No. 671,165. Patented Apr. 2, 1901.

L. KÜHN.

PROCESS OF PRODUCING MULTICOLOR PICTURES.

(Application filed Jan. 24, 1896.)

(No Model.)

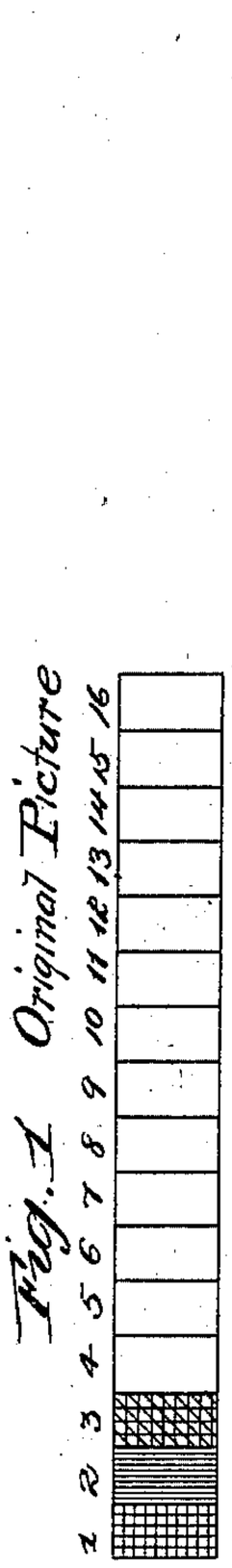

Fig. 1.

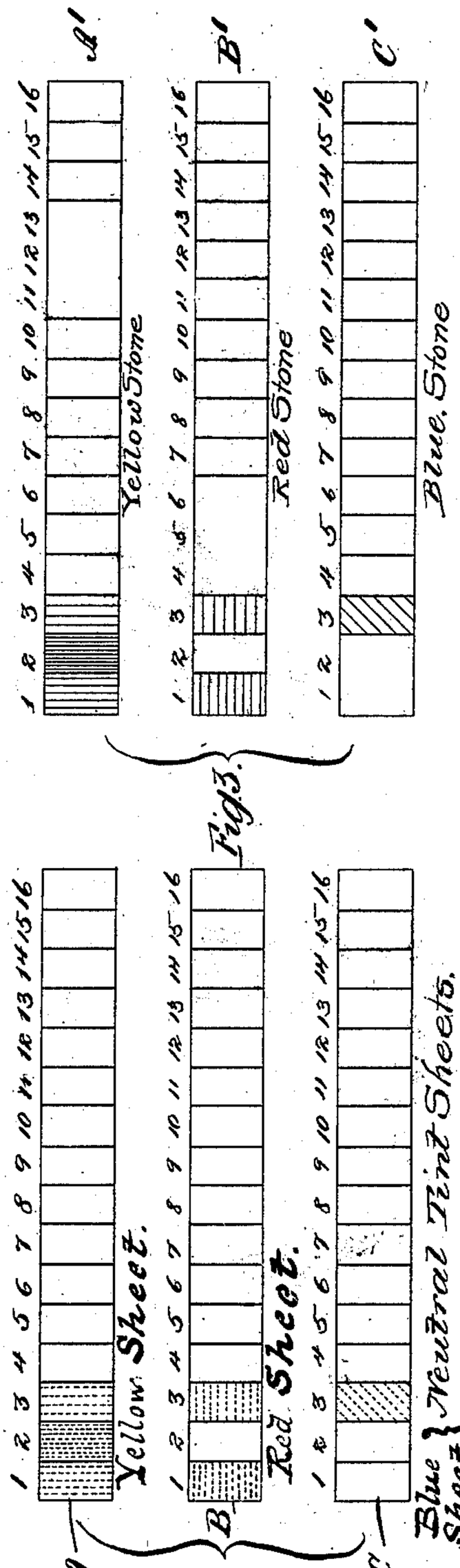

Fig. 3.

Fig. 2.

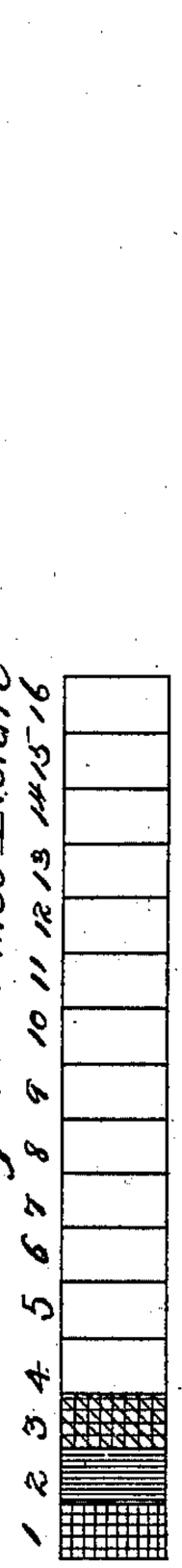

Fig. 4.

Fig. 5.

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PROCESS OF PRODUCING MULTICOLOR PICTURES.

SPECIFICATION forming part of Letters Patent No. 671,165, dated April 2, 1901.

Application filed January 24, 1896. Serial No. 576,693. (No specimens.)

To all whom it may concern:

Be it known that I, LUDWIG KÜHN, a subject of the King of Bavaria, residing at Nuremberg, in the Kingdom of Bavaria, Germany, have invented a new and useful Process of Producing Pictures of Many Colors, of which the following is a specification.

In making chromolithographs as generally practiced at the present time there are required many printing-blocks, each for a different tint or color, from which impressions are made one over the other upon the sheet on which the picture is to be made. The number of blocks required varies with the character of the picture to be reproduced and may range from ten to forty or more. This large number of blocks is rendered necessary because the eye cannot directly resolve the colors of the original into the primary colors, (red, blue, and yellow,) so as to be able to estimate their proportions in the compound colors of the original. If this were possible, the color-printer would have to provide and print practically from only three blocks, one for each of the primary colors. Already attempts to effect this have been made—for example, by the process described by Hosch in the German Patent No. 17,410 and also described in the United States Patent to Hosch, No. 287,938.

The present invention relates to a process which has for its object the reduction in number of the printing-blocks from which the chromo is actually printed to three, one for each of the primary colors.

In order to carry out the process, it is necessary to first make the number of blocks that would be required according to the ordinary method of printing, and by means of this number of blocks to prepare three blocks, one for each primary color, from which the chromo will actually be printed. For the sake of brevity and distinction the blocks first prepared will be termed "original blocks" and the three blocks subsequently prepared will be termed the "printing-blocks."

The original blocks are prepared in the usual manner, and each is for a tint or color different from the others, and each carries a printing-surface representing so much of the original design as is necessary to print in its color. Now each tint or color represented by these blocks may be resolved into its primary colors and also the particular shade of each primary color necessary to produce it either by the eye of the artist or by the aid of a suitable color-scale—such, for instance, as described in United States Patent to Hosch, No. 287,938. This having been ascertained, three sheets are provided, each to represent a primary color. The original blocks are then put into a press separately and an impression taken from each on one or more of the sheets, according to the primary color or colors into which the color of such block has been resolved. These impressions are printed not in the special colors, but in a neutral tint, such as gray or brown. Impressions are taken from each of the original blocks successively upon these sheets, such impressions being one over the other. After all the impressions necessary upon each sheet have been made each sheet will be a combination-sheet printed in a neutral tint representing all of one of the primary colors that would have been printed by all the original blocks in producing the chromo. From these sheets are produced by any suitable reproduction process—as, for example, photography—three printing-blocks which are used to print with the respective primary colors one over the other, and thus produce the chromo by making only three impressions on the sheet instead of as many impressions as there were original blocks.

As an illustration of carrying out my process reference may be had to the accompanying drawings, in which—

Figure 1 is a diagram which may represent a picture to be copied and which would require under the usual process sixteen blocks to print in the necessary colors. Fig. 2 is a diagram which may represent the three sheets produced by printing from the original blocks. Fig. 3 is a similar diagram which may represent the printing-blocks made by the reproduction thereon of the sheets in Fig. 2. Fig. 4 is a diagram which may represent the chromo produced by the impressions made one upon the other by the printing-blocks in

Fig. 3. Fig. 5 shows an arrangement of lines to indicate the primary colors—yellow, red, and blue.

It will be seen that I have arbitrarily indicated yellow by a series of vertical lines, red by a series of horizontal lines, and blue by a series of diagonal lines.

In Fig. 1 sixteen blocks are shown arranged side by side, each being supposed to represent one of the colors necessary to be used to reproduce the picture. While the blocks representing the colors are arranged side by side, it is of course understood that the sixteen colors present in the picture overlap. To avoid diffuseness in the specification, three of the blocks only are shaded, and these may be assumed to represent a flesh tint, the first yellow, and the first gray in blocks 1, 2, and 3, respectively, in Fig. 1. By the terms "first yellow" and "first gray" I mean the lightest shade of the respective colors present in the picture. The next darker shade would be termed "second yellow" or "second gray," as the case might be, and so on according to the number of different shades of the same color present in the picture. Now on resolving flesh tint into its primary colors it is found to contain yellow and red, and therefore it is arbitrarily represented by vertical and horizontal lines crossing each other at right angles. Now assuming an original block to be made for printing all the flesh tint in the picture, an impression would be made from such block on sheets A and B, representing yellow and red, respectively, in a neutral color—as, for instance, gray—and while the outline of these impressions would be the same on both sheets their degree of shade or depth of color might be varied according as the yellow or red might have to predominate. The flesh tint has a slight tendency toward yellow, and as the red is a somewhat more penetrating color it would be necessary to print sheet A a shade darker than sheet B.

A skilled color artist or printer is able to determine by sight only the primary colors necessary to produce any tint or color and also the particular shade of such primary colors and is also able to select the corresponding shade of neutral color; but for the purpose of readily determining the shade of the neutral color to be used the operator may have prepared four scales, one for each of the primary colors (yellow, red, and blue) and one for the neutral color. Each of these scales may have on it twenty or more different shades of its color, gradaully increasing in depth from the lightest to the darkest, and which may be numbered, beginning with the lightest shade of such color and ending with the darkest. Experience has proven that for practical purposes twenty different shades of one color are all that are essentially necessary in color-printing and that when more are used the successive shades cannot be readily distinguished by the naked eye. Assuming, therefore, that four scales have been prepared—one for yellow, one for red, one for blue, and one for the neutral color—and that each scale has on it twenty different shades of its color, gradually increasing in depth from the lightest to the darkest and numbered consecutively from "1" to "20," the various shades in neutral color will correspond each for each to the varying shades in the primary colors, shade No. 4, for instance, of the neutral color being the representative in such neutral color of shade No. 4 in each of the primary colors.

Now it having been determined that flesh tint contains yellow and red, with a slight tendency toward yellow, the artist is able to determine which of the particular shades of yellow and red contained on the scales of these colors is necessary to produce the flesh tint. Experience shows that shade No. 4 of yellow and shade No. 3 of red (in the scale of twenty different shades) will produce the ordinary flesh tint, and in printing on the combination-sheets shade No. 4 of gray will be used on sheet A and shade No. 3 of gray on sheet B.

The first yellow in block 2 is a primary color, and consequently an impression from the original block designed to print all the first yellow in the picture would have to be made in neutral color on sheet A only. As the first yellow is somewhat darker than the yellow entering into the flesh tint, the neutral color should be a shade or two darker than that used for flesh tint.

The first gray is resolved into yellow, red, and blue, and therefore an impression must be made from the original block for this color on each sheet A, B, and C, the latter representing blue. Each impression should be in quite a light shade of neutral color—that on sheet C being the darkest—say shade No. 3—and that on sheet B the lightest—say shade No. 1—while that on sheet A should be intermediate—say shade No. 2.

The dotted lines in the blocks 1, 2, and 3 of sheet A represent different degrees of shade, those in block 2 being the darkest, those in block 1 next, and those in block 3 next. The same in respect to sheet B, where block 1 is darker than block 3.

The foregoing is sufficient to give a clear idea of the course of procedure in forming the sheets A, B, and C, and after all the original blocks have been used the sheets will respectively represent in a neutral color every part of the picture to which it will be necessary to apply the respective primary colors and also the shade or depth of such color. These sheets are next reproduced upon three printing blocks or stones by any of the well-known processes and will be used to print in yellow, red, and blue, respectively. The yellow will be printed first, the red next, and finally the blue. The colors employed for the final

printing must be the pure tints of yellow, red, and blue, such as are ordinarily used in three-color printing.

By the term "block" in the foregoing specification I desire to be understood as meaning any kind of stone, plate, or block ordinarily employed in this art. Also by the word "chromo" I mean any muticolored picture or design.

Having described my invention, I claim—

1. The herein-described process of producing blocks for printing chromos, which consists in first preparing a number of original blocks, one for each color necessary to be used in the chromo, then resolving such colors into their primary colors, then forming combination-sheets, one for each primary color, by making impressions thereon from said blocks one over the other, and then reproducing said combination-sheets on blocks, substantially as set forth.

2. The herein-described process of producing chromos, which consists in preparing for each color to be used in the chromo a block capable of printing all necessary parts in such color, resolving said colors into their primary colors, then preparing combination-sheets, one for each primary color by making impressions thereon in a neutral color from said blocks, one over the other, then reproducing said combination-sheets on blocks, and then printing with primary colors from the latter blocks, substantially as set forth.

3. The herein-described process of producing chromos, which consists in first preparing a plurality of original blocks, one for each color necessary to be used in the production of the chromo and each capable of printing its color on all necessary parts of the sheet on which the chromo is produced, next resolving the color of each block into its primary colors, then making an impression in a neutral color from each block on as many separate sheets as there are primary colors in the color it was designed to print, the impressions from said blocks being made on the same sheet for each primary color one over the other, whereby three combination-sheets are made each representing all of a primary color that would be represented by all the blocks, next reproducing said combination-sheets on printing-blocks, and then printing from said blocks in the primary colors, the impression from said blocks being one over the other, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LUDWIG KÜHN.

Witnesses:

CARL ROESCHEL,

OSCAR BOCK.