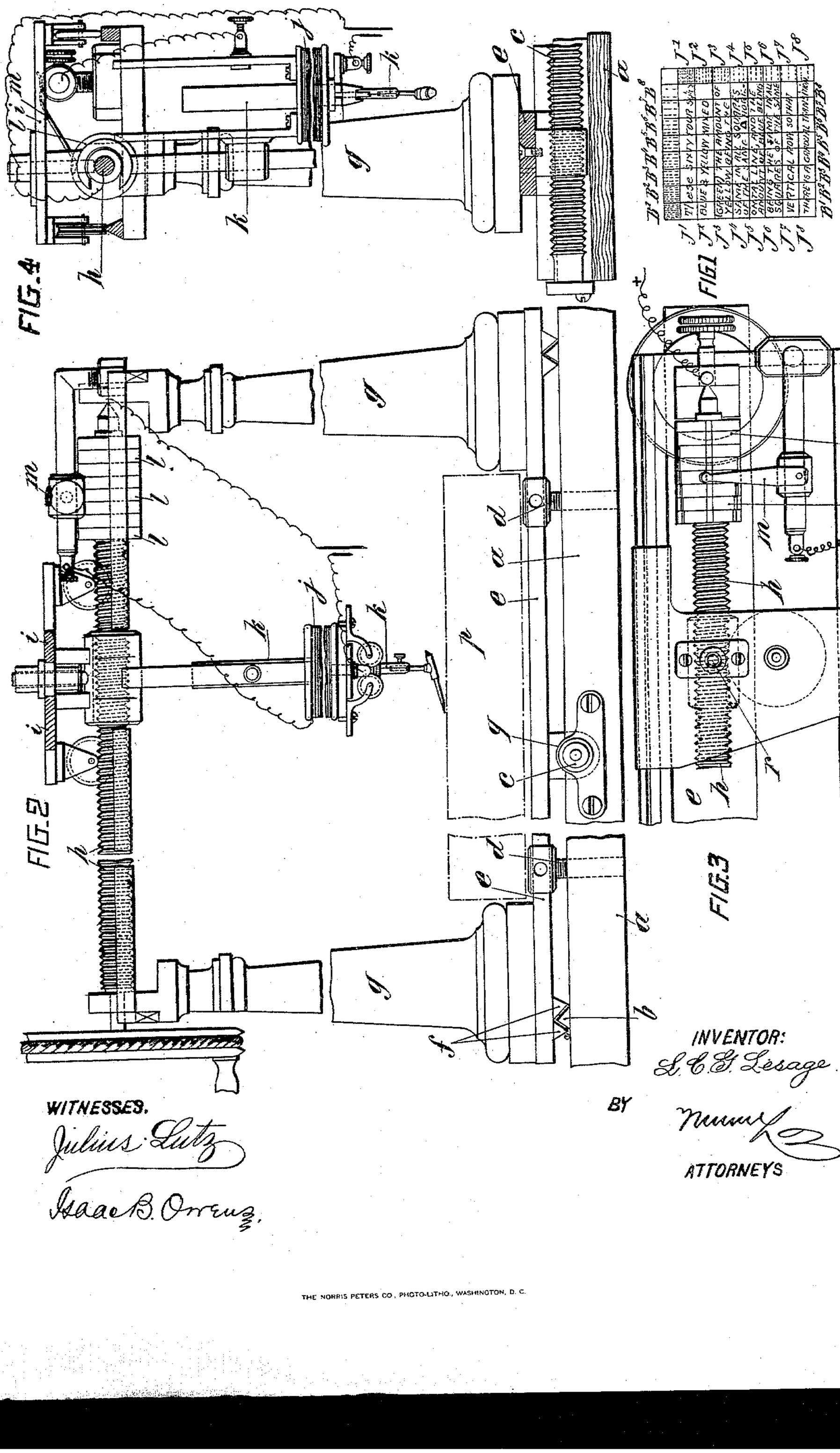
(No Model.)

L. C. G. LESAGE.

ENGRAVING MACHINE AND COLOR CHART.

No. 596,816. Patented Jan. 4, 1898.



UNITED STATES PATENT OFFICE.

LOUIS CHRISTIAN GÉRARD LESAGE, OF PARIS, FRANCE.

ENGRAVING-MACHINE AND COLOR-CHART.

SPECIFICATION forming part of Letters Patent No. 596,816, dated January 4, 1898.

Application filed May 22, 1896. Serial No. 592,548. (No model.) Patented in France January 19, 1895, No. 244,471.

To all whom it may concern:

Be it known that I, LOUIS CHRISTIAN GÉRARD LESAGE, of the city of Paris, France, have invented an Improved Engraving-Machine and Color-Chart, (for which I have obtained Letters Patent in France for fifteen years, dated January 19, 1895, No. 244,471,) of which the following is a full, clear, and exact description.

My invention relates to a process of and apparatus for use in color-printing by which distinct shades or colors are produced and the proofs obtained are very true images of the design or sketch.

My invention is equally applicable to chromotypography and to chromolithography; but I will particularly describe the process with reference to this latter application by way of example.

The lithographer who transfers upon stone a design or sketch furnished by an artist must have the following characteristics: First, he must be sufficiently sure of himself and must sufficiently know his palette in order that he may mentally decompose the colors of which the design or sketch is composed into their primary colors; second, he must be sufficiently skilful in his profession to be able to execute with lithographic ink upon the different stones he desires to employ very exactly such dots as will when colored constitute the primary color or tone and when printed by the further superposition will constitute the composed tone or shade to be rendered. This method of procedure is lengthy, presents irregularities disagreeable to the eye, and always shows very considerable digressions from the tone or shade, so much so that two lithographs produced by different lithographers and intended to represent the same design or sketch sometimes do not resemble one another. In order to obviate these inconveniences, I have devised a color-indicator in which the lithographer always finds the tones or shades of the design or sketch required to be rendered or transferred. This indicator is combined with a machine designed for and capable of reproducing the chosen tones or shades, so that the lithograph produced will be an exact transfer or rendering of the design or sketch.

Lithographic reproduction obtained by means of my color-indicator and machine combined constitutes the subject-matter of the present invention.

In order to make myself well understood, I have represented the indicator and the machine in question in the accompanying drawings as a specimen only.

In the drawings, Figure 1 shows one of the sheets of my color-indicator, the shaded lines representing various tones or degrees of intensity of a given color. Fig. 2 represents a front elevation of the machine. Fig. 3 is a corresponding plan thereof, and Fig. 4 shows the same machine in vertical section.

In the different figures similar reference-letters denote similar parts.

In proceeding according to my invention I produce the compound colors by the superposition of generally two or three primitive colors—that is, a design will generally be produced by impression from two or three plates. The three colors generally employed are yellow, blue, and red. It is well known that the superposition of yellow and blue will yield green, yellow and red will produce orange, and blue and red violet. It will be further obvious that different shades of green may be obtained by varying the proportions of yellow and blue. This result I obtain by producing upon the impression-plates a series of dots or color-retaining projections which are spaced more or less according to the shade desired. Thus if it is desired to produce a shade of green in which blue and yellow are mixed in the proportion of two to one I shall place the dots on the blue-impression plate twice as near together as on the yellow-impression plate. Instead of doing this work by hand, where the results are uncertain and never the same, because they depend upon the skill and judgment of the operator, I provide a machine which produces dots or the like with unvarying regularity. Thus in the drawings, more particularly described hereinafter, I have represented a machine by means of which dots may be produced at eight different predetermined and preferably regularly-graduated distances from each other. This, with the employment of one impression-plate only, say in blue, will enable me to obtain eight different shades of blue, the lightest shade corresponding to the places

where the dots are farthest apart. These eight shades are accurately determined, and as they are produced by machinery I may reproduce them at will with an absolute certainty of securing identical results in each case. Similarly I may produce eight predetermined tints of yellow or red. It will be obvious that I may readily produce these tints adjacent to each other in the shape of squares, lozenges, or the like, and an impression taken from a plate so treated will constitute a tint-indicator or color-indicator from which the operator will be able to pick out at a glance the tint which corresponds to the one he has to reproduce from the sketch or pattern. Each of the squares or the like on the indicator will have a reference to the number of dots required to produce the same tint, and thus the operator will be enabled to accurately adjust the machine so as to secure exactly the same tint as that represented on the indicator. The above explanation will make it clear that a predetermined number of tints of a primary color (such as blue, red, or yellow) can be produced on an indicator and reproduced therefrom with absolute identity. In a similar manner I can produce an indicator for colors composed of two primary colors, such as an indicator for green. In this case I have of course to use two impression-plates, one for blue and the other for yellow. Each of said plates will have portions with differently-spaced dots, so that an impression from the blue plate alone would show different tints of blue and an impression from the yellow plate alone would show the (say eight) different tints of yellow. It will be obvious that by an appropriate superposition of these two colors, obtained by successive impression from the two plates upon the same material, I shall obtain an indicator showing sixty-four different shades of a mixture of yellow and blue. This indicator, if provided with reference-marks showing how each portion was produced—that is, what shade of blue and what shade of yellow corresponds to such portion—will form an infallible means for the operator to reproduce the exact tint of such portion. In a like manner I can produce by impression from three plates (blue, red, and yellow) an indicator enabling me to reproduce exactly any tint composed of three colors. These examples are sufficient to explain my method of proceeding for obtaining any combinations of colors or shades.

The machine by the aid of which I first obtain my color-plates constituting the color-indicator, and which subsequently serves to reproduce the colors and the shades of the indicator, is constructed in principle as shown in Figs. 2, 3, and 4 of the drawings. This machine is composed of a base *a*, which supports two parallel rails *b*, that permit of laterally displacing the whole upper frame of the machine. This displacement is effected either by the aid of one central screw *c* or by means of two screws or of any other appropriate mechanical device. The base *a* is likewise provided with three or four screws *d*, which support the stone and permit of adjusting the stone perfectly horizontal. The frame rests upon a cross-beam *e*, provided at each of its extremities with frictional counter-rails *f* for the transverse displacement above referred to. Upon the extremities of the cross-beam two standards *g* are fixed, in the upper part of which are received the axle ends of a screw *h*, serving for the displacement of a carriage *i*, from which a solenoid *j* is suspended, the core *k* of which forms a pen-holder. The screw *h* is also provided with eight disks *l*, of insulating material, divided into sectors or contacts. The first disk possesses one contact, the second two, the third three, and so on, and, finally, the eighth eight. In this way, supposing the two poles of any appropriate source of electricity are connected, one to the screw *h* and the other to an insulated brush *m*, the circuit includes the solenoid and will be closed each time the brush arrives at a contact. Then the current acting upon the solenoid will cause its pen-holding core *k* to descend and the pen will mark a point upon the stone *p*.

If the screw *h* has a pitch of two millimeters and the brush is placed upon the disk with one contact, the circuit will be completed once for each revolution of the screw and the pen will mark in a straight line one dot to every two millimeters. If the brush is placed upon the disk with eight contacts, the pen will mark eight points per two millimeters, and, similarly, if the brush is placed on the intermediate contacts two to seven, a corresponding number of points will be made. Now in order to add a dotted line sidewise of the first or of the preceding one it is necessary that the carriage be displaced at a right angle relatively to the first dotted line. For this purpose the whole frame is actuated by the aid of the screw *c*, having likewise a pitch of two millimeters and carrying a divided scale *g* for indicating the fractions of a revolution. The two screws *c* and *h* can be turned together or separately either manually or by means of an appropriate mechanical arrangement.

In order to displace the carriage of the solenoid by the aid of the screw *h*, I provide a kind of spring-catch *r*, which engages with the threads of this screw. This spring-catch is lifted by hand when the carriage is required to be returned to the commencement of its course.

The dotted lines may be arranged in square formation or they may be provided in lozenge-like arrangement. For this purpose it is sufficient to throw the spring-catch *r* into engagement with the screw-thread of the screw *h* instead of placing it into the end or extremity of the screw-thread, as for the first line. At the third line the catch is replaced, as for the first line, and so forth. I may also effect this lozenge-like arrangement by an adjust-

ment of the pen. The pen is fed by means of a small tube starting from an ink cup or vessel placed upon the carriage by siphonic or by capillary action.

Instead of employing a single brush placed upon a single support I may arrange as many brushes as there are disks. The brushes would then be operated by the aid of keys arranged on the base of the machine.

If I no longer require to obtain dots of different thickness, I insert into the electric circuit an appropriate graduated resistance. I shall then obtain a drawing-pattern.

I may provide any other means than electricity for moving my penholders—for example, compressed air or an appropriate mechanical device.

If instead of using a penholder provided with a lithographic pen I employ a light pointed steel rod or stylus of a very small diameter and if I replace the lithographic stone by a smooth alloy previously cast on well-polished marble, my stylus when set in motion will produce recesses or dots in the alloy. Having once obtained these dots it will be easy to produce relief-molds therefrom by any of the processes (galvanizing, for example) employed for this purpose. The relief-mold once obtained is rolled in cylinder form, after being first reinforced, if necessary, and is subsequently mounted upon a rotary machine. I produce a color-indicator by this process as I have produced one with my pen, and going always through the same operations I obtain any desired number of tones or shades by means of two or three cylinders, which, placed successively upon the same rotary axis, will produce a complete chromolithograph. Thus suppose the operator finds upon the sketch or design he has to reproduce a green tint, which by comparison he ascertains to be the same as that of the square marked in the indicator Fig. 1. He refers to the indications on the margin and finds that square is at the intersection of the lines or rows J^4 and B^6. Accordingly he prepares a plate for impression in blue in which the dots are produced with the brush *m* on the disk *l* having six contacts, and another plate for impression in yellow in which the dots are produced with the brush *m* on the disk *l* having four contacts. This will produce exactly the same green as that of the square marked on the indicator.

This particular novel system dispenses with the working upon stone and the printing process and obviates one of the greatest difficulties met with at present—namely, the process of providing the marks of junction. In fact, when the cylinders are once put in place the sheets of paper must always meet them at the same place. There would, however, be no hindrance to employ by any appropriate mechanical arrangement one single cylinder divided into three parts, each of which is inked with its special color.

It is evident that the shape, detail parts, accessories, material, and dimensions of this machine may vary without thereby in any way departing from the spirit of my invention.

I claim—

1. The combination of the carriage-guide, the carriage mounted to travel thereon, means for actuating the carriage, the marking-tool on the carriage yet movable relatively thereto toward and from the carriage-guide at an angle to the path of the carriage, and mechanism for periodically moving the tool relatively to the carriage during the movement of the carriage, said mechanism comprising two coöperating parts, one of which is operatively connected to the carriage-actuating means so as to move simultaneously with the carriage, said movable part being divided into sections having different numbers of operating points or portions, while the other part of said mechanism is normally stationary, yet adjustable to register with any one of the sections of the movable part, whereby the frequency of the movements of the marking-tool relatively to the movement of the carriage may be varied.

2. The combination of the carriage-guide, the carriage mounted to travel thereon, means for actuating the carriage, the marking-tool on the carriage yet movable relatively thereto toward and from the carriage-guide at an angle to the path of the carriage, and mechanism for periodically moving the tool relatively to the carriage during the movement of the carriage, said mechanism comprising coöperating parts, one of which is divided into sections having different numbers of electrically-conducting portions while the other part is a contact normally stationary yet movable into registry with any one of said sections, and an electrically-controlled tool-operating device proper in circuit with said contact and the conducting portions of said sections.

3. A tint-indicator for colors resulting from two component colors, said indicator having the proportion of one component color increasing gradually in one direction, and the proportion of the other component color increasing gradually in a direction crossing the first-named direction, whereby the mixture of the component colors will appear in regular gradation.

The foregoing specification of my improved process of and apparatus for use in color-printing signed this 7th day of May, 1896.

LOUIS CHRISTIAN GÉRARD LESAGE.

Witnesses:

CLYDE SHROPSHIRE,

MAURICE H. PIGNET.