 38 closes an electrical circuit which operates through the wire 48 connected to the contact button 27 into one side of the particular solenoid 49, corresponding to the particular key 26 depressed. This particular solenoid is one of the many solenoids 49 composing the first letter selecting control stop unit. A current passing through the solenoid 49 passes out through a wire 51 and wire 50 leading to one side of a source of electrical energy, such as a battery, generator or other suitable electrical power. A current passing through the contact button, the bar 31, the lever 32, bar 36 and pawl 37, into the plate 38 is conducted through the wire 42 into a disk 43 where it passes through the wire brush 44 and the wire 45 into one side of the solenoid 46, which solenoid is contained in the first letter selecting positioner unit. The current passing through the solenoid is led outwardly by means of the wire 47 to the opposite side of electrical energy. We thus have a closed circuit in which there is positioned two solenoids 49

and 46. The former solenoid 49 operates to project a stop block 53 within the path of travel of an armature 57 actuated by the solenoid 46. This actuation of the armature 57 by reason of a ratchet gear connection 62 and 61 causes the type carrier frame 60 to rotate about its axis 58, the said type carrier frame being the frame associated with the first letter selecting positioner unit. By this mechanism the armature 57 rises until stopped by the block 53 at which position it is held by engagement of the dog 76 into the teeth 75 formed in the armature 57.

As the finger is released from the key 26, a spring 30 causes the same to rise to normal position and this action permits the spring 35 to lift the pawl 37 from contact with the plate 38, the ratchet wheel 39 being held in locked position by means of the dog 80. This lifting of the pawl 37 causes the same to pass upwardly over the tooth of the ratchet wheel 39, which action results first in a breaking of the current between the pawl 37 and the plate 38. When the pawl 37 reaches its uppermost position, the lower edge thereof is in engagement with the plate 82 associated with the next tooth of the ratchet wheel 39. The key 26 is permitted to rise further after the bar 31 has reached its uppermost position, and this results in a breaking of the contact between the contact button 27 and the bar 31, the circuit thus being broken and the solenoids 46 and 49 de-energized. No action takes place on the armature 57 of the solenoid 46 owing to the holding action of the dog 76 in the teeth 75, but de-energizing of the solenoid 49 permits the spring 55 to withdraw the block 53 from the channel 54, this dis-engaging the said block from the armature 57.

The next character to occupy the second space in the line being set up is obtained by a pressure of the suitable key 26 in the same manner as previously described. The electrical circuit in this instance is closed through the contact button 27, the bar 31, lever 32, bar 36, pawl 37 and plate 82, which leads by a different wire to the proper solenoid 49 in the next adjacent letter selecting control stop unit. The type carrier 64 associated with this unit is actuated by its associated solenoid 46 connected with this unit, and this results in a position of the type in the second space of the line being composed. Subsequent characters in the line are positioned in the same manner, the shifting of the electrical circuit to the proper letter selecting control stop and the proper letter selecting positioner being accomplished automatically according to the contact plate 38 or 82 being used, and the proper wires associated therewith. Thus with each depression of a key in the keyboard the proper type is positioned and the ratchet wheel 39 composing the adjacent letter unit control is moved a distance of one tooth. Inasmuch as there are the same number of teeth in the ratchet wheel 39 as there are places in the line being set up, it should be evident that upon complete rotation of the ratchet wheel 39 in one given direction, all of the teeth have been used and all of the contact plates 38 or 82 and associated wires 42 or 83 have been brought into operation.

As the last character in the line has been properly positioned, the operator withdraws the rod 87 by means of the handle 86, and this action causes the levers 90 and 94 to move the shaft 95 and the blocks 98 toward the right, as viewed in Fig. 1 and 5, which causes the adjacent bars 100 in each space to project the type carriers to forward position as shown in Fig. 6 and 8, this positioning of the type carrier 64 being associated with the proper line spacing and filling mechanism according to the number of spaces contained in the line of characters being set up. As the rod 87 reaches its extreme outer movement it actuates the lever 113 to cause contact of the block 122 with the shutter bell crank 123 which makes the proper exposure of the type positioned at the frame 108 and illuminated by the lamp 22.

Upon the photographing of a single line, the operator returns the rod 87 by means of the handle 86 and this action first permits the spring 121 associated with the lever 113 to operate through the rod 115 and the lever 116 to move the ratchet wheel 119 and thus position a new unexposed surface of the sensitized film in the camera 24 for its next photographic impression. Further movement of the handle 87 backward toward its normal position, moves the levers 90 and 94 and the shaft 95 with the blocks 98 thereon, which action withdraws the bars 100 to the normal position shown in Fig. 5, the extensions 105 and the bars 100 being withdrawn from contact with the type carrier 64. The spring 68 of each carrier, withdraws the same into the recess 63 of each frame 60. This position of the parts is illustrated in Fig. 1. A slight further movement of the handle 86 is permitted by reason of a spring 126 as shown in Fig. 1. The operator therefore upon restoring the lever 87 to normal position slightly depresses the handle 86 which permits a further longitudinal movement of the rod 87 and this actuates the lever 90, the shaft 91 and the lever 94 causing the movement of extensions 127 on each of the said levers 90 and 91 to depress a bar 128 carried thereby, see Fig. 4 and 9. The bar 128 thus strikes the projections 79 of the dog 76—see Fig. 4, causing the said dogs to move about their pivots 78, against the action of the several springs 77, and this movement disengages all of the dogs from the teeth 75 on the several armatures 57. The spring 72 of each armature 57 thereupon restores the frames 60 associated therewith to normal position.

Inasmuch as the full line of type properly illuminated is projected through the opening 109 of the frame 108 previous to the operation of the handle 86 and the bar 87, the said line of type is inspected by the operator. If for any reason there is any defect in the line, or if it is not desirable to photograph the same, the operator fails to withdraw the handle 86 to the full outward stroke. By this partial withdrawal of the rod 87 the operator positions the type, but does not actuate the mechanism connected with the shutter of the camera. He thereupon returns the rod 87 to its innermost position by means of the handle 86 and this automatically resets all of the parts in position ready for compiling the next line of type. By this method therefore, I have provided a simple and effective means for preventing the photographing of any particular line of type set up at the will of the operator. None of the mechanism connected with the camera is operated, and therefore the film on which the type is being photographed is not moved from its position but is in proper position for the next photographic operation.

I claim my improved mechanism when used for the setting of any suitable form of translucent type, whether of triangular prism or other form. As to my improved form of type, of the triangular prism shape, wherein the reflecting surface is within or at the surface of or not exterior to the type, I claim the same when set by hand or any suitable mechanism other than that which I have described. It will be understood that other electromagnetic means may be employed in place of the solenoids, for instance electromagnets, in situations where the same are practicable. It will be understood that each series of type in its carrying frame will ordinarily comprise an entire alphabet, with proper punctuation marks and spaces or slugs, the latter not coming into the photographing range of the illuminant, and that the number of such series will be according to the length of line desired to be set up. For a narrow column there would not be so many series of type, whereas for a page there would be a greater number of series, according to the width of the page. The type 70 may have its opposite parallel sides covered with an opaque substance so as to concentrate the light passing through each type entirely within such type, for the purpose of effecting a more intense action of the light rays which are transmitted into the camera and on to the sensitized film or plate therein.

What I claim is:

1. In a method of preparing lithographic printing plates, causing the light to pass into translucent type and to impinge on a reflecting surface within the type, and to be reflected thence out of the type and to a distance therefrom and to the sensitized surface through a translucent letter outline on another face of the type.

2. In a method of preparing lithographic printing plates, causing the light to pass into translucent type and to impinge on a reflecting surface within the type, and to be reflected thence out of the type and to a distance therefrom and to the sensitized surface through a translucent letter outline on another face of the type, and confining the light from passing through the sides of the type by making said sides opaque.

3. In a system of typewriting by light, the combination of illuminating means, a camera, and translucent triangularly prismatic type to direct and partly cut off the light rays and arranged at a distance from said camera.

4. The combination of a series of pivoted segment type carrying frames, series of type-carriers in said frames, translucent type mounted on said carriers, keys having means for turning any segment to bring the desired carrier and its type to a predetermined line, and means for moving the positioned carrier and type to photographing position.

5. The combination of a series of pivoted segment type carrying frames, type-carriers in said frames, translucent triangular prismatic type mounted on said carriers, keys having means for turning any segment to bring the desired carrier and its type to a predetermined line, and means for moving the positioned carrier and type to photographing position.

6. The combination of a series of pivoted segment type carrying frames, type-carriers in said frames, translucent type mounted on said carriers, each type being laterally movable relative to its series, keys having means for turning any segment to bring the desired carrier and its type to a predetermined line, and means for moving the positioned carrier and type to photographing position.

7. The combination of a series of pivoted segment type carrying frames, type-carriers in said frames, translucent type mounted on said carriers, keys having means for turning any segment to bring the desired carrier and its type to a predetermined line, means for moving the positioned carrier and type to photographing position, and a type-wedging light aperture for justifying said type when so positioned.

8. The combination of a photographic unit, an illuminant, a plurality of series of translucent type made partly opaque to reduce rays from said illuminant to the form of letters, a casing having a type-justifying light aperture, and means for assembling type from said series justified in said aperture in the form of a line, through which line of type and aperture light rays may pass to said photographic unit.

9. The combination of a photographing

unit, an illuminant, series of partly transparent type through which light may be transmitted from said illuminant in the form of characters and by said type to said photographing unit, carriers on which said type are permanently mounted, and means for actuating said carriers to move the type into the range of said illuminant and to withdraw the type to normal position.

10. The combination of a photographing unit, an illuminant, series of partly transparent type through which light may be transmitted from said illuminant in the form of characters and by said type to said photographing unit, and means for assembling said type in position for the purpose, including devices for moving each of said series of type and for projecting from its series into the range of said illuminant the individual type which is desired.

11. The combination of a photographing unit, an illuminant, series of partly transparent type through which light may be transmitted from said illuminant in the form of characters and by said type to said photographing unit, justifying means for assembling said type in a line in position for the purpose, and means for moving the type into engagement with said justifying means and for returning the type to normal position.

12. The combination of a photographing unit, an illuminant, series of partly transparent triangular prismatic type through which light may be transmitted from said illuminant in the form of characters and by said type to said photographing unit, and means for assembling said type in position for the purpose.

13. The combination of a photographic unit, series of translucent type each series adapted to move to bring the desired type to a predetermined position, a movable stop to arrest the series when the type has been positioned, actuating means to so set the stop, actuating means to so move the series of type to be arrested by said stop, and a key having means to cause the operation of both of said actuating means.

14. The combination of a photographic unit, series of translucent type each series adapted to move to bring the desired type to a predetermined position, a movable stop to arrest the series when the type has been positioned, actuating means to so set the stop, actuating means to so move the series of type to be arrested by said stop, and a key having means to cause the operation of both of said actuating means, and means for retracting said type each to its place in its series.

15. The combination of a photographic unit, series of translucent type each series adapted to move to bring the desired type to a predetermined position, a movable stop to arrest the series when the type has been positioned, electro-magnetic and connecting means to so set the stop, electro-magnetic and connecting means to so move the series of type to be arrested by said stop, and a key having means to cause the operation of both of said electro-magnetic means.

16. The combination of a photographic unit, series of translucent type each series adapted to move to bring the desired type to a predetermined position, a movable stop to arrest the series when the type has been positioned, a solenoid and connecting means to so set the stop, a solenoid and connecting means to so move the series of type to be arrested by said stop, and a key having means to cause the operation of both of said solenoids.

17. The combination of a photographic unit, series of translucent type each mounted to move to a predetermined line, and further movable to be projected beyond the other type of its series into position where it may be illuminated, and a key board and connecting and actuating means whereby a key may position the corresponding type at said line, and means for restoring said type to normal position in its series, and means for projecting and justifying the line of positioned type.

18. The combination of a photographic unit, series of translucent type each mounted to move to a predetermined line, and further movable to be projected beyond the other type of its series into position where it may be illuminated, the type being laterally movable towards each other for justifying, and a key board and connecting and actuating means whereby a key may position the corresponding type at said line, and means for restoring said type to normal position in its series, and means for projecting and justifying the line of positioned type.

19. The combination of a photographic unit, series of translucent type each mounted to move to a predetermined line, and further movable to be projected beyond the other type of its series into position where it may be illuminated, and a key board and connecting and actuating means whereby a key may position the corresponding type at said line, and means for restoring said type to normal position in its series, and means for projecting and a light aperture for justifying the line of positioned type.

20. The combination of a photographic unit, series of translucent triangular prismatic type each mounted to move to a predetermined line, and further movable to be projected beyond the other type of its series into position where it may be illuminated, and a key board and connecting and actuating means whereby a key may position the corresponding type at said line, and means for restoring said type to normal position in its series, and means for projectng and justifying the line of positioned type.

21. The combination of a photographic unit, series of translucent type each mounted to move to a predetermined line, and further movable to be projected beyond the other type of its series into position where it may be illuminated, and a key board and connecting and actuating means whereby a key may position the corresponding type at said line, and means for restoring said type to normal position in its series.

22. The combination of a photographic unit, series of translucent type each mounted to move to a predetermined line, and further movable to be projected beyond the other type of its series into position where it may be illuminated, and a key board and connecting and actuating means whereby a key may position the corresponding type at said line, means for restoring said type to normal position in its series, and justifying means adapted to compress together the type of a line of set type.

23. The combination of a photographic unit, series of translucent type each mounted to move to a predetermined line, and further movable to be projected beyond the other type of its series into position where it may be illuminated, and a key board and connecting and actuating means whereby a key may position the corresponding type at said line, means for restoring said type to normal position in its series, and justifying means, said justifying means and a line of set type being relatively movable to cause the engagement and compression of the type of said set line by said justifying means.

24. The combination of a photographic unit, rotary series of translucent triangular prismatic type each mounted to move a predetermined line, and further movable to be projected beyond the other type of its series into position where it may be illuminated, and a key board and connecting and actuating means whereby a key may position the corresponding type at said line, and means for restoring said type to normal position in its series.

In testimony whereof I affix my signature.

WILLIAM GRASS.