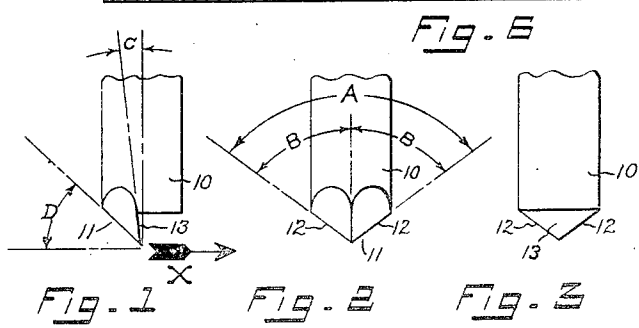
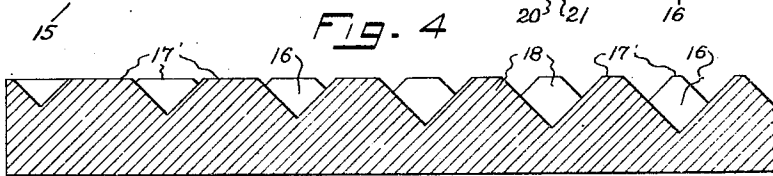
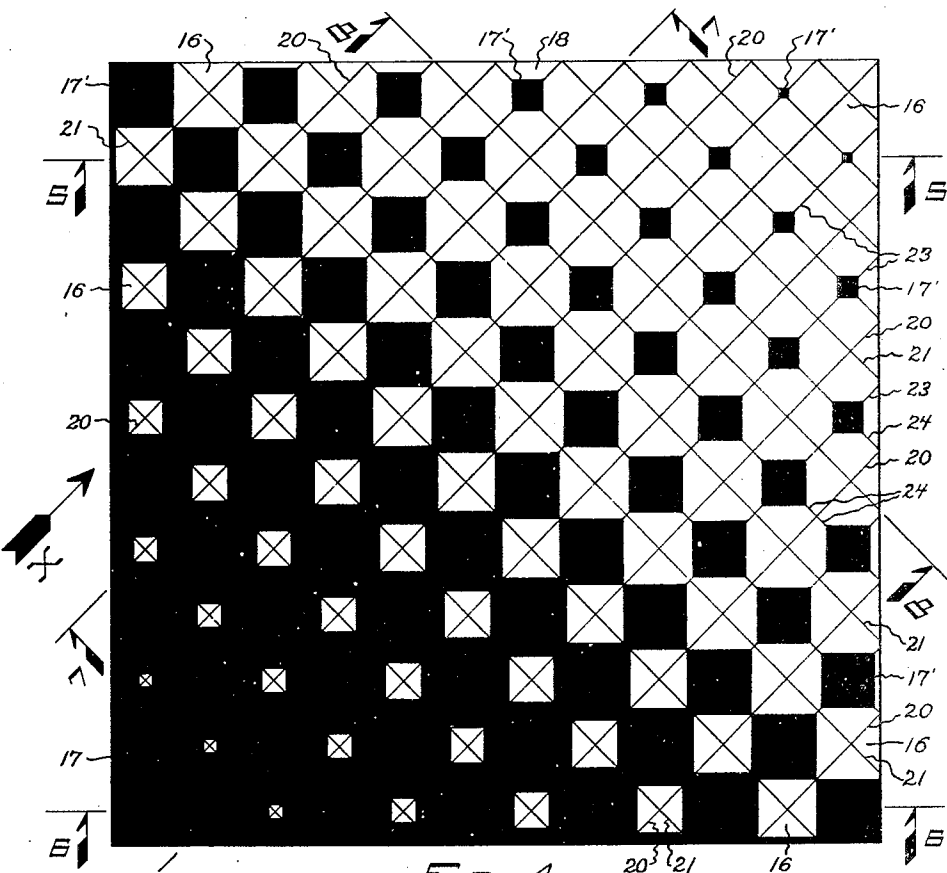


March 3, 1936.

G. E. LOSIER
PICTURE PRINTING PLATES AND ALLIED ELEMENTS,
AND METHOD AND STEPS FOR MAKING THE SAME
Filed Sept. 5, 1934 3 Sheets-Sheet 1

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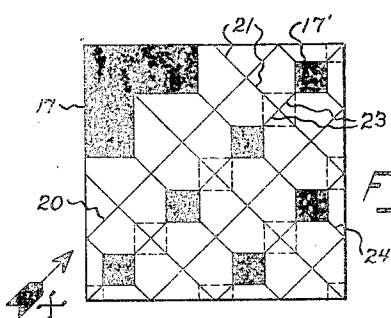
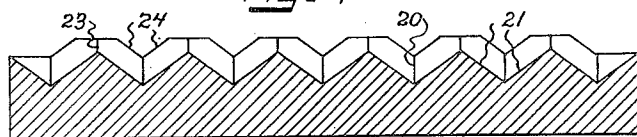
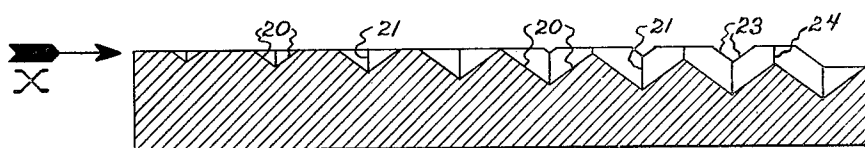
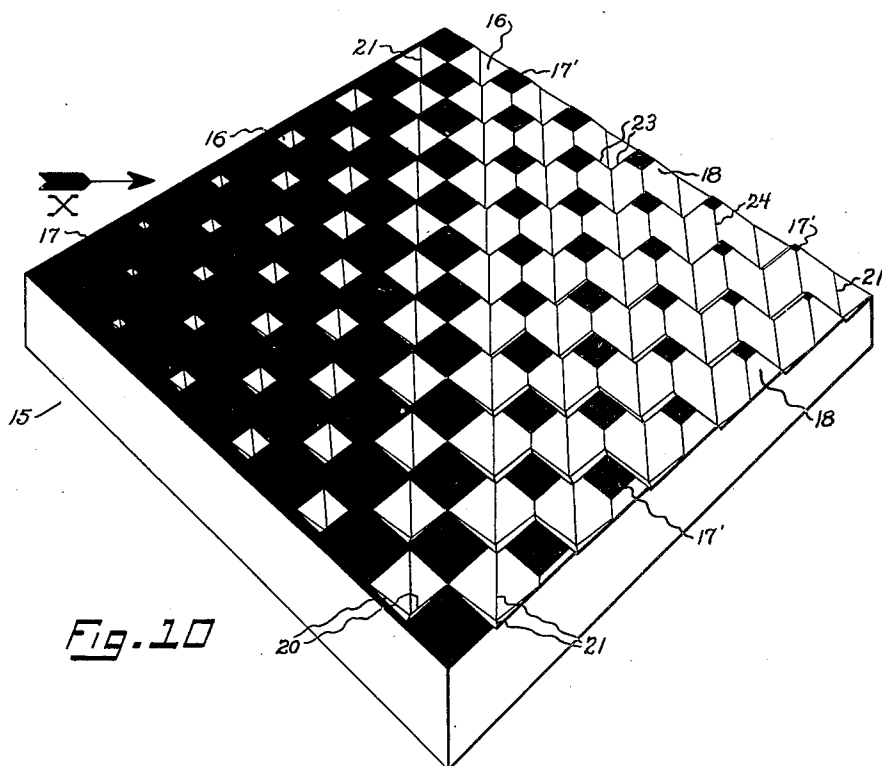
GEORGE E. LOSIER
INVENTOR
BY William A. Hayes
HIS ATTORNEY

March 3, 1936.

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3 Sheets-Sheet 2



GEORGE E. LOSIER

INVENTOR

BY William Hughes

HIS ATTORNEY

March 3, 1936.

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Fig. 11

GEORGE E. LOSIER

INVENTOR

BY *William A. Hughes*

HIS ATTORNEY

UNITED STATES PATENT OFFICE

2,032,541

PICTURE PRINTING PLATES AND ALLIED
ELEMENTS, AND METHOD AND STEPS
FOR MAKING THE SAME

George E. Losier, East Orange, N. J., assignor of
one-fifth to William A. Hughes, Newark, N. J.,
and four-fifths to Marion L. Losier, East
Orange, N. J.

Application September 5, 1934, Serial No. 742,715

12 Claims. (Cl. 101—401.1)

The present invention relates generally to machine etched cameo relief printing plates of the screen effect type and allied elements such as monotypes and matrices, and such as wax engravings for making electrotypes, all of the screen effect type; and the present invention relates more particularly to toolcut cameo relief printing plates and allied elements (in which the cameo reliefs have sloping sides like the sides of four sided pyramids or frustrums of four sided pyramids, but in which plates or elements said sloping sides of adjacent cameo reliefs intersect each other at pyramidal corners) in the form of a multiplicity of substantially pyramidal or frusto-pyramidal shaped cameos adjacent ones of which intersect each other at their sloping edges and the present invention relates to the method of cutting the same.

Heretofore automatically tool-cut cameo-relief printing plates have been made which were not of the screen grid type although they were attempts which were approximations thereof. However, most of the attempts in this direction are inoperative or impractical because of the comparative cumbersomeness of the apparatus and the attendant inherent inertia thereof or because they do not produce pure whites or even a practical appearance of clear whites. Among these are the "line half-tones" of Bain (U. S. Patent #288,395) and Amstutz (U. S. Patent #1,019,404); the line "half-tone" of Amstutz made by mechanically scanning or tracing in a transverse direction over a previously made line "half-tone" plate (U. S. Patent #577,373); the "line half-tone" of Amstutz (U. S. Patent #569,595) made on a plate which had previously been transversely cut by grooves of uniform depth and width; the rotating drill method of said Amstutz (U. S. Patent #569,595) or Howey (U. S. Patent #1,914,258) by which oval holes are made to define cameo printing surfaces; and the known method of photo-electrically scanning a picture and cutting a plate therefrom twice, the second time in a direction transverse to the first. But by none of these methods is the screen effect produced. That is they failed to make a plate which would print a picture that can be viewed with comfort or without the viewer being conscious of mechanical arrangement of the inked portions of the picture. The screen effect picture as photo-chemically produced has been considered as being the best form or arrangement of small increments of ink to effect a picture which is comfortable to the eye to see, and this is because the increments are so arranged that they blend by

an optical illusion into the smooth and continuous gradations of shadings such as is presented by a photograph.

An object of the present invention is to produce a cameo-relief half-tone printing plate which gives the screen effect given by the photo-chemical process and in which the several cameo-reliefs are not undercut as they are by the acid process but are tapering from the printing surface thereof toward the bottoms of the surrounding grooves or cuts so that they are in the forms of frustrums of pyramids. By virtue of this form the strength of the printing plate is increased and greater pressure can be used thereon and a greater number of good pictures can be printed therewith. Also matts and electro-plates can be made from these plates and wax engravings without the disadvantage of the snagging mushroomed tops of the cameo-reliefs.

Another object of the present invention is to provide a method of mechanically cutting screen effect cameo-relief printing plates in which the printing surfaces of the several cameo-reliefs are substantially square in shape; in which the substantially square cameo printing surfaces are substantially aligned diagonally in both directions; and, in the medium shade portions, adjacent cameo printing surfaces touch or nearly touch at their corners; and in the dark or below medium shade portions the printing surface is continuous, with substantially square spaced-apart interruptions interspersed therethrough of various sizes to give various dark shades.

Another object is to provide a single operation mechanical method of cutting a cameo relief screen effect printing plate with a V-shaped tool whereby successive parallel rows of substantially square shaped cuts are made in the direction of the diagonals of said squares, whereby said square shaped cuts are spaced apart in their rows and their rows are spaced apart at the dark printing portions of the plate; said square shaped cuts touch or substantially touch at their corners at the medium shade printing portions of said plate, and said square shaped cuts run together along both diagonals in the portions of the plate which print lighter than medium shade and where there is no printing surface left.

In the drawings forming a part of this specification there are views showing cameo reliefs of various sizes for the purpose of illustrating the relation of such cameo reliefs to each other as they might occur in a printing plate of the present invention, and also to illustrate the tool used for cutting said printing plate, together with a

picture printed with a plate made according to the present invention. In the drawings, showing illustrative embodiments of the present invention;

5 Figures 1, 2 and 3 are side, back and front views, respectively, illustrating the cutting end of a tool used for making the plate of the invention, the drawings in these figures being enlarged about six times for purposes of illustration;

10 Figure 4 is a plan view of a tone cut plate having frusto pyramidal cameo reliefs of various sizes;

Figures 5, 6, 7 and 8 are sectional views taken along the lines 5—5, 6—6, 7—7 and 8—8, respectively, of Figure 4, looking in the directions of the arrows;

Figure 9 is a plan view, in part cut away, of a portion of uniform tone of a partly cut printing plate;

20 Figure 10 is a perspective view corresponding to Figures 4 to 8, and is taken looking diagonally from the lower right hand corner of Figure 4; and

Figure 11 is a print made from an actual plate of the present invention, having sixty dots to the inch.

Referring now to Figures 1, 2 and 3 of the drawings, the cutting tool 10 has a V-shaped cutting end 11 whose cutting edges 12, 12 are at an angle (A) of about one hundred and eight degrees to each other or each at an angle (B) of about fifty-four degrees from a normal to the plane of the surface to be cut (see Fig. 2). The face 13 has a drag at an angle (C) of about six degrees from a normal to the surface to be cut (see Fig. 1), and the back is ground back from both said cutting edges 12, 12 to a line having a clearance at an angle (D) of about forty-five degrees from the plane of the surface to be cut. The arrow X of Figure 1 indicates the direction of relative movement of said V-shaped tool 10 over or under the surface of a plate being cut, as indicated also by the arrows X of Figures 4, 7, 9 and 10.

45 In the use of said V-shaped cutting tool 10 in cutting a cameo relief printing plate, such as illustrated in Figures 4 to 11 for example, successive parallel cutting strokes are made at a predetermined longitudinal rate of movement across the plate and the cuts are made at a predetermined distance from each other, uniform throughout the plate. While the tool is cutting, it is caused to move up and down at a certain rate with respect to the rate of relative longitudinal movement thereof with respect to the plate, said rate of up and down movement being of a predetermined value for all tones of shading, but changing slightly at changes from one tone to another, the limit of each downward movement, being determined according to the light or shade of a picture to be reproduced, as done for example by the apparatus and according to the methods set forth in my copending applications Serial No. 645,384, filed December 2, 1932 and Serial No. 647,884, filed December 19, 1932, of the former of which the present application is a continuation in part. And such said rate of up and down movement of said V-shaped tool 10 is predetermined so that the distance between the lower limits of successive downward movements is substantially equal to the said predetermined distance between successive parallel cutting strokes.

Referring now more particularly to Figures 4 to 10 in the tool cut printing plate 15, a number of tetrahedral depressions 16, 16 extend down-

wardly from the printing surface 17 thereof. In the lower left hand corner of Figure 4 and in the left hand corner of Figure 10 said depressions 16, 16 are comparatively small and the surface cut away is much smaller than the surface left for printing but going in the diagonal direction that is, upwardly toward the upper right hand corner of Figure 4 and transversely in Figure 10, said depressions 16, 16 increase in size so that at about the center of the plate 15 the surface left for printing is about equal to that which was taken away where the depressions were cut. In the upper right hand corner of Figure 4 and in the right hand corner of Figure 10 the printing surface is smaller than the surface taken away; and here the said depressions 16, 16 run in together around a number of four sided pyramidal frustums 18, 18 whose several square top printing surfaces 17', 17' are parts of the original surface 17. Near the center of said printing surface 17, where the surface left is equal or about equal to that cut away, said square surfaces 17', 17' touch or nearly touch at their corners.

In making each cut in the direction indicated by said arrows X the point of said V-shaped tool 10 defines a line 20 which is at the bottom of the cut (see particularly Figures 4, 7, 9 and 10). In those portions of said plate 15 where the tone of the reproduced picture is medium or darker than medium, said line 20 will be interrupted because the point of said V-shaped tool 10 comes up to or higher than the surface of the plate (see Figure 7); and in those portions of the plate where the tone is lighter than medium, said line 20 is continuous; but in every case said line 20 rises and falls as a result of the rise and fall of said tool 10 and as said V-shaped tool 10 changes from a fall to a rise in its cutting movement, said cutting edges 12, 12 leaves transverse lines 21, 21 (see particularly Fig. 8) which, in effect, are at the bottoms of slanting V-shaped troughs, in accordance with the slopes of said cutting edges 12, 12.

Again in those portions of plate 15 where the tone of the reproduced picture is lighter than medium, that is, where the point of said tool 10 does not come up to said surface 17, the cuts will overlap laterally as indicated by the dotted lines in Figure 9 and will define longitudinal ridges whose crests are the lines 23, 23 and lie beneath the plane of the original surface of said plate 15 (see Figures 4, 7, 9 and 10), said lines 23, 23 being formed successively in pairs, the first one sloping downwardly and the second one continuing from the first and sloping upwardly; and, in the same portions of plate 15, transverse ridges whose crests are the lines 24, 24 are defined where the tool changes the direction of its movement from the upstroke to the downstroke, said lines 24, 24 are formed simultaneously in pairs by the two cutting edges 12, 12 of said tool 11 as the latter changes from an upward to a downward stroke.

Referring particularly to Figures 4 and 10 and referring again to those portions of said plate 15 where the tone is lighter than medium, a number of separate surfaces 17', 17' of the original surface 17 of said plate 15 are isolated after the surrounding portions of the plate have been cut away at the parts where the point of said tool 10 remains entirely below the surface, and each of said surfaces 17', 17' is the top surface of one of said four sided pyramidal frustums 18, 18 whose sloping sides are defined laterally by two each of said lines 23, 23 and 24, 24. Each of said frustums 18, 18 abuts at each of its four sloping corner

edges against another like frustum and laterally at a V shape point of each of its sloping sides against the base of each of four other like frustums (or parts of frustums in those light portions of the plate which are next adjacent to medium tone parts) and is supported thereby when pressure is applied when a print or mat is made and such support is substantially as strong for a surface 17' which is small as for a large one because the lateral surfaces of each of said frustums 18, 18 slope upwardly from a comparatively wide base to the top and do not undercut the top surface 17'.

It is to be noted that, in a printing plate in which the cameo reliefs (which are frustums 18, 18) are spaced apart at the same distance both longitudinally and transversely, the angle between a given pair of said lines 21, 21 will be the same as the angle (A) between said cutting edges 12, 12 of said tool 10, as will be also the angle between a given pair of said lines 24, 24. That is, the several angles between given pairs of said lines 20, 20; 21, 21; 23, 23 and 24, 24 will all be the same and equal to said angle A. The angle between said pairs of lines 21, 21 and 24, 24 is determined of course by said angle A, but the angle between said pairs of lines 20, 20 and 23, 23 to be made equal to angle A is predetermined by the relation between the speed of said tool 10 across said plate 15 and the speed of said tool 10 in its downward and upward movement into and out of said plate 15. In order to get the spacing of the cameo surfaces the same in both the transverse and longitudinal direction, this predetermined relation must be such that the ratio of the rate of speed of said tool 10 across said plate 15 to the rate of speed of said tool 10 into and out of said plate 15 is substantially equal to the tangent of half the angle A, that is equal to the tangent of said angle B, with the additional provision that the distance between successive cutting strokes of said tool 10 across said plate 15 must be substantially equal to the distance between the bottom points of two successive downward movements of said tool 10 for a portion of even shading, or substantially equal to the average distance between the bottom points of successive downward movements of said tool 10.

The above description is for a plate made by cutting in one direction only and with a substantially V-shaped tool under optimum operating conditions, but several variations therefrom may occur without departing from the general physical relations and details above set forth and without departing from the description of the plate of the present invention as set forth in the appended claims. These variations when they occur are slight, some of them being compensating one to another, and none of them detracts effectively from the advantages above set forth for the products of the present invention. Some of these variations and the causes thereof may be as follows. The hardness or softness of the material being cut might effect the characteristics of the cuts made, whether type metal, zinc, copper, etc., for printing or for making matrices of wax or other soft material for making electrotypes. In some substances or materials the tool might come up out of a cut faster than it entered, but, due to the small size of the individual cuts made, the variation when printed would not be noticeable to the eye. In any case the cutting apparatus could be adjusted to operate with substantially optimum characteristics on materials of various characteristics or de-

grees of hardness. When the rate of movement of the tool down (or up) varies, the sides of the pyramidal frustum are not plane but slightly concave and the corresponding side or edges of the resulting cameo surfaces are curved lines instead of being straight. At the point or line where the size of the cameo reliefs changes (corresponding to the point or line where there is a change in tone in the picture) the printing surface of the cameo relief is not exactly square and the distance between centers in the direction of the parallel cuts is not exactly the same as at a part where the size of the cameo reliefs are the same (where the tone is uniform), and over a given unit of distance at any part the number of cameo reliefs is uniform. But in any case these differences can be made so small as to be negligible and in no case is there any undercutting.

In cutting the plate of the present invention with said tool 10, illustrated in Figures 1, 2 and 3, to get the best results the median of said angle A should be perpendicular or in a plane perpendicular to the plane of said plate 15 and said face 13 should be directly forward with respect to its movement relative to said plate 15 in the parallel cutting strokes. If the point of said cutting end 11 of tool 10 does not come to a good point said depression 15, 16 in shades up to medium shades will not be square but will be six sided or will have its forward and rear corners rounded, and in place of said lines 20, 20 there will be two lines closely spaced at the distance equal to the width at the blunted end of the point or there will be a curved trough.

The reproduction shown in Figure 11 of the drawings is a print from an actual printing plate of the present invention and graphically shows the results of machine etchings of various width and depth in the same plate. For example, the derby shown at the left hand side of the picture is very dark as compared with most of the other parts of the picture and here the plate is continuous with small indentations therein and some parts are solid black particularly the part of the derby next to the hand holding it. Just adjacent the right shoulder of the figure, a shadow on the wall is shown in medium tone with the printed dots almost exactly square in shape. The rail on which the figure is leaning is shown in good contrast between a medium tone on the side surface thereof and a slightly lighter shade on the top surface. The vertical post supporting the rail and also the handkerchief in the figure's pocket show high lights in pure white.

The plate from which the sixty screen reproduction shown in Figure 11 was produced was made with apparatus shown and described in my said U. S. patent application Serial Number 647,884. In the cutting thereof the cutting tool reciprocated at a maximum speed of over six hundred reciprocations per second and with an average rate of over four hundred reciprocations per second, the variations being due to the harmonic movement of the cutting table or bed on which the plate rode while being cut. With a cutting table moving at a uniform rate of speed the higher rate of cutting could be maintained throughout, that is over six hundred reciprocations of the cutting tool per second. For cutting a finer screen picture the rate of movement of the cutting table could be decreased but preferably it could and would be increased to double the speed used for the sixty screen cutting. The power used on the cutting head could be increased, but the depth of the cut would not need

to be so much as in the case of the coarser screen.

What I claim as new and desire to protect by Letters Patent is:

1. A screen effect reproduction adapted for use
5 in the printing arts comprising a multiplicity of four-sided projections, and having a plurality of depressions which are substantially square in plan and whose surfaces are substantially tetrahedral in form.
- 10 2. A screen effect reproduction adapted for use in the printing arts comprising a multiplicity of four-sided projections which are substantially frusto-pyramidal in shape, and having a plurality of depressions which are substantially
15 square in plan and whose surfaces are substantially tetrahedral in form.
3. A screen effect reproduction adapted for use in the printing arts comprising a multiplicity of four-sided projections of various sizes, which
20 said projections are substantially frusto-pyramidal in shape and the lateral surfaces of which at their bases come to substantial points on their respective medians.
4. A tool cut screen effect printing plate having
25 formed in the printing surface thereof a plurality of holes whose surfaces define substantially the lateral surfaces of tetrahedral angles.
5. A screen effect printing plate having cut in the printing surface thereof a plurality of de-
30 pressions which are substantially square in plan and whose surfaces are substantially tetrahedral in form.
6. A machine etched printing plate of the screen effect type for reproducing a chiaroscuro
35 picture on which plate the light portions comprise a multiplicity of four sided printing surfaces, the dark portions comprise substantially continuous printing surfaces interspersed by four sided depressions, and the medium shade portions
40 comprise a multiplicity of four sided printing surfaces touching at their corners and interspersed with four sided depressions defining cut-away areas substantially equal to the adjacent printing surfaces, and corresponding variations
45 where portions of different shade adjoin each other.
7. A machine etched printing plate of the screen effect type having a multiplicity of print-
50 ing surfaces defined by a multiplicity of substantially square, cut depressions having substantially pyramidal surfaces, said printing surfaces being substantially square.
8. The method of forming a screen effect re-
55 production of pictures, images and the like, having a plurality of holes that are substantially square in plan and whose surfaces are substantially tetrahedral in shape, comprising begin-
60 ning at a corner and ending at a diagonal corner and making each hole of a depth, length and width proportional to the degree of shading de-

sired in the corresponding part of the picture or image to be reproduced.

9. The method of forming a screen effect reproduction of pictures, images and the like, hav-
ing a plurality of holes that are substantially
5 square in plan and whose surfaces are substantially tetrahedral in shape, comprising begin-
ning at a corner and ending at a diagonal corner and making each hole of a depth, length and
10 width proportional to the degree of shading desired in the corresponding part of the picture or
image to be reproduced, said method being fur-
ther characterized by the facts that at those
15 portions of the plate which correspond to shades lighter than medium the said holes are made
continuously in longitudinally connecting rela-
tion and are made of such maximum widths that
they run into each other laterally.

10. The method of making a cameo relief
printing plate which comprises making parallel
20 series of cuts with a V-shaped pointed tool, the several cuts of each series being made to a depth
and for a longitudinal distance proportionate to the degree of light or shade of a picture to be
25 produced, in such a manner that at the part of the plate for printing white or a light shade the
cuts of adjacent series overlap and one side of
said V-shaped tool passes through portions
already cut in the adjacent series by the oppo-
30 site side of the tool and forms cuts thereat sloping in an incline reversed to the slope cut by said
opposite side of the tool in the previous series.

11. The method of cutting a screen effect en-
graving with a cutting tool which comprises mov-
ing said tool across a surface to be cut while
35 reciprocating said tool substantially perpendicu-
larly to said surface in successive cutting engage-
ments at a rate of more than two hundred re-
ciprocations per second while varying the dis-
tance of each reciprocation into said surface in
40 a predetermined manner.

12. The method of making a screen effect
cameo relief engraving by rows of parallel series
of cuts with a symmetrical V-shaped tool having
a given angle at the V whereby the cameo reliefs
45 are spaced apart substantially equidistant both
in said given direction and in the direction trans-
verse thereto which comprises moving said sym-
metrical V-shaped tool in cutting relation over a
surface to be cut in a succession of parallel passes
50 at a given rate of speed and at the same time
moving said tool in an up and down motion at
a substantially constant rate of speed such that
the ratio of the rate of speed in making parallel
passes to the rate of speed in the up and down
55 motion is substantially equal to the tangent of
half the angle at said V, and making said parallel
passes at a distance apart substantially equal to
the distance between the bottom points of
two successive downward movements.

GEORGE E. LOSIER.