

(No Model.)

3 Sheets—Sheet 1.

T. W. MORRISON.

METHOD OF AND APPARATUS FOR PRINTING IN COLORS.

No. 546,024.

Patented Sept. 10, 1895.

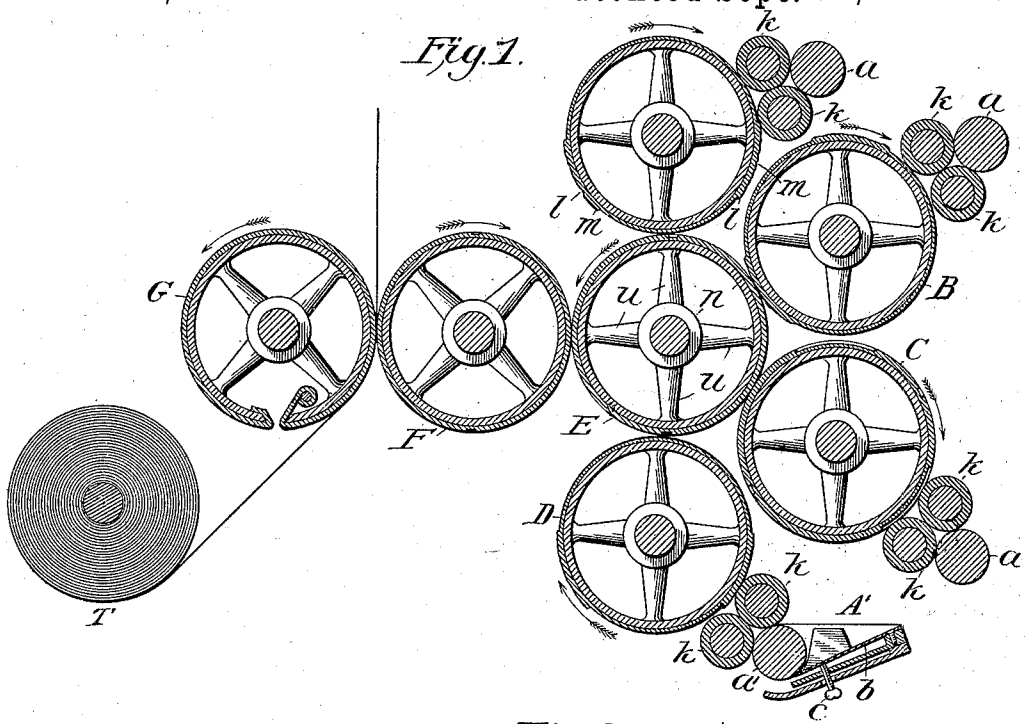
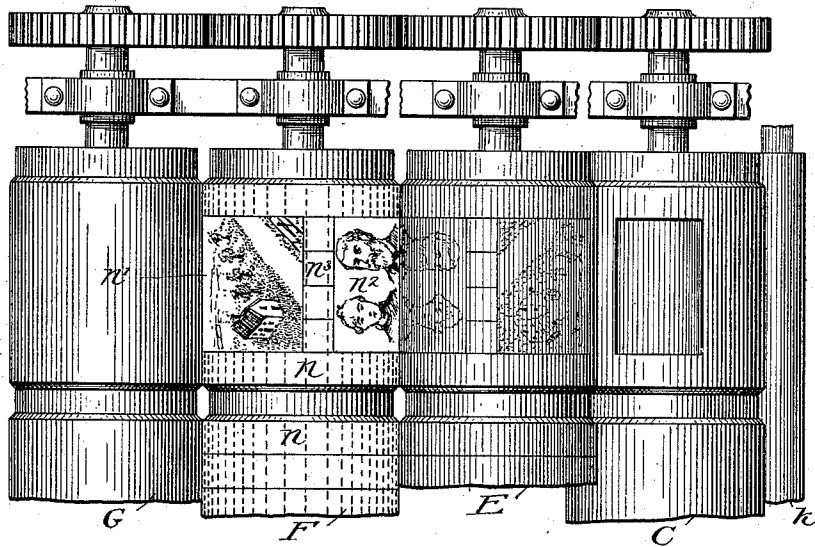


Fig. 2.



Witnesses.

Clark Dillenbeck.
E. T. Dillenbeck.

Inventor.

Thos. W. Morrison.

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Fig. 5.

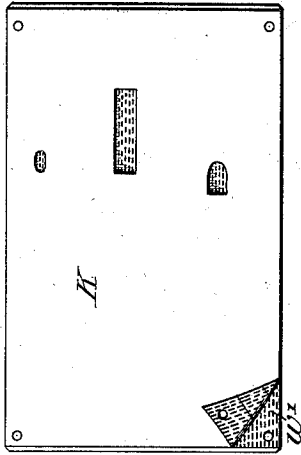


Fig. 4.

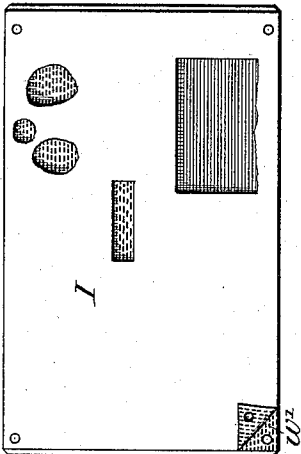


Fig. 3.

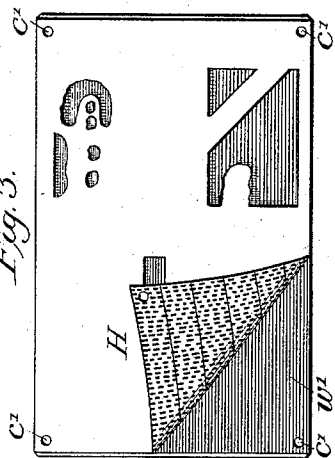


Fig. 8.

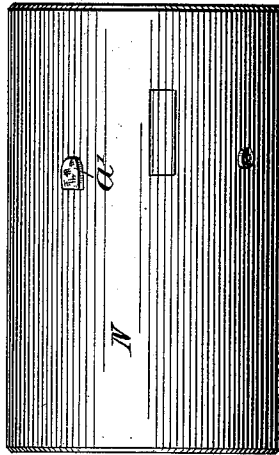


Fig. 7.

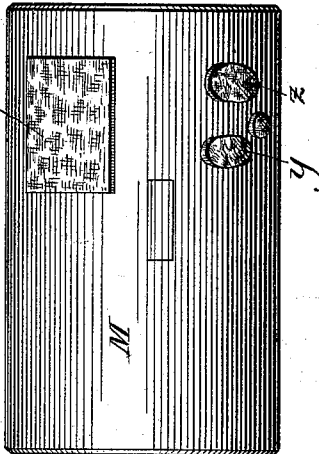
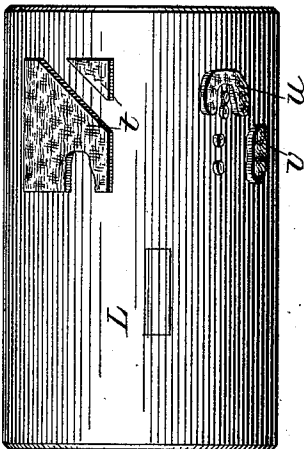


Fig. 6.



Witnesses.

Clark Dillenbeck,
E. T. Dillenbeck.

Inventor.

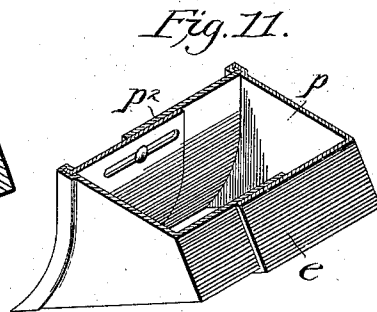
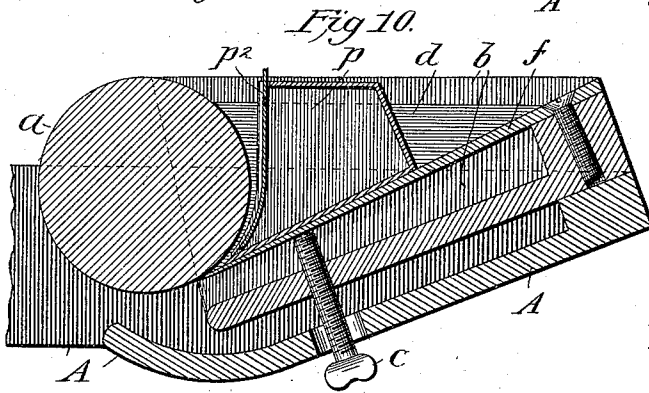
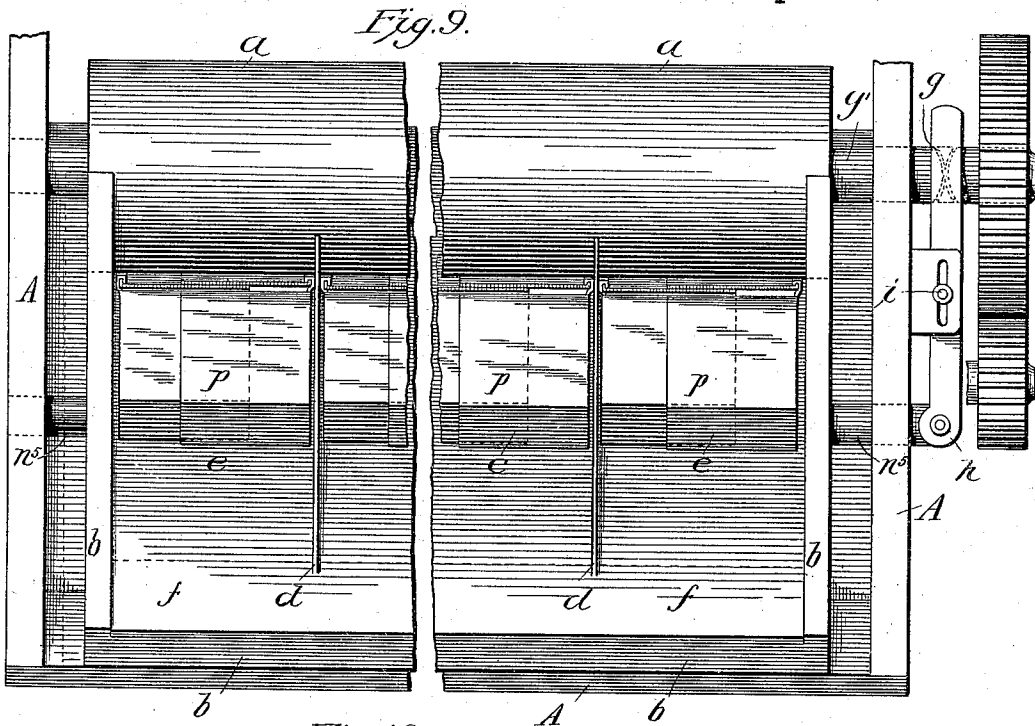
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UNITED STATES PATENT OFFICE.

THOMAS W. MORRISON, OF NORTH PLAINFIELD, NEW JERSEY.

METHOD OF AND APPARATUS FOR PRINTING IN COLORS.

SPECIFICATION forming part of Letters Patent No. 546,024, dated September 10, 1895.

Application filed October 8, 1894. Serial No. 525,188. (No model.)

To all whom it may concern:

Be it known that I, THOMAS W. MORRISON, a citizen of the United States, residing at North Plainfield, in the county of Somerset and State of New Jersey, have invented certain new and useful Improvements in the Art of Printing; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates generally to the art of printing in colors, and more particularly to the method of inking the form so as to produce the desired distribution, blending, and variation of color upon the sheet or other surface to be printed, and to the apparatus employed in carrying out the method, including the specific construction of the inking mechanism and its arrangement and disposition with respect to the form and impression-cylinders of the printing-press. It further includes the method of making the ink-receiving jacket or shell of those rollers of the inking mechanism which are proximate to the form-inking roller, and to the apparatus for carrying out such method.

In the accompanying drawings, Figure 1 represents in vertical section the main elements of a printing-press and of inking mechanism of my improved construction, the frame and gearing being omitted so as to simplify the understanding of the parts shown. Fig. 2 represents, partly broken away, a plan view of such printing-press, the upper set of inking-rollers being omitted. Figs. 3, 4 and 5 represent proof-blanks attached to subjacent matrices and illustrate the manner of cutting said blanks to produce the desired jackets (cast in stereotype metal) for the inking-rollers. Figs. 6, 7, and 8 represent the jackets corresponding, respectively, to the blanks shown in Figs. 3, 4, and 5. Fig. 9 represents, in plan and partly broken away, my preferred construction of ink-fountain. Fig. 10 represents a vertical section thereof. Fig. 11 is a perspective view, partly in section, of one of my telescopic ink-holders.

Referring to the drawings, T indicates the usual continuous web of paper, G the impression-cylinder, F the type-bearing cylinder or form, and E the form-inking roller, of a printing-press, said form-inking roller being provided with a roller-shaft having arms *u*

which support the stock *n* and provided with a soft-composition surface. 55

Encompassing the form-inking roller E are sets of inking mechanisms, each set comprising an inking-fountain with its customary hard roller, a soft roller or rollers taking the ink from said hard roller, and a hard roller transmitting the ink from the soft rollers to the form-inking rollers. 60

The inking-fountain, as shown more fully in Figs. 9 and 10, in its preferred construction consists of a trough *f*, mounted upon studs *n*², one of which is connected with an arm *h*, adjustably fulcrumed at *i* and engaging at its opposite end, as shown, within a double-grooved cam *g* upon the continuously-revolving inking-roller shaft *g'*, whereby, during the revolution of the shaft, the trough *f* is given a reciprocating movement. The trough *f* is provided with a series of transverse partitions *d*, forming pockets *e* for the reception of inks of different colors. One of the purposes of imparting a reciprocating motion to the trough is to cover with ink those parts of the roller immediately opposite the partitions. It is obvious that the same effect would be produced by reciprocating the roller itself in any suitable manner, either independently or in conjunction with the trough. In the pockets *e* of the trough I may place tin cases *p* for holding the colors, said cases having openings provided with slides *p*² to control or entirely interrupt the outflow therefrom. To further graduate the amount of color fed by the hard roller *a* of the inking-fountain to the soft rollers *k*, I make use of the usual flexible blades *b* (one for each compartment or tin case) and by means of the corresponding set-screw *c* regulate the distance of the free end of the blade from the roller *a*, and consequently the thickness of the layer of ink supplied thereto. 75 80 85 90 95

Intermediate of the form-inking roller and the soft roller or rollers *k*, I interpose in each set an inking-roller, indicated in the drawings for the different sets of inking devices by A B C D. The function of these last-mentioned rollers is to supply to the form-inking roller the several colors which they take up from the soft rollers *k*. 100

The main characteristic features of my invention are the method of producing and utilizing in the general arrangement of the machine the active surfaces of these rollers. For 105

the purpose of making plain their construction and function I will first explain, by reference to Figs. 3 to 8, inclusive, the preferred method followed in producing them.

5 The matter to be printed on the press having first been composed and justified in the form, a number of proofs thereof are first taken in the usual manner upon paper of a quality that will withstand without serious
10 injury when suitably backed the temperature and weight of molten stereotype metal. The number of these proofs should, for convenience, be one in excess of the primary colors which it is desired to ultimately print upon the
15 sheet. Upon this extra proof the person whose office it is to determine upon the coloring indicates by drawing a line about them those portions of the page which are to be colored, and within or near this line he also indicates
20 whether they are to be colored in red, blue, yellow, or the like. The extra sheet thus marked is, together with the unmarked proofs, taken to the proper person, who thereupon cuts from one of the unmarked proofs those portions
25 which are to be colored red on the printed page. From another of the unmarked proofs he in like manner cuts those parts that are to be colored yellow, and so on for each of the primary colors. If any part of the marked
30 proof is indicated to be printed in a color blended from the primary colors—as, for instance, a blend of red and yellow—he cuts such part from the proof-sheets intended for each of those colors. The cut proofs thus
35 produced I will for convenience call “masks.” They are each made of the desired thickness and attached to a suitable backing of papier-maché, and each forms the matrix from which
40 said casting in stereotype metal is produced, said casting consisting of a shell having in relief thereon projections corresponding in shape to the cut-away portions of the mask. These shells or jackets are cast in semicylindrical form, so as to be readily applied to
45 the stock of the rollers A B C D, and constitute the inking-surface thereof. Thus the shell corresponding to the proposed blue coloring is placed upon the roller (say A) of the inking set supplying that color, the shell corresponding to the proposed red coloring is placed upon the roller (say B) of the inking-set supplying that color, and so on. The soft rollers K K are so arranged with relation to the rollers A B C D as only to ink the raised
55 projection, and upon operating the press the several rollers A B C D will each supply to the form-inking roller E batches of color corresponding in size to the projections thereon and corresponding in distribution to the distribution of coloring that is to be had upon the form. The several rollers and the form are, of course, so geared that the form-inking roller will transmit to the form the colors received in exact register therewith according
60 to the predetermined arrangement.

The picture-plates employed upon the form for the purpose of illustrating the sheet or

other surface to be printed are castings in stereotype metal taken from papier-maché
70 molds or matrices produced from swelled gelatine negatives of the picture itself. This impressed papier-maché serves as the backing or matrix for the masks corresponding to the pictures to be colored, and it is evident that the stereotype-metal inking-roller shells cast
75 in such matrices will have upon their surfaces projections which are negatives of the picture to be printed or of such portions thereof as are to be printed in particular colors. It will, of course, be understood that it
80 is within the intent and scope of my invention to print the picture-plates in one color, in which event the negative projection upon one of the inking-rollers A B C D will correspond to the entire picture. When the pic-
85 ture is to be colored differently in different parts, a portion of said negative will appear upon another of said inking-rollers, and so on, as hereinbefore described.

In the printing operation the character of
90 the negative projections on the inking-rollers for inking the negative picture-plates is such that the ink is supplied to the picture-plates in such manner as to produce exceedingly fine effects, especially in the shading. Thus
95 each bulging and depression of the picture-plate on the form, however minute or considerable, finds its counterpart in exact position upon the inking roller or rollers A B C D. These latter rollers, by reason of their bul-
100 gings and depressions, secure the distribution of more ink on their higher portions or bulgings than on their depressed portions, because the higher portions press harder upon the fountain-roller, from which they take
105 their supply. In like manner these higher or bulging portions of the negatives of the inking-rollers give off more ink to the form-inking roller E and at exactly the points where the negative picture-plates of the form
110 present their correspondingly high points to the form-inking roller, the more depressed portions receiving a correspondingly lesser supply. The production of the printing-plates themselves and of the corresponding nega-
115 tives thereof from like photographic plates and by a stereotyping process insures absolute uniformity of result and high excellence in product at a cost comparatively small for this kind of work and by the use of processes
120 or steps which are separately well understood in the art, so as to be capable of being put in practice successfully and readily by workmen whom it might be difficult to instruct in unfamiliar manipulations. It will be observed
125 that the matrix of papier-maché, which is to furnish the backing for the masks corresponding to the ordinary type portions of the form, are to have smooth surfaces, thereby producing correspondingly smooth projections upon
130 the inking-rollers, these projections being of uniform height throughout instead of being irregular in height, as is the case with the projections corresponding to the printing-

plates. The advantage of having these uniform projections is that in practice it is found that the ink is thus distributed to the type to the best advantage.

5 For purposes of illustration I have indicated roughly in Fig. 2 a form showing two picture-plates n' n'' , separated by rows of type-matter n^3 .

10 In Figs. 3, 4, and 5 are illustrated the masks for producing the stereotype-metal inking-roller shells shown in Figs. 6, 7, and 8, which shall permit the illustration to be printed from the form, so that the picture n' will appear with a blue sky, green grass, trees of
15 green of darker hue, a yellow roadway, and a yellow house with a terra-cotta roof, and so that, for instance, the portrait of the woman will appear in flesh tints with blue eyes, red lips, brown hair, and garment of appropriate
20 tone or hue. H indicates the mask for the blue coloring, said mask being attached to a papier-maché backing w , one end of the mask being shown as folded upon itself, so as to show the backing. The mask and matrix of
25 Fig. 3 produce the stereotype-metal shell L of Fig. 6, the parts that are to appear in blue, or in some blending of blue with another color, appearing in relief at $t u v$.

30 I, Fig. 4, indicates the mask for the yellow coloring attached to its matrix w' and adapted to produce the stereotype-metal shell M, Fig. 7, with its raised projections $x y z$.

35 K, Fig. 5, indicates the mask for the red coloring attached to its matrix w' and adapted to produce the stereotype-metal shell N, with its raised projections $a' b'$. It is obvious that for the black coloring for regular type-work the mask would be cut away at all
40 parts corresponding to the location of the type on the form, and that the stereotype-metal shell would have a corresponding projection smooth on its surface and of uniform height throughout.

45 By reference to Fig. 7 it will be noted that the projection x occupies a position corresponding to the projection t on Fig. 6, by reason of which fact the projection x superimposes a coating of yellow upon those parts of the form-inking roller which have already
50 been coated with blue by the projections t , thereby causing a blend of the two colors where they touch each other and producing a green color for the grass of the picture, while leaving the roadway yellow. So, also, the
55 house appearing in yellow upon the printed sheet will have its roof in terra-cotta, because of the fact that the projection a' will superimpose a coating of red upon the corresponding subjacent portion of the yellow coating
60 supplied to the form-inking roller by the projection x . In the portrait of the woman a light coating of yellow, caused by the depression of the picture-plate of the form-roller at the part corresponding to the face and the
65 corresponding depression of the like part of the projection on the inking-roller combined with the white of the paper, yields a flesh

color, which may be made of warmer hue by the addition of red from the red-color inking-roller to the form-inking roller E. It will be
70 remembered that the bulgings and depressions of the counterpart on the inking roller or rollers vary the shading, so as to produce the same graduations present in the original, modified by the colors applied. In some instances—as, for example, in hurriedly issuing
75 a late edition or an "extra" of a newspaper—it may be of importance to save the time required for producing the stereotyped picture-plate for the form and to use instead
80 thereof a flat half-tone or line engraving. In such case I nevertheless preferably produce the bulged counterpart upon the inking roller or rollers and produce advantageous
85 results, for the reason that the said bulged counterpart acts, as before, in distributing the ink to the form-inking roller. It is, however, obvious that the same delicacy of shading cannot be obtained by the employment of the
90 flat plate as by the employment of the stereotyped negative, inasmuch as the latter co-operates, as has been hereinbefore explained, to peculiar advantage in the taking up of the color from the form-inking roller and in
95 exact accordance with the manner in which the bulged inking-roller has imparted said color to the form-inking roller, part of this advantage being lost where a flat engraving is used on the form. In some cases, also, where I
100 employ the bulged negatives upon the inking-rollers I may entirely dispense with any design upon the corresponding surface of the form-cylinder, and use instead thereof a
105 smooth surface upon the form-cylinder which receives the layers of color of different thicknesses from the form-inking cylinder and prints them direct upon the paper or other surface to be printed. In this case the effect produced is somewhat similar to the effect produced by the photogravure process.

110 In further explanation of the principles of my invention I desire to observe that if the form-cylinder alone were provided with the bulged or irregular surface for the printing-plates it could not be used to advantage, as
115 it would require a hard tympan on the impression-cylinder to produce even fair results, inasmuch as a soft tympan would press into the depressed portions of the bulged surface of the picture-plates. In my invention,
120 on the contrary, the bulged or irregular surfaces of the inking-rollers regulate with exactness the thickness of the layers of color that are to be applied to the picture-plates on the form, whether said picture-plates be
125 bulged or flat, and it follows necessarily that the picture-plates can only print the ink on the paper in corresponding layers, for which reason it is a matter of no consequence whether the tympan on the impression-cylinder is
130 hard, as of Manila paper, or soft, as of rubber or felt. For this reason my invention can be applied directly to existing web-presses which print in one color and in which soft

tympan, such as felt, are almost invariably used. It will, furthermore, be observed that in adapting my invention to such presses the tympan is prepared for the printing operation in the usual manner employed for ordinary type-printing. It is of course evident that by the employment of my invention I can dispense with the use of engravings as commonly understood—for instance, such as are cut by hand or by machine with the aid of engraving-tools or that have been etched by acids or cut by the aid of the sand blast or the like.

In the construction of the inking-trough I may dispense with the tin cases hereinbefore mentioned and place the colors directly in the partitioned compartments; but I prefer the employment of the cases, principally because they may be readily transferred from one compartment to another, and because they are made in two parts, sliding telescopically one within the other, as fully shown in Fig. 11 and as indicated by the dotted lines in Fig. 10, whereby the length of their discharge-openings may be varied to suit the exact requirements of use.

The adjusting-screws *c* of the inking-fountains play important parts in the practical utilization of the invention, because of the fact that they permit the supply of color to be varied from the several fountains with such graduated regularity as to produce the exact blend desired where said colors are superimposed upon each other. So, also, the dividing of the trough into sections forming color-pockets, in conjunction with the lateral reciprocation of the trough or its roller and the rotation of the latter, not only permits the inking of those parts of the roller opposite the partitions, but permits blendings of color upon the roller itself, whereby rainbow and like effects can be readily produced. Instead of forming each mask from a separate proof-sheet, a single proof may be laid on a sheet of papier-maché or other suitable material, and by puncturing or creasing the proof like punctures or creasings will be made in the papier-maché, thereby indicating the parts that are to be cut from it. The papier-maché is then cut along the line of the punctures or creasings, and thus becomes a mask to be used in the stereotyping operation in the same way that a cut proof would have been used and for which it furnishes a substitute. In this way a single proof may be used to produce a set of masks for the entire series of inking-rollers, each mask being made to correspond with the projection to be produced upon its appropriate roller. In this case pin-holes through the corners of the proof-masks and matrix or other base will serve for the introduction of registering points *c'*. It may be said, generally, that in casting the shells by the use of the masks and their matrices, care should be taken to have each mask fit snugly, so that the metal will not run between the mask and the papier-maché matrix or

base, and to this end it may sometimes be necessary to touch up or seal the edges of the openings with clay or some other suitable material.

The composition employed for the form-inking roller is the usual composition of glue, glycerine, and molasses. It may be cast upon the segmental bases or shells of the form-inking roller or in recesses made in said segmental bases or in said segmental bases as a framework. The impression-roller, form-roller, and ink-fountain rollers are of the usual construction in common use and need no further description. Provision is made by the ordinary adjustments for regulating the pressure of the various rollers upon each other throughout the entire press and for varying said pressure at will. The rolls when in the press and not in use should be separated as much as is necessary to prevent the soft rollers becoming flattened by the constant pressure of the hard rollers or type-cylinder upon them, this being the usual precaution ordinarily taken on presses provided with adjacent soft and hard rollers.

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

1. The method of printing in colors, which consists in setting and adjusting type and design blocks in a form, taking a proof or proofs of the form, preparing masks from said proof or proofs whose cut-away portions correspond to the corresponding portions of the form that are to be inked in the several colors, casting from each of said masks a stereotype shell having a raised active surface conforming to the cut-away portion of the mask, and mounting each of said shells upon an inking roller stock so as to supply to the corresponding parts of the printing surface the several colors intended and printing from said printing surface; substantially as described.

2. In a printing press, the combination with the form, of a form-inking cylinder, sets of inking mechanisms, each set supplying its individual color or colors and the sets being arranged in series about the form-inking cylinder, and the roller which supplies ink to the form-inking cylinder from one of the sets, having an inking projection or active surface, overlapping, in its location, an inking projection on an active surface upon the like roller of another set, whereby the first projection will deposit a portion of its ink upon the ink already deposited on the form-inking roller by the second projection, and means for varying the amount of ink supplied to each inking set; substantially as described.

3. The method of printing a design, which consists in producing the same upon an inking surface in patches of ink of varying thickness corresponding to the tones and shadings to be printed, the thickest portions of said patches being upon the highest projections of the inking surface and the thinner portions being upon the lower depressions there-

of, transferring said ink design, as thus received by the inking surface, to the printing surface and printing from the printing surface; substantially as described.

5 4. The method of printing a design, which consists in producing the same upon an inking surface in patches of ink of varying thickness corresponding to the tones and shadings to be printed, inking the printing surface
10 from said inking surface, and printing from the printing surface, said printing surface bearing the negative configuration of the design to be printed; substantially as described.

5 5. The method of printing a design, which consists in producing the same upon an inking surface in patches of ink of varying thickness corresponding to the tones and shadings to be printed, inking the printing surface
15 from said inking surface, and printing from the printing surface, said printing surface bearing the bulged or swelled negative configuration of the design to be printed; substantially as described.

25 6. The method of inking a printing surface with patches of ink of varying thickness corresponding to the tones or shadings of a design to be printed, which consists in casting a fac-simile of a swelled negative of the design, inking said fac-simile, transferring said
30 ink to an inking surface and then transferring it to the printing surface; substantially as described.

35 7. The method of inking a printing surface with patches of ink of varying thickness corresponding to the tones or shadings of a design to be printed, which consists in casting a fac-simile of a swelled negative of the design, inking said fac-simile, transferring said ink
40 to an inking surface and then transferring it to the printing surface, said printing surface bearing a cast fac-simile of the swelled negative; substantially as described.

45 8. The method of printing a design in colors, which consists in preparing cast fac-similes of fractional portions of a swelled negative of the design, inking said fac-similes in various colors, transferring said colors to an inking surface, transferring them therefrom
50 to the printing surface, and finally printing from the latter; substantially as described.

55 9. The method of producing the shell of an inking roller, which consists in taking a proof from the printing form, preparing a mask from said proof, superimposing the mask upon a matrix and thereupon casting upon
said matrix; substantially as described.

60 10. In molding apparatus for stereotyping the surfaces of inking rollers, a mask made from a proof of the form, and having a flexible backing or matrix; substantially as described.

65 11. In molding apparatus for stereotyping surfaces in relief, a combined mask and matrix having no fixed or established curvature, but freely flexible from a plane surface to a

curved surface and back again, whereby it is at once adapted to cast one plate flat, and the next one curved, and so on, as desired; substantially as described.

12. In a press for printing a design from a printing surface or form, an inking mechanism having an active surface provided with a fac-simile of the whole or a portion of a swelled gelatine negative of the design to be printed; substantially as described.

13. In a press for printing in blended colors, the combination with the form, of a form-inking cylinder, sets of inking mechanisms, each set supplying its individual color or colors and the sets being arranged in series about the form inking cylinder, and the roller which supplies ink to the form-inking cylinder, from one of the sets, having an inking projection or active surface, overlapping, in its location, an inking projection or active surface upon the like roller of another set, whereby the first projection will deposit a portion of its ink upon the ink already deposited on the form inking roller by the second projection; substantially as described.

14. In a press for printing in blended colors, the combination with the form, of a form-inking cylinder, sets of inking mechanisms, each set having a fountain supplying a number of different colors to the fountain roller side by side, the sets being arranged in series about the form-inking cylinder and the arrangement or succession of the colors varying in the fountains of the different sets, whereby any particular part of the form-inking cylinder may receive any one of a number of blends; substantially as described.

15. In a printing press, the combination with the form having a picture plate consisting of a fac-simile of the swelled gelatine negative of the design to be printed, a form-inking roller, and inking mechanism supplying ink to the latter, said inking mechanism having active surfaces which constitute a fac-simile of the swelled gelatine negative of the design; substantially as described.

16. In a press for printing in colors, an ink fountain or trough having a number of ink supply reservoirs side by side and having a fountain roller and mechanism for laterally reciprocating the one with relation to the other; substantially as described.

17. In a press for printing in colors, an inking fountain provided with a number of ink supply reservoirs arranged side by side, and means for closing or opening the outlet of each reservoir, said reservoirs being telescopic so as to be lengthened or shortened as desired; substantially as described.

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

THOS. W. MORRISON.

Witnesses:

H. W. STERLING,
R. M. ELLIOTT.