No. 815,310. PATENTED MAR. 13, 1906.

H. L. RECKARD.

PHOTOMECHANICAL PRINTING.

APPLICATION FILED JUNE 16, 1905.

Fig. 1

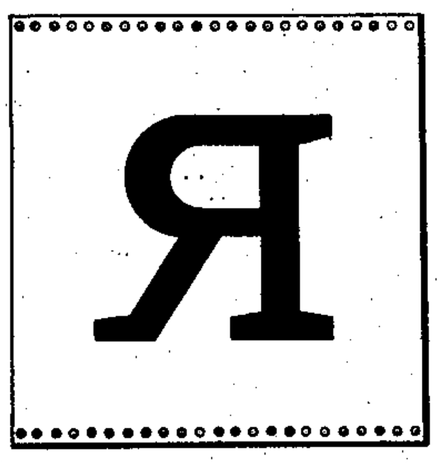


Fig. 2

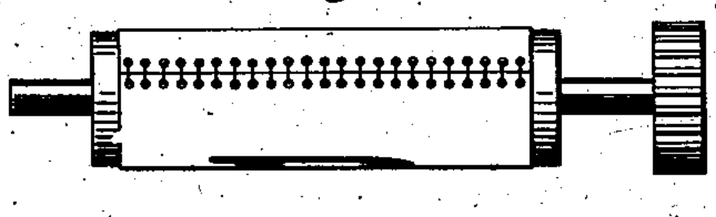


Fig. 3

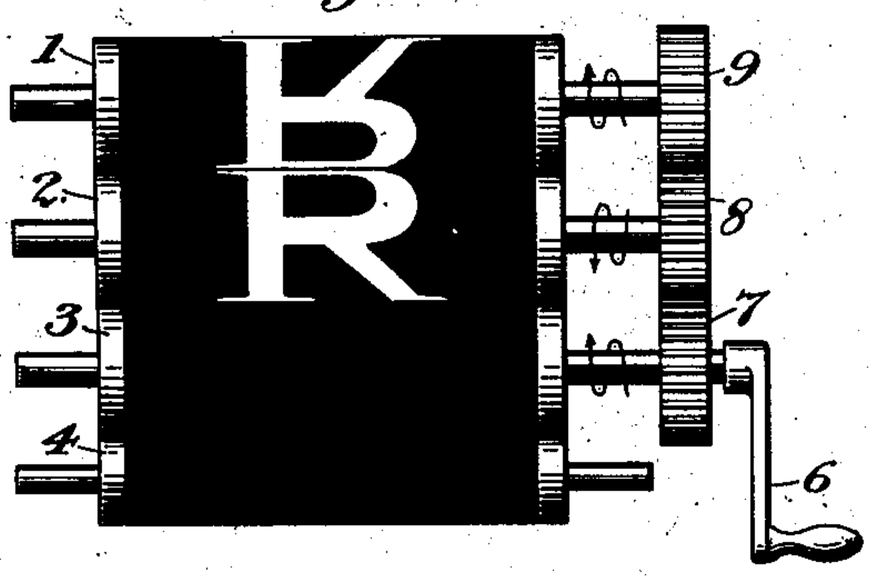


Fig. 4

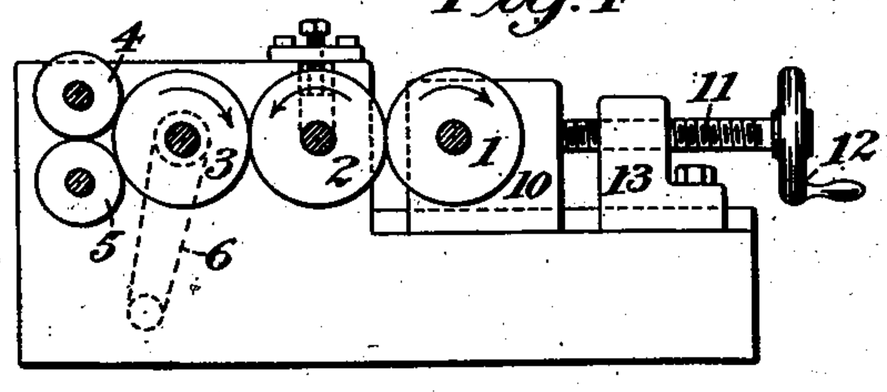
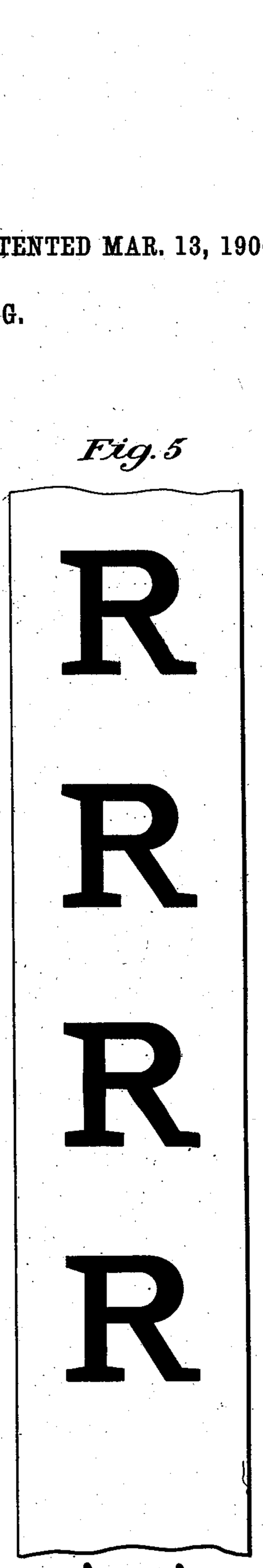


Fig. 5



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UNITED STATES PATENT OFFICE.

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PHOTOMECHANICAL PRINTING.

No. 815,310. Specification of Letters Patent. Patented March 13, 1906.

Application filed June 16, 1905. Serial No. 265,475.

To all whom it may concern:

Be it known that I, HENRY L. RECKARD, a citizen of the United States, and a resident of Manhattan, New York, in the State of New York, have invented certain new and useful Improvements in Photomechanical Printing, of which the following description and claims constitute the specification, and which are illustrated by the accompanying drawings.

The object of my invention is to make pictures of natural or artificial objects by deposits of printing-ink in relief-printing, intaglio-printing, or planographic printing and by a process which includes photographic means and mechanical means without any hand drawing or engraving.

The nature of my invention consists in making a sensitive gelatin roller having a cylindrical core of metal or other suitable material and a sensitized gelatin coat of uniform thickness and preferably having an elastic cushion between the coat and the core and in thereupon exposing that sensitive gelatin roller to light through a flexible translucent picture bent upon its periphery and in then developing that exposed gelatin roller by bathing it in water, and thereby swelling some parts of its surface into relief while leaving some parts of its surface in depression, and in thereupon drying that developed gelatin roller in air and in afterward using it in producing a relief, intaglio, or planographic printing surface.

Figure 1 of the drawings is a view of a flexible translucent picture adapted to be applied to the periphery of my sensitive gelatin roller. Fig. 2 is a view of my sensitive gelatin roller with the translucent picture of Fig. 1 applied thereto by being bent upon the roller in close contact with the periphery thereof and being held firmly upon the periphery of the roller by means of a cord laced through the holes which perforate opposite borders of the translucent picture. Fig. 3 is a plan view of some parts of an inking-machine which may be used in my process and which machine includes my developed gelatin roller located between a copper roller on one side of it and a set of inking-rollers on the other side of it. Fig. 4 is a side view, partly in section, of the same machine. Fig. 5 is a view of a fragment of an indefinitely-long strip of paper or cloth which has had the letter "R" repeatedly printed thereon by means of a copper roller, the printing-surface of which has been delineated thereon by my gelatin roller.

The particular program illustrated by the drawings is performed as follows: I produce the translucent picture shown in Fig. 1 by taking a thin, flexible, and translucent sheet of celluloid or other material and by making the opaque reversed letter "R" thereon, while making or leaving the background of the sheet translucent. The letter "R" may be made on the sheet photographically or by a brush or pencil or in any other available way.

The sensitive gelatin roller of Fig. 2 can be made by the following means, in describing which I specify quantities by troy weight: I dissolve one ounce of hard German gelatin in six ounces of water in a vessel of its own. I also dissolve one hundred and twenty grains of bichromate of ammonia in six ounces of water in a vessel of its own. Thereupon I add the solution containing the bichromate of ammonia to the gelatin solution, and then I add three ounces of alcohol thereto, and then I filter the compound solution two or three times. The resulting composition of matter is a sensitized gelatin emulsion, the ingredients of which I mix together and filter and keep in a dark room or in a room dimly lighted with red light. I also make an unsensitized gelatin emulsion by dissolving two ounces of hard German gelatin in twelve ounces of water in a vessel of its own. I also make a stock solution by mixing twenty-eight ounces of water, and one hundred and eighty grains of citric acid, and five hundred and twenty grains of nitrate of potassium, and seventy grains of chrome-alum and one-half of an ounce of liquid ammonia in a vessel of its own. I then take two ounces of that stock solution and mix it with twelve ounces of glycerin, and six ounces of water in a vessel of its own and thus produce a glycerin solution.

I make a cylindrical core of metal or other suitable substance and provide it with an axial opening for the reception of a shaft, with which it can revolve without any eccentricity or gyration. I first coat that core with unsensitized gelatin by continuously revolving it in a pan or box containing the unsensitized gelatin emulsion, so that all the parts of the periphery of the core will pass successively through that gelatin emulsion time after time and at a uniform speed,

and so as to result in the deposit upon the periphery of the roller of successive layers of gelatin until the periphery of the roller is provided with a uniform and elastic cushion of unsensitized gelatin of considerable thickness. I thereupon remove the covered core from the pan or box containing the gelatin emulsion, and thereupon I revolve the covered core at a uniform speed in the open air or in a drying-box until the unsensitized gelatin is coherently dried upon the core, but is not baked into an inelastic condition.

An elastic rubber tube or rubber blanket of uniform thickness can be substituted for an elastic gelatin cushion upon the core of my gelatin roller and under the sensitized gelatin coat of that roller, and when thus substituted such a tube or blanket will perform the function of cushioning the sensitized gelatin coat. Such a tube can be applied to such a core by thrusting the core into the tube, and thus stretching the tube over and upon the core, and such a blanket can be applied to such a core by cementing it thereon with its opposite edges stretched to a close and accurate joint or by stretching the blanket around the tube until its opposite edges accurately meet and then lacing those edges together.

The elastic cushion under the sensitized gelatin coat of the gelatin roller may be omitted in some cases, where the particular character of the picture or print to be produced is such that the gelatin coat of the roller can perform its function without an elastic cushion between it and the core of the roller.

Whether or not I make a gelatin or a rubber cushion upon the core of the roller, I revolve the core in a pan or box containing the sensitized gelatin emulsion, and I thus apply a coat of sensitized gelatin to the surface of the cushion or to the surface of the core, as the case may be. I then remove the coated core from the pan or box containing the sensitized gelatin emulsion and immediately revolve the former in the open air or in a drying-box until the sensitized gelatin coat is thoroughly and coherently dried thereon. The application of the sensitized gelatin emulsion to the gelatin or rubber cushion or to the naked core and also its drying thereon is conducted in a dark room or in a room dimly lighted with red light.

The sensitized gelatin roller being thus made and being kept dark until it is used, I proceed as follows: I measure the flexible translucent picture of Fig. 1 and reduce its vertical dimension, if necessary, so that that dimension corresponds exactly with the circumference of the sensitized gelatin roller. Thereupon I bend that flexible picture firmly around that roller and bring its opposite edges exactly together by means of a cord laced through the two sets of holes shown in Fig. 1, and which holes and which cord are shown in their final relations to each other in Fig. 2. I then expose the sensitized gelatin roller, with the translucent picture thereon, to light passing through the translucent parts of the picture, and I continuously revolve the roller at uniform speed during this exposure or otherwise insure uniformity of action of light through the translucent picture upon the sensitized gelatin roller during the exposure. This exposure to light continues for spaces of time varying from five to ten minutes, and it results in hardening the different areas of the sensitized gelatin coating on the gelatin roller in proportion to the number of rays of light reaching those areas, respectively, through the different areas of the translucent picture of Fig. 1. As no rays of light will pass through the area covered by the opaque letter "R" of that translucent picture, the corresponding area of the gelatin roller is not hardened; but as strong and uniform rays of light will pass through the translucent areas of the picture of Fig. 1 the corresponding areas of the gelatin roller are uniformly hardened by the exposure. The sensitive baked gelatin roller having been thus exposed to light, the translucent picture is removed therefrom in a dark room or in a room dimly lighted with red light, and then the roller is immersed and bathed in that room first in slightly-warm water and then in cool water. That bathing causes the absorption of water by the unhardened parts of the gelatin coating of the roller, and the absorbed water causes those parts of that gelatin coating to swell up, and that swelling brings the letter "R" into relief on the gelatin surface, while leaving in depression the other parts of the periphery of the gelatin roller. If I am working in a temperature above 65° Fahrenheit, I next bathe the gelatin roller for from three to five minutes in a solution of five drams of chrome-alum in twenty-four ounces of water; but this bathing is not necessary when I am working in a temperature as low as 60° Fahrenheit. The bathing of the gelatin roller in the solution of chrome-alum tends to prevent the swollen area of the gelatin from receding entirely down to the original concentric surface of the roller when the water is absorbed from that swollen area by the drying of the roller by means of a current of air produced by an electric fan or otherwise and which drying is the next operation to which the roller is subjected. Still that drying causes the swollen area of the gelatin to somewhat recede; but the gelatin coating under that area remains comparatively soft and porous, while the gelatin coating under the depressed parts of the surface of the periphery of the roller continues to be comparatively hard and dense. The gelatin roller having been thus developed, I revolve that roller in a pan containing the above-described glycerin

solution, so that each part of the periphery of the roller passes successively through that glycerin solution. That solution adheres to and is absorbed by the relief parts of the periphery of the roller because they are porous; but it is repelled by its depressed parts because they are hard. I then remove the surplus glycerin from the developed gelatin roller by means of tissue-paper applied thereto and removed therefrom, and I repeat this operation, if necessary, until no free glycerin solution remains upon any part of the gelatin surface. The gelatin roller of Fig. 2 having been thus developed and dried and treated with glycerin solution is placed with its shaft in the inking-machine of Figs. 3 and 4, where it is designated by the numeral 2. The numeral 3 in those figures indicates an inking-roller for applying ink to the gelatin roller 2, and the numerals 4 and 5 indicate a pair of distributing-rollers for distributing ink uniformly to the periphery of the inking-roller 3, while the numeral 1 indicates a copper roller for receiving ink from the gelatin roller.

The ink which I use in my inking-machine is composed by melting together one pound of asphaltum, one pound of rosin, half a pound of beeswax, one pound of mastic, and three ounces of mutton-tallow and then mixing that composition with double its quantity of the crayon-ink of commerce, which crayon-ink is composed of cooked linseed-oil and lampblack without any fat.

The rollers 1, 2, 3, 4, and 5 being placed and adjusted in the inking-machine in the relations shown in Fig. 4, the crank 6 and the roller 3 are turned in a clockwise direction, as indicated by the arrow upon the end of the roller 3 in Fig. 4 and by the arrow which surrounds the shaft of that roller in Fig. 3. That turning operates, through the gears 7, 8, and 9, to turn the gelatin roller 2 in an anticlockwise direction and to turn the copper roller 1 in a clockwise direction, as indicated by the arrows on the ends of those rollers in Fig. 4 and by the arrows around the shafts of those rollers in Fig. 3, respectively. The turning of that inking-roller 3 in contact with the gelatin roller 2 results in the application of ink to the depressed areas of the periphery of that gelatin roller, but does not result in the application of any ink to the relief area of that periphery, because the ink is repelled from that relief area by the glycerin solution therein. The turning of the gelatin roller 2 in contact with the copper roller 1 transfers ink from the depressed areas of the gelatin roller to the corresponding areas of the copper roller, while leaving naked that area of the copper roller which corresponds with the relief-letter "R" upon the gelatin roller. This transfer of ink from the depressed areas of the gelatin roller to the copper roller requires that the two rollers shall be held in very close rolling contact during the operation and be thus held with considerable pressure. To that end the copper roller is mounted on the sliding block 10 and is forced into hard contact with the gelatin roller by means of the screw 11, turned by the crank-wheel 12, and turning in the threaded opening through the bracket 13, which is firmly bolted or otherwise attached to the foundation-frame of the inking-machine of Fig. 4.

The copper roller 1 and the gelatin roller 2 are preferably exactly equal in circumference or have those dimensions in multiple relation to each other, so that the two rollers may be turned in mutual contact more than once without varying the location of deposit of ink on the copper roller. That capability enables me, by repeated turning of the two rollers in contact, to certainly transfer all the ink from the gelatin roller to the copper roller or to transfer at least enough ink to complete the desired deposit upon the copper roller, and the two rollers must be exactly equal in circumference or must have those dimensions in multiple relation to each other where the design applied by the gelatin roller to the copper roller is continuous, so that whatever design encircles the gelatin roller without a break may likewise encircle the copper roller without a break and may be repeatedly printed without a break by the copper roller upon a strip of cloth or paper.

The copper roller may be made to have more than one identical printing-surface either by making more than one identical printing-surface on the gelatin roller or by giving the copper roller a circumference two or more times greater than that of the gelatin roller, so as to multiply on the copper roller the printing-surfaces of the gelatin roller.

The copper roller being provided with a deposit of ink from the gelatin roller, I remove the copper roller from the inking-machine and proceed as follows: I change the ink upon the periphery of the copper roller into an enamel by means of the application thereto of an enameling-powder and by means of heat. That enameling-powder is composed of two parts of rosin, one part of shellac, and two parts of alcohol melted together and then cooled and finely pulverized. I apply that powder with a cotton ball to the inked surface of the copper roller, so as to make the powder adhere to the inked portions of that surface without adhering to the naked portions thereof. Then I heat the copper to a temperature high enough to melt the enameling-powder into the ink to which it has adhered. This heating results in changing the ink on the surface of the copper roller into an enamel, and that enamel will protect those areas of the copper roller covered thereby from the eating of the etching liquid which is subsequently applied to the copper roller. I next protect the interior of the copper roller, if it is hollow, and also its ends with asphalt

varnish from the action of the etching liquid, which I next apply to the periphery of that roller. I make that application by simply causing the roller to rotate above a pan containing the etching liquid and with all portions of the periphery of the roller successively passing through the etching liquid in the pan as the roller is rotated. That etching liquid, which may be chlorid of iron, eats into the naked portions of the periphery of the copper roller, while not affecting those portions of that periphery which are covered by the enamel. I cause the etching liquid to do its etching work for a greater or less length of time, according as I intend to etch more or less deeply into the periphery of the copper roller. After the periphery of that roller has been etched I wash it with water to remove the etching solution, and then I remove the enamel from its relief-surface with turpentine. The copper roller 1 having been thus provided with the depressed letter "R" upon its periphery is ready to be put in a printing-machine and used there to print the letter "R" successively upon a strip of paper or cloth. When in place in such a machine, ink or "color" is applied to the entire periphery of the copper roller by an inking-roller proper for that purpose; but that ink or color is scraped from the relief parts of the periphery of the copper roller by a scraper so straight and stiff that it will be held out of the depressed parts by the relief parts and will leave a uniform continuous deposit of ink in all parts of the depressed letter "R" on the periphery of the copper roller, while leaving no ink on the relief parts of that periphery. Thereupon a strip of paper or cloth is drawn between the copper roller and a plain roller opposite thereto, and the depressed letter "R" upon the periphery of the copper roller deposits ink enough to print the letter "R" upon that strip of paper or cloth once for each revolution of the copper roller.

The program particularly illustrated by the drawings relates to intaglio-printing in one of the simplest ways provided for by my present invention. A desirable addition to that program consists in making the depressed printing-surface on the copper roller 1 with a series of minute ridges or peaks of copper extending upward from the bottom of that depression instead of making the bottom of the depression flat. The function of such ridges or peaks consists in preventing the scraper which removes ink or color from the relief-surfaces of the roller from descending to the flat bottom which would exist in that depression in the absence of those ridges and peaks and from thus removing the ink or color from that depression, as well as from the relief-surfaces of the roller. Continuous ridges of copper extending upward from the bottom of the depression in the roller are preferable to peaks, and it is desirable to make those ridges diagonal instead of being parallel to the axis of the roller in order that the edge of the scraper shall never be parallel with those ridges as the roller passes under the scraper during its revolution.

Where a copper roller is to be prepared for printing on paper, the ridges or peaks which extend upward from the bottom of the depressed printing-surface thereof should be not quite flush with the relief-surfaces of the roller, for if made quite flush those peaks or ridges might prevent a continuous deposit of ink on the paper opposite to the depressed printing-surface; but where a copper roller is to be prepared for printing on absorbent cloth these ridges or peaks should extend upward flush with the relief-surfaces of the roller, for the capillary attraction of such cloth will spread the color over the lines or dots of space opposite to those peaks or ridges, and will thus complete a continuous deposit of color on the cloth opposite to the general depression on the copper roller, and because ridges or peaks that are thus flush will perform their function more perfectly in cloth-printing than they would if not flush.

The desired ridges or peaks may be made to extend upward from the bottom of the depressed surface in the copper roller by means of the application of ink in lines or in dots to the otherwise naked surface of the copper roller in order to limit the action of the etching liquid to the spaces between those lines or around those dots instead of exposing the entire proposed intaglio-printing surface of the roller to the action of the etching liquid.

My invention is not only applicable to printing a plain flat character like the letter "R" upon a strip of paper or cloth from the depressed surface of a copper roller, according to the particular program illustrated by the drawings, but it is also applicable to printing a picture in a modulated color by means of the depressed surface of a copper roller upon a strip of paper or cloth. Thus, for example, I can print a picture of a rose instead of printing the letter "R" upon a strip of paper or cloth with ink deposited on that material from a depressed surface on the periphery of a copper roller. In order to accomplish this result, the depressed surface of the roller must be provided with numerous irregular and irregularly-distributed peaks of copper extending upward from its bottom, so that the depressed surface will not make a uniform and continuous deposit of ink or color upon the paper or cloth, but will make numerous minute, irregular, and irregularly-distributed deposits of ink or color upon the paper or cloth, which numerous deposits may not be separately recognized by the naked eye, but will appear to constitute such a modulated deposit of ink, shading from dark

to light, as will cause the whole deposit of ink to represent all the parts and shadings of the rose.

In order to produce a copper roller having a depressed printing-surface upon its periphery adapted to printing a picture of a rose upon a strip of paper or cloth, it is proper to modify the particular program illustrated by the drawings and explained in the foregoing parts of this specification by the following changes in that program: Those changes begin by painting the picture of a rose upon such a thin, flexible, translucent, celluloid sheet as that which is shown as having the reversed letter "R" thereon in Fig. 1 of the drawings, and those changes continue by adding a solution of one hundred and forty grains of chlorid of calcium in three ounces of water to the sensitized gelatin emulsion employed in producing the final gelatin coat upon the gelatin roller of Fig. 2, and those changes conclude by applying that flexible sheet with the rose painted thereon to the thus doubly-sensitized gelatin roller of Fig. 2. The subsequent exposure of the doubly-sensitized gelatin roller to light passing through the celluloid sheet having the rose painted thereon produces the following additional result: That additional result consists in numerous eruptions in those parts of the surface of the periphery of the doubly-sensitized gelatin roller which are under the different parts of the picture of the rose. Those eruptions are distributed irregularly over those parts of the surface of the periphery of the gelatin roller, being less numerous and less wide in those parts of that periphery which were under the darker parts of the rose than in those parts of that periphery which were under the lighter parts of the rose on the translucent celluloid sheet, because the eruptive tendency of the different particles of the chlorid of calcium in the gelatin coating of the roller is in direct proportion to the amount of light reaching those particles, respectively; but those eruptions, though potentially caused by the chlorid of calcium in the gelatin coating of the roller, are not actually developed therein by the exposure of the gelatin roller to light passing through the different parts of the rose upon the celluloid sheet. That actual development results from the subsequent bathing of the gelatin roller in water. The eruptions which are developed by the water at that time result in making irregular cracks, more or less wide and more or less near together, in those parts of the surface of the periphery of the gelatin roller which were under the picture of the rose during the exposure to light, the wider and more frequent cracks developing in those parts of the gelatin coating which were under the lighter parts of the rose and the narrower and more infrequent cracks being developed in those parts of the coating which were under the darker parts of the rose. Many of those cracks intersect each other, but some of them are isolated from the others. The sizes of the cracks can be varied by varying the proportion of the chlorid of calcium in the sensitized gelatin emulsion. The presence of the chlorid of calcium in the sensitized gelatin coating of the gelatin roller will also result in producing larger and more numerous cracks in those portions of the surface of the periphery of the roller which were under the uncovered translucent celluloid sheet having the rose painted thereon than will be produced in those parts of the surface of the periphery of the roller which were under the rose during the exposure of the gelatin roller to the light through the translucent celluloid sheet; but those more numerous and larger cracks will be in the bottoms of the most depressed parts of the gelatin roller and will not be separately represented by the ink deposited by those depressed parts upon the copper roller, because those depressed parts will be filled with ink over their entire areas from the inking-roller 3, and will therefore transfer to the copper roller 1 a continuous deposit of ink.

My invention is also applicable to printing a plain flat character like the letter "R" or a modulated picture like that of a rose from the relief-surface of a copper roller upon a strip of paper or non-absorbent cloth, as well as from a depressed surface of such roller. Relief-printing of either of these kinds involves the following changes from the foregoing description of intaglio-printing: The first of those changes consists in using a negative translucent picture instead of such a positive translucent picture as that of Fig. 1 of the drawings or such a positive translucent picture as would result from painting a rose upon a sheet of translucent celluloid. Where the result to be accomplished is the production of a strip of paper with the letter "R" repeatedly printed thereon, as in Fig. 5 of the drawings, the translucent sheet of Fig. 1 will have a naked letter "R" instead of a painted one and will have its background uniformly opaque instead of being uniformly translucent. The application of such a sheet to the gelatin roller of Fig. 2 and the exposure of that gelatin roller to light through that sheet would result upon subsequent bathing of that roller in water in raising into relief those portions of that roller which are shown as black in Fig. 3, while leaving in depression those portions of the periphery of that roller which constitute the white letter "R" of that roller in that figure. The subsequent treatment of that gelatin roller with glycerin solution would cause those portions of its periphery which are black in Fig. 3 to repel ink, while those portions which are white in Fig. 3 would receive ink from the inking-roller 3. The gelatin roller 2 being

thus provided with ink upon those portions of its periphery represented by the letter "R" and not provided with ink upon the other portions of its periphery would simply print the letter "R" in ink upon the copper roller 1, and that ink being changed into an enamel, as above described, and the copper roller being thereupon etched, as above set forth, the result would be the formation upon the periphery of the copper roller of a naked letter "R" in relief, surrounded by depressed portions corresponding with those that are shown as black in Fig. 3. Those depressed portions would be made deeper by longer etching than were the depressed portion constituting the letter "R" in the former example, because printing from the relief-surface of a copper roller necessitates a greater difference between its relief-surfaces and its depressed surfaces than is proper where the depressed surfaces are to be used as the printing-surfaces. A copper roller being thus provided with the letter "R" in high relief, such a roller would be placed in a printing-press and would receive ink upon its relief-surface and would print that ink in the form of a letter "R" upon a strip of paper or non-absorbent cloth drawn between that roller and a plain roller adjacent thereto once for each revolution of the copper roller. Where a modulated picture like the picture of a rose is to be printed on paper or non-absorbent cloth from the relief-surface of a copper roller, that copper roller can receive such a relief-surface by means of the same program, as the result of which it would receive the representation of a rose in depression, except that in this case the picture of the rose upon the translucent sheet of Fig. 1 would be a negative picture instead of a positive one in that the parts of the rose which are to be darkest in the ultimate picture upon paper would be lightest in the picture upon the translucent celluloid, while the parts which are to be lightest in the ultimate picture would be darkest in the corresponding picture on the translucent celluloid and except that the background of the picture of the rose upon the flexible celluloid would be opaque instead of being transparent. My invention is also applicable to printing a plain flat character like the letter "R" or a modulated picture like that of a rose from the depressed surface or from the relief-surface of a copper plate upon a sheet of paper or other suitable material, as well as from the relief-surface or the depressed surface of a copper roller. To prepare a copper plate for any one of these kinds of printing, the most nearly corresponding program for preparing a copper roller will be varied by transferring ink from the gelatin roller of Fig. 2 to a copper plate instead of to the copper roller 1 and in some other particulars which will be obvious to persons skilled in the prior art. My invention is also applicable to relief or to intaglio printing from rollers or plates of other metals than copper, except that different metals are best etched with different etching liquids and produce different results in respect of cost and merit. So, also, a planographic-printing surface may be made on a slab of stone or a plate of zinc by means which include the use of my gelatin roller for printing a picture upon stone or zinc and which include such other means as would be employed if the same picture were to be put upon the surface of the stone or zinc by the pen of an artist.

My invention is not only available for printing from one metal roller or plate or from one slab of stone upon a strip or sheet of paper or cloth, but it is also available for the preparation and printing of two or even ten such rollers, plates, or slabs with mutual registration upon one strip or sheet of paper or cloth in order to produce a picture or other print composed of a plurality of lapping or non-lapping colors. Further information relevant to three-color printing and to multi-color printing can be read in the Ippertype patent, No. 785,735, of March 28, 1905, and in the Reckard patent, No. 788,377, of April 25, 1905, and the applicability of my present invention to those kinds of printing is evident in the light of those patents without further statements in this specification.

I claim as my invention.

1. The following process of photomechanical printing: making a roller, having a sensitive gelatin coat; exposing that sensitive gelatin roller to light, through a partly-translucent and partly-opaque flexible sheet, bent upon the periphery of the roller; developing that exposed gelatin roller, by bathing it in water, and thereby swelling some parts of its surface into more or less relief, while leaving other parts of its surface in more or less depression; drying that developed gelatin roller in air; applying glycerin solution to the relief-surfaces of that developed gelatin roller; applying ink to the depressed surfaces of that gelatin roller; transferring ink from the depressed surfaces of that gelatin roller, to the surface of a metal roller or plate; etching away the naked surfaces of that metal roller or plate; applying ink or color to that metal roller or plate; and transferring ink or color from that roller or plate, to whatever fabric, paper or other material constitutes the base of the print which results from the process; all substantially as described.

2. The following process in photomechanical printing: making a roller, having a sensitive gelatin coat; exposing that sensitive gelatin roller to light through a partly-translucent and partly-opaque flexible sheet, bent upon the periphery of the roller; developing that exposed gelatin roller by bathing it in water, and thereby swelling some parts of its

surface into more or less relief, while leaving other parts of its surface in more or less depression; drying that developed gelatin roller in air; applying glycerin solution to the relief-surfaces of that developed gelatin roller; applying ink to the depressed surfaces of that gelatin roller; transferring ink from the depressed surfaces of that gelatin roller, to the surface of a metal roller or plate; and etching away the naked surfaces of that metal roller or plate; all substantially as described.

3. The following process in photomechanical printing: making a roller, having a sensitive gelatin coat; exposing that sensitive gelatin roller to light through a partly-translucent and partly-opaque flexible sheet, bent upon the periphery of the roller; developing that exposed gelatin roller by bathing it in water, and thereby swelling some parts of its surface into more or less relief, while leaving other parts of its surface in more or less depression; drying that developed gelatin roller in air; applying glycerin solution to the relief-surfaces of that developed gelatin roller; applying ink to the depressed surfaces of that gelatin roller; and transferring ink from the depressed surfaces of that gelatin roller, to a solid surface of metal or stone; all substantially as described.

4. The following process in photomechanical printing: making a roller, having a sensitive gelatin coat; exposing that sensitive gelatin roller to light through a partly-translucent and partly-opaque flexible sheet, bent upon the periphery of the roller; developing that exposed gelatin roller by bathing it in water, and thereby swelling some parts of its surface into more or less relief, while leaving other parts of its surface in more or less depression; and drying that developed gelatin roller in air; all substantially as described.

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