

UNITED STATES PATENT OFFICE.

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PROCESS OF PRODUCING MULTICOLOR PRINTS.

No. 814,108.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN BACHMANN, a citizen of the United States of America, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Processes of Producing Multicolor Prints, of which the following is a specification.

This invention has reference to improvements in process of producing multicolor prints.

It pertains particularly to a multicolor-printing process by means of which colored prints resembling lithographic reproductions are produced with the ordinary type-printing press, which heretofore were made exclusively by chromolithographic processes. The multicolor prints obtained by my novel process are cheaper than those produced from lithographic stones, but cannot be distinguished as to quality and perfection from the very best of chromolithographic prints. To attain this desirable result, I have modified old methods and added new features, phases, or steps to the methods known to the arts of photography and typography. These when combined and employed in proper order constitute a novel process by means of which the desirable object above stated is accomplished.

The novelty of the invention, therefore, consists partly in the sequence of the various steps of my process which are necessary for producing multicolor prints from a type-printing press as perfect as same could be obtained heretofore only by chromolithographic processes.

In carrying out my invention I substantially proceed as follows: As a copy for reproduction I can use any kind of sketch or copy which is fit for lithographic purposes, and it is not necessary to prepare an expensive special kind of copy. The first step of the process is to photograph the copy. Three negatives of the desired size are made in the usual manner by means of color-filters. One negative is for yellow, one for red, and the third one for blue. For certain subjects a fourth negative is desirable, which I call the "neutral" one—that is, an ordinary photographic negative made without the use of color-filters. It must be left to the judgment of the operator to determine what kind and number of negatives are required in each instance. He will soon learn to discriminate. In the production of fancy cigar-labels it is required to emboss them after they have been printed.

This is done from an engraved metal die stamped on an embossing-press. In order to engrave such a die and make it to correspond with the printed design which is to be embossed, a key or outline to guide the engraver must be obtained. In such a case it will be found economical to make a tracing of the copy in black ink on a thin transparent sheet of gelatin. Then while exposing for any one of the aforesaid negatives the exposure is interrupted after three-quarters of the required time have elapsed. Now the transparent sheet of gelatin with the black tracing on it is placed in its exact position over the copy before the camera. When this is done, the exposure is continued for the last quarter of time. This will leave just enough indication on the negative to give the required key for guiding the engraver of the embossing-plate, but not enough to interfere with or impair the other later-on-mentioned usefulness of the negative. The glass plates for the chromate-gelatin coating are next prepared. The sensitive gelatin plates when exposed under the color negatives and rolled with a printer's roller charged with printing-ink will show a grained surface, which represents the color values. The plates are prepared in the following manner: A plate of glass one-quarter inch thick, which was previously ground with emery, is thoroughly cleaned. Then a solution is flown thereon which consists of one pound of porter (English malt liquor) and five grams of caustic soda. This mixture is put into an open tray and slightly heated. When the last trace of foam has disappeared from the surface of the solution, then one-half of an ounce of silicate of sodium is gradually poured into the tray from a graduate and mixed with the solution while constantly stirring same. The solution thus prepared is now filtered. Should same become cloudy, then it can not be used and must be thrown away. If this solution turns out clear, then the plates are coated with same. Now they are allowed to dry while standing each on one edge. The dry plates are then rinsed in hot water for the purpose of removing the glucose of the coating which was originally contained in the porter. The plates thus prepared may be stored for an indefinite period of time. The next step is the preparation of the sensitive gelatin solution. This is an emulsion composed of five hundred parts of water, fifty parts of white gelatin, fifteen parts of bichro-

mate of potassium, and one-tenth of one part of chrome-alum. It is prepared and compounded in the following order: The white gelatin is allowed to soak in cold water for several hours. Then it is gradually heated up to the boiling-point and boiled for about ten minutes. Now it is filtered and allowed to cool down to a degree not above 120° nor below 110° Fahrenheit. At this temperature the powdered bichromate of potassium is added while constantly stirring. After the bichromate of potassium has been completely dissolved the chrome-alum, dissolved in a small quantity of water, is added drop by drop while still stirring. The solution is now ready for immediate use or may be kept for future application, but not longer than about ten days. The plates are now coated with the described sensitive gelatin solution and baked. In order to bake the plates properly and at the same time retain the possibility of producing the grain, a box is required which can be heated from below. In this box, which may be called an "oven," a tripod is placed, which is provided with three set-screws. When the tripod has been leveled, then the coated plates are placed thereon and baked. Care must be taken that the degree of heat in the oven is ascertained and regulated. When the oven is ready for use, then the plate is placed therein and leveled on the tripod. Now the oven is heated up to 150° Fahrenheit, and when this temperature is reached then the plate is taken out, placed on a level surface, and the emulsion cast over same. The thicker the coating on the plate the more open the grain will become. The plate is now put back into the oven and the temperature therein gradually reduced to 120° Fahrenheit. This temperature is maintained until the plate is dry, which will require about two hours. Now the sensitive chrome-gelatin plates are finished. They may be used at any time within ten days. These plates are made to be exposed under the negatives and developed. The exposed image when rolled over with a roller and printing-ink will appear to the eye and found to be in the nature of a grained texture. From these plates surface-prints are drawn on a press.

The exposure of the chromatic plate under the negative is the stage in the process during which the texture is developed into a printing possibility. I proceed here in a manner different from any employed in any other known method. Before exposing the chrome-gelatin plate same is again placed in the oven in which it was baked; but before doing so a pan with water is put at the bottom of the oven for the purpose of creating moisture. Now heat is applied and the temperature brought up to 100° Fahrenheit. When the plate has become warm in the moist atmosphere, which will require about six minutes,

then it is ready to be exposed under the negative. How long the exposure should last depends on the light. When exposing in a frame, then this is easily determined by looking at the back of the glass and through same. The print is complete when the deepest shadows have a transparent appearance. After this the plate is taken into the dark room and washed in running water to remove the chromate. Then it is taken out of this room and dried.

Before printing from the gelatin plate with printing-ink the plate must first be dampened for about fifteen minutes with a solution composed of five hundred parts of water, four hundred parts of glycerin, fifty parts of ammonia, and fifty parts of common salt. The plate is now put on the press and rolled over with a leather roller charged with black ink. The image will soon begin to show, and when it has developed or its values have appeared to the eye in the form of black printing-ink to the required extent then the paper can be laid directly on the plate and an impression drawn. Upon inspection of this impression it will be found to be of a fine open grain in texture. It becomes closer approaching the shadows and absolutely solid black where the color in the original copy is deepest. From such described plates charged with black printing-ink impressions are now drawn on white paper or cardboard.

Assume that a job has to be done which requires three of the later-on-described metal printing-plates of one color—say blue. In order to get them, I employ the following method: The gelatin plate, which has been exposed under the blue negative, is moistened with water containing ammonia and rolled over with a leather roller charged with the stiffest of black ink. The very deepest parts of the image of the plate only will take the black printing-ink, and as the deepest blue on the copy corresponds with these parts of the plate it is natural that an impression drawn therefrom will represent that value in black. For the medium blue I use less-stiffened ink, roll longer, and use less ammonia in the dampening-water. For the pale blue I use soft ink, no ammonia in the dampening-water, and roll until the last possibility in the plate is developed or made visible in the form of black printing-ink. Prints obtained in this way would make a fair copy for reproduction by photoengraving; but as finished products from such plates they would not fulfil the requirements for the commercial object set out—that is, goods resembling lithographic work—as the grain texture differs therefrom. Therefore I employ additional means for accomplishing my purpose. After all the required impressions from the gelatin plate are drawn in black this plate is washed clean with turpentine, and the same is again rolled over with a roller charged with a pale-

blue ink of such consistency as will allow itself to adhere to the entire image on the gelatin plate. From this so-inked plate with light-blue color an impression is once more drawn on the same sheet that has before been printed in black from that gelatin plate. Care must be taken that it will register exactly to the one in black. This is easily done by the use of pointing-needles. This blue print is necessary for a guide in retouching the prints in black, and as this, what may be called a "key," is in light-blue color, this color will have no effect upon the negative, which must later on be taken from the black print. The black prints from the chromate-gelatin plate with the blue key now passes to the hands of a man known as a "stippler," whose task is to join his art to the existing texture found in the black print. From the chromate-gelatin plate this can be done with a pen, brush, or whatever may be most found practical to give the prints the earmark of lithography. From these prints drawn from the chromate-gelatin plate and treated by the stippler to give them the earmarks of lithography negatives are now taken, preferably by what is known in photography as the "wet-plate process." It may be well to mention here that I have simplified the treatment in some instances in this way by first making the blue print from the chromate plate, and then on top of this the black is printed from the gelatin plate for the deepest color. After the print has passed the hands of the stippler a negative is taken from same. Its use is explained farther down. When this has been done, I take the same print again and print from the chromatic plate the values of the medium shade whereby the print in the darker parts will be intensified. This leaves only the extended medium shades to be treated by the stippler. Now I take a negative of this print and proceed in the described manner with the next shade. Thus I obtain the three negatives practically from the one positive.

After having all the negatives from either kind of prints from the gelatin plates and treated by the stippler as hereinbefore described it solely remains to make the typocolor plates—that is, the actual color-printing plates which are to be put in the press and from which the editions are printed. These plates are made of copper one-sixteenth of an inch thick. They are first highly polished and then coated with a solution consisting of the following substances: Two ounces of albumen in two ounces of water, two ounces of liquid glue in two ounces of water, then twenty grains of bichromate of ammonium and one grain of chromic acid. The plates are now put on a swivel over a mild flame and constantly turned until they are dry, which will require about five minutes. When thoroughly dry, and before being cooled off, the

plates are placed on the negative which has been taken from the prints treated by the stippler. This is done in a frame which has been held ready. All these operations have to be performed in the dark room. The plate in the frame is now exposed to light under the negative made from the gelatin plate and treated by the stippler. For making prints the plate is exposed, preferably, to sunlight for printing. This will take from three to five minutes. The time must be gaged from the density of the negative. Upon returning with the frame to the dark room the plate is taken out and placed on a stone slab. A thin composition of asphaltum and turpentine is then spread over the plate with a roller and the plate held under fine spraying water. It will soon be noticed that wherever the light has acted the asphaltum will remain, while the rest will disappear under the influence of the spraying water, leaving thus an unprotected surface on the plate. This surface remains subject to the action of acid. It is absolutely necessary for this kind of work that the plates receive a relief such as will make them adapted to print from. This must be attained by what is termed the "first etching." The etching fluid employed here is composed of eighty parts of chlorid of iron and twenty parts of gum-arabic. This, together with the asphaltum used as a protection to the relief, will yield the desired depth. After trimming and routing the plate is ready for printing-press.

In the described manner a special plate is prepared for each color or shade, and the printing of the finished product is done from these plates in the type-printing press.

Thus I have provided a process for producing multicolor prints from the type-printing press which are considerably cheaper than those obtained by chromolithographic processes, but cannot be distinguished from them as to perfection and quality.

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

1. The process of producing multicolor prints from the type-printing press consisting in making negatives from the copy to be reproduced by means of color-filters, preparing first the photographs from the copy, then a tracing of same on a thin gelatin film, exposing the negative for three-quarters of the time necessary for extracting the color, placing the tracing over the negative and exposing the last quarter of time, preparing then sensitive chrome-gelatin plates, exposing same under the negatives, producing thereby positives on the sensitive plates, developing the positives, making several negatives of various shades of each positive, preparing then the typocolor plates from these negatives, placing said plates into the type-printing press and printing therefrom.

2. The process of producing multicolor prints from the type-printing press consisting in making negatives from the copy to be reproduced by means of color-filters, preparing then the sensitive chrome-gelatin plates by first coating a ground and well-cleaned glass plate with a clear solution of porter containing some caustic soda and silicate of sodium, drying the plate, removing therefrom the glucose of the porter by hot water and applying then the sensitive chrome-gelatin coating, exposing the sensitive plates thus obtained under the negatives, producing thereby positives thereon, developing the positives with printing-inks, making several negatives of various shades of each positive, preparing the typo-color plates from these negatives, placing said plates into the type-printing press and printing therefrom.

3. The process of producing multicolor prints from the type-printing press consisting in making negatives from the copy to be reproduced by means of color-filters, preparing then the sensitive chrome-gelatin plates by first coating a ground and well-cleaned glass plate with a clear solution of porter containing some caustic soda and silicate of sodium, drying the plates, removing therefrom the glucose of the porter by hot water and applying then a sensitive chrome-gelatin emulsion prepared from five hundred parts of water, fifty parts of white gelatin, fifteen parts of bichromate of sodium, and one-tenth part of chrome-alum, exposing the sensitive chrome-gelatin plates thus obtained under the negatives, producing thereby positives thereon, developing the positives with printing-inks, making several negatives of various shades of each positive, preparing the typo-color plates from these negatives, placing said plates into the type-printing press and printing therefrom.

4. The process of producing multicolor prints from the type-printing press consisting in making negatives from the copy to be reproduced by means of color-filters, preparing then the sensitive chrome-gelatin plates, subjecting said plates to a hot moist atmosphere at 100° Fahrenheit, exposing then the moist and warm sensitive plates under the negatives to develop the texture into a printing possibility and producing thereby positives thereon, taking then the plate into the dark room and washing out the chromate, drying then the plate in the open, dampening the plate with a solution containing ammonia, rolling the plate with a leather roller charged with stiff black ink, taking a print therefrom which represents the darkest value in black, dampening the plate with a solution containing less ammonia, rolling on for a longer time with less-stiff ink, taking a print therefrom which represents the medium shade of black, dampening the plate again with a solution free from ammonia, rolling on longer

yet with soft ink, taking a print which represents the light shade of black, washing the plate now with turpentine, rolling it up with a roller charged with blue ink whereby the entire image appears in blue, printing this over the one in black, stippling the plate, taking a negative of this, printing now on the same print from the chromatic plate the values of the medium shade, stippling then the extended portions of the medium shades, taking a negative of this, printing now on the same print from the chromatic plate the values of the pale shade, stippling again, and taking a negative of this, preparing then the typo-color plates from these negatives, placing said plates in the type-printing press, and printing therefrom.

5. The process of producing multicolor prints from the type-printing press consisting in making negatives from the copy to be reproduced by means of color-filters, preparing then the sensitive chrome-gelatin plates by first coating a ground and well-cleaned glass plate with a clear solution of porter containing some caustic and silicate of sodium, drying the plates, removing therefrom the glucose of the porter by hot water, and applying then a sensitive emulsion prepared from five hundred parts of water, fifty parts of white gelatin, fifteen parts of bichromate of potassium, and one-tenth of one part of chrome-alum, drying then the plate at about 120° Fahrenheit, subjecting it now to a hot moist atmosphere at about 100° Fahrenheit, exposing the moist and warm plate under a negative, producing thereby positives thereon, developing the positive with black and colored printing-inks, making several negatives of various shades of each positive, preparing the typo-color plates of copper from these negatives, placing the typo-color plates in the type-printing press, and printing therefrom.

6. The process of producing multicolor prints from the type-printing press consisting in making negatives from the copy to be reproduced by means of color-filters by preparing first photographs from the copy, then a tracing of same on a thin gelatin film, exposing the negative under the color-filter for three-quarters of the time necessary for extracting the color, placing the tracing over the negative and exposing the last quarter of time, preparing then the sensitive plates by first coating a glass plate with a clear solution of porter containing some caustic and silicate of sodium, drying the plates, removing therefrom the glucose of the porter by hot water, and applying then a sensitive emulsion prepared from five hundred parts of water, fifty parts of white gelatin, fifteen parts of bichromate of potassium, and one-tenth of one part of chrome-alum, and drying the plates at about 120° Fahrenheit, subjecting the dry plates to a hot and moist atmosphere

at about 100° Fahrenheit, exposing the moist and warm plates under the negatives, producing thereby positives thereon, developing the positives with black and blue printing-ink, making several negatives of various shades of each positive, preparing the typocolor plates of copper from these negatives, placing said plates into the type-printing press and printing therefrom.

7. The process of producing multicolor prints from the type-printing press consisting in making first negatives of the copy to be reproduced by means of color-filters, preparing then the sensitive chrome-gelatin plates, subjecting same to a hot and moist atmosphere at about 100° Fahrenheit, exposing the moist and warm sensitive plates under the negatives, removing therefrom the chromate in the dark room by running water, and drying the plate in the open, dampening now the plate with a solution of water, glycerin, ammonia, and common salt, rolling the plate with a leather roller charged with stiff black ink, taking a print therefrom which represents the darkest shade of black, dampening the plate with a solution containing less ammonia, rolling on less-stiff ink for a longer time, taking a print therefrom which represents the medium shade of black, dampening the plate again with a solution free from ammonia, rolling on soft ink for a longer time yet, and taking a print which represents the light shade of black, washing now the plate with turpentine, rolling it up with a roller charged with blue ink, whereby the entire image appears in blue, printing this over the one in black, stippling the plate, taking a negative of this, printing now on the same print from the chromatic plate the values of the medium shade, stippling then the ex-

tended portions of the medium shade, taking a negative of this, printing now on the same print from the chromatic plate the values of the pale shade, stippling again, and taking a negative of this, preparing then the typocolor plates from these negatives, placing the typocolor plates into the type-printing press, and printing therefrom.

8. The process of producing multicolor prints from the type-printing press consisting in making first negatives of the copy to be reproduced by means of color-filters, preparing then the sensitive chrome-gelatin plates, exposing same under the negatives, producing thus positives thereon, developing the positives, making several negatives of various shades of each positive, preparing then the typocolor plates from these negatives by coating first highly-polished copper plates with a composition consisting of water, albumen, liquid glue, bichromate of ammonium, and chromic acid, heating then the plates gently while turning, and placing same then under the negatives in the dark room, making then prints by light, treating the plate in the dark room with a thin emulsion of asphaltum in turpentine, removing the excess of asphaltum under spraying water obtaining thereby an unprotected surface for the action of the etching acid, producing then a relief by the first etching with a solution composed of chlorid of iron and gum-arabic, trimming and routing the plate, placing it in the press and printing therefrom.

Signed at New York, N. Y., this 25th day of October, 1904.

JOHN BACHMANN.

Witnesses:

GEORGE H. BRUCE,
WILLIAM MEYER, Jr.