THE ADAPTATION

OF

PHOTOGRAPHIC SERIGRAPHY TO INTAGLIO PRINTMAKING

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of the requirements for the degree
of Master of Arts

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CHAPTER I

STATEMENT OF THE PROBLEM

With a background in silk screen (serigraphy) and a reasonable experience with intaglio, a union of the two mediums seemed logical to me. Could the flat print achieved by the use of silk screen be combined successfully with the relief quality of the intaglio process to produce economical color? The aesthetic quality of the intaglio print has evolved in recent years so as not to require a lengthy discussion of its value. The commercial application of the silk screen process has not enjoyed this acceptance in the fine art field. Perhaps some of the qualities and character of silk screen need further use and exploration.

It shall be the purpose of this paper to explore some of the techniques necessary to produce a photo screen, and to evaluate the problems and possible solutions of the combination of a multicolor serigraphic and a single color intaglio print.

One such problem is color registration. Silk screen registration is simpler than intaglio color registration because the paper does not have to be dampened and thus the stretch and shrink of wet and dry paper is avoided. Also serigraphic registration is easily observed and errors can be corrected by simple guide adjustments.

Another color problem to be considered is economy. The cost of many large copper plates becomes prohibitive to the average artist, whereas one reuseable silk screen should serve him for hundreds of impressions. The simple silk screen described in the next chapter

requires a relatively low investment when compared size for size to the cost of copper plates.

CHAPTER II

AN INTRODUCTION TO FUNDAMENTAL INTAGLIO AND SERIGRAPHY PROCESSES

A discussion of basic serigraphy and intaglio printing is presented here to serve as a fundamental background for the photographic silk screen and intaglio experiments to follow.

Serigraphic print making is basically a simple stencil printing process. It consists of some resist material applied to a silk screen which is stretched over a wooden frame. The frame is greater in size on each side than the desired print to permit a paint flow area. The silk is stretched tightly with hammer and tacks or staple gun. The edges between the wooden frame and the silk area must be covered with ordinary paper butcher's tape and the edges of the tape painted with shellac to further seal the frame-staple area away from paint leakage when the screen is ready for a print. The frame is hinged at the back to a table or board and is ready for the resist stencil.

A paper stencil is one of the simplest screen resists, but has a primitive charm when used skillfully. From an original drawing a design is traced to a sheet of thin but sturdy paper. The paper is held in place on the screen by a few drops of water soluble glue in each corner. The squeegee, which carries the fountain of paint across the screen, is a piece of rubber one quarter inch thick, two inches high and mounted in a wooden handle. With one "pull" of the squeegee a clean print can be produced on the guided material beneath the screen.*

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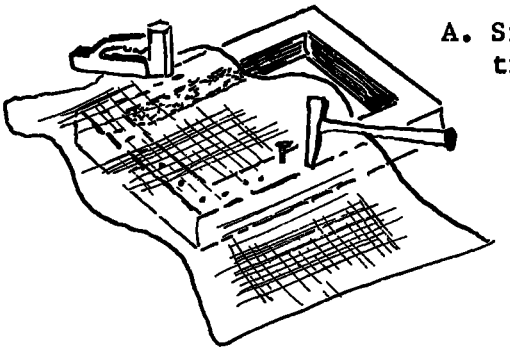
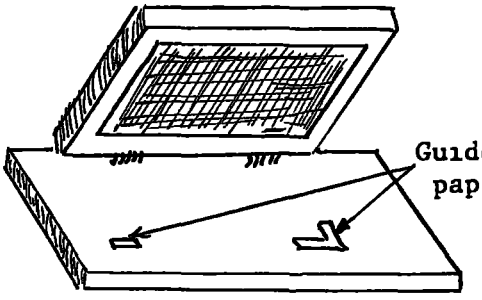
*See illustration on page 4

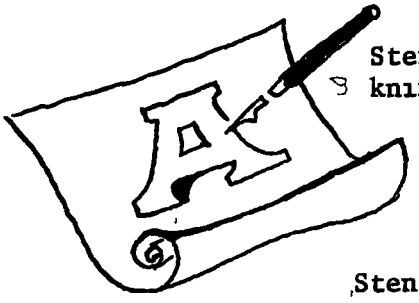


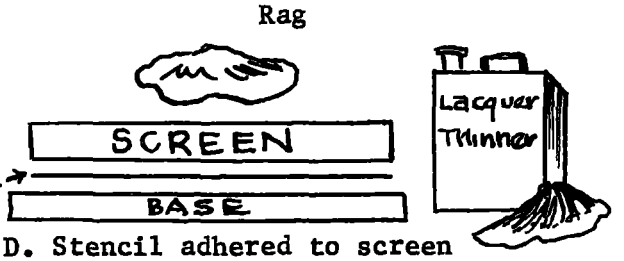
A. Silk tacked or stapled to frame tightly.

B. Screen hinged to board or table.



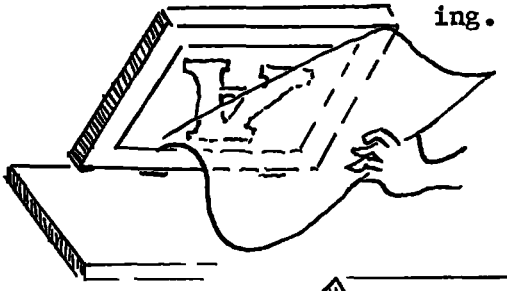
C. Design cut from paper backed lacquer stencil.

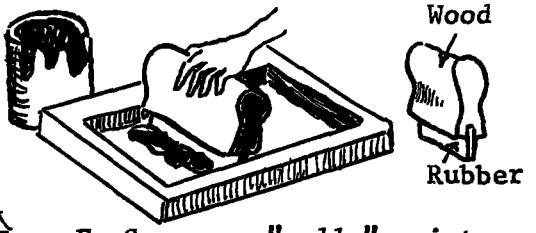




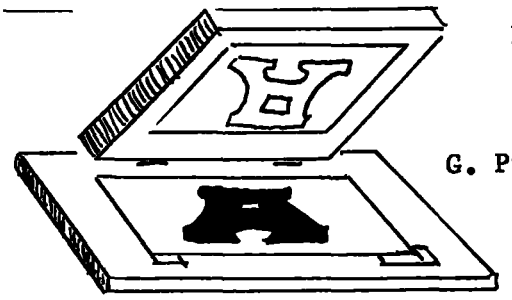
D. Stencil adhered to screen with rag wet with lacquer thinner.

E. Removal of stencil backing.





F. Squeegee "pulls" paint across screen.



G. Printed image in guides.

Tusche is another resist material that may be applied to the screen. It is a greasy lithographic ink soluble in benzine. The shapes to be printed can be quickly or meticulously drawn. After painting the resist areas with liquid tusche or drawing with a lithograph crayon (number 0 extra soft) the entire screen is covered with a thin coat of glue. The glue covers the drawing also but when the drawing is washed out with benzine later, the tusche lifts off these areas and a clean stencil results. The print is made with the squeegee and the fountain of paint as described in the previous paper process.

A third simple resist technique lies in the use of lacquered paper. The paper consists of a thin coat of amber colored lacquer applied thinly over a transparent backing paper. The areas to be printed are removed with a small stencil knife, taking care not to cut the backing paper. The stencil is adhered to the screen with a modified lacquer thinner which melts the stencil slightly so as to mesh with the fibers of the silk. The backing paper is removed and the stencil is ready for printing.[1]

The intaglio print differs from the serigraphic print in that it is produced from an etched or engraved piece of copper, zinc, or other material. The area to be printed is either cut with a burin or "bitten" with an acid. The engraving technique requires the artist to create textures with line, short strokes, crosshatching, small dots,

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[1]Albert Kossloff, Screen Process Printing. Cincinnati: The Signs of the Times Publishing Company, 1950.

or any other cut method he may devise. The acid bite technique requires acid resist materials called hard ground and soft ground to prevent the acid from biting the plate in undesireable areas.*

The hard ground is used primarily to provide a resist for line work which is cut through the ground with a scratch tool called an etcher's needle. The needled areas expose the metal to the acid when the plate is placed in the acid bath. Care must be taken to block the edges and the back of the plate with a varnish or uneven edges and a damaged plate may result.

The soft ground is used to reproduce natural textures, man made textures or a combination of both. The back and edges of the plate must be blocked with varnish as in the needled plate and the front covered with a soft ground. The textured material is placed on the soft ground plate which is on the bed of the press and run through the press with two or three felts between the rollers and the plate. The result is an exposed metal reproduction of the texture due to the texture material pulling or absorbing part or all of the soft ground. The time controlled acid bath produces an acid bite on the plate which is cleaned of the ground and protective varnish with solvents. The cleaned plate is inked and run through the press for an intaglio print.

Both the engraved or etched plate is inked with a dabber of felt of rolled leather and wiped with a sized gauze called tarlatan cloth. The final print is produced after many bites and much engraving. Proofs are taken from time to time to determine the quality of

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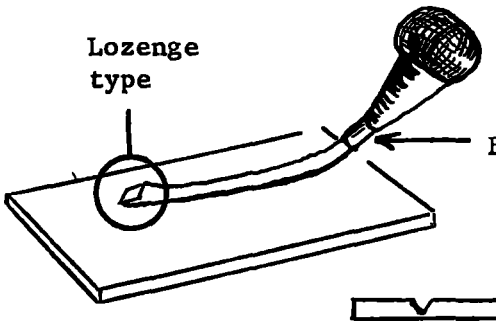
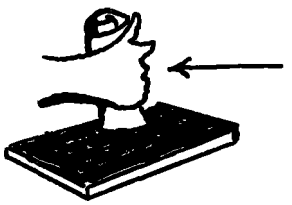
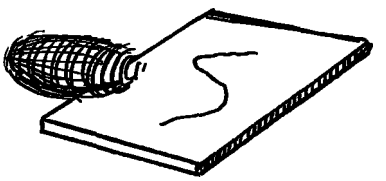
*See illustration on page 7



A design is cut into a copper plate with a burin.

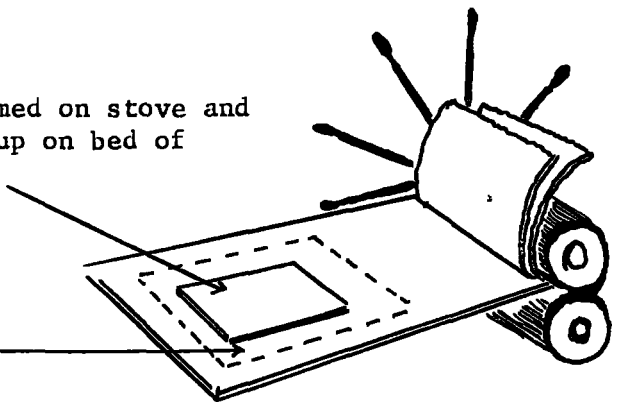


After design cuts are completed the plate is covered with ink using a felt dabber and wiped clean with tarlatan cloth using circular strokes.



At least three or more wipes with progressively cleaner cloths may be needed.

Plate is warmed on stove and placed face up on bed of press.



Dampened paper is placed over wiped plate and both are covered with felts. Plate is pulled through press. Felts are thrown back and print is removed from plate. Wet print is stretched on a flat rigid surface with butcher's tape. Print is removed with razor blade when dry.

BASIC INTAGLIO (ENGRAVING)

the print. One method of multicolor intaglio printing is with the use of a plate for each color run. This may require numerous metal plates and result in tedious registration problems.[2]

The following will demonstrate another method of achieving color and texture in intaglio prints through the use of photographic serigraphy. It is a procedure which produces natural or man made color and texture effects by combining the engraved or etched intaglio plate with a silk screen process.

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[2]Jules Heller, Printmaking Today. New York: Holt, Rinehart and Winston, 1958, pp. 189-193.

CHAPTER III

PHOTOGRAPHIC SERIGRAPHY PROCESS

The photographic silk screen stencil can be made in various ways. One basic method is to sensitize the screen directly. This is accomplished by impregnating the screen fibers and areas between the fibers with a liquid sensitizer. The sensitizer, known commerically as Birtex, must be heated in a double boiler until the liquid nearly reaches the boiling point. The screen must be blocked at the edges with two or three inches of a lacquer coating or filler. These lacquer bands provide a bed for the hot sensitizer. The sensitizer is now ready to be applied to the screen.

The hot sensitizer is squeegeed across the screen starting with a fountain of sensitizer over the lacquer filled bed. This must be done quickly in a semi-darkened room. When the screen is coated thoroughly it must be placed in a dark room to dry. The coating must be repeated until three even layers have been squeeged across the screen. Between applications the sensitizer can be kept as a hot solution in the double boiler. When applying the second and third coats one must work rapidly in the semi-darkness so that the light sensitive screen is not out of the dark room any longer than necessary.

To make a contact print on the sensitized screen one must work in a dark room under no more than a twenty-five watt red photo safety lamp as a light source. The positive photograph, already prepared, is placed in a photographic contact frame so that the

design side is away from the glass. Then the sensitized screen is placed in the contact frame with the design side against the silk. Black cloth or black paper should be placed inside the screen so that no light can penetrate around the edges during exposure.

Photo bulbs or an arc lamp may be used as light sources to expose the positive to the light sensitive screen. The time of exposure depends greatly upon the source of light. Two number two photoflood bulbs at a distance of thirty inches may only require from three and one half to four minutes. Half tones, which depend upon a dot screen, require less than three minutes under the arc lamp. After one has found the exact exposure through trial and error with several exposure timings one can proceed to develop the screen.

Spray the screen with hot water until the design is open and clear. Finally, dry the screen under a fan before printing. The screen edges must be blocked with brown tape and lacquer as in the ordinary screen process to prevent paint leaks.

After printing, the sensitizer can be removed from the screen with a lye solution containing about one tablespoon of lye to a pint of water. The lye solution should be permitted to soak for about three minutes before flushing the screen with quantities of water. This should clear the screen for other stencils.[3]

A second method involves pigment paper, provides sharp detail, clean lines and open spaces with less preparation than the direct screen

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[3]Harry Schoker, Artists Manual for Silk Screen Print Making. New York: Arthur Brown and Brothers, 1941, pp. 52-60.

sensitizing method. The pigment paper method has been improved recently through the use of new papers and chemicals. No longer is it necessary to pre-sensitize and prepare the photofilm in advance. In the past it was necessary to sensitize the pigment paper in a solution of two ounces of ammonium bichromate and one hundred ounces of water, soak for three minutes and dry on a piece of pre-waxed or benzol coated celluloid which acted as a temporary support for the emulsion. The pigment paper was then placed face down upon the celluloid and squeegeed to eliminate bubbles. This process is known as the wet pigment paper method.

The dry pigment paper method used today eliminates the necessity for preparing the pigment paper or "film" for exposure. The manufacturer has pre-sensitized the screen photofilm and placed it upon a plastic backing for immediate use. Today, only the photographic positive need by ready for a quick contact print on the fully prepared sensitive film. After the proper exposure to the positive, the photofilm is placed in a peroxide solution for a few minutes, washed with warm water until the appropriate areas have been washed clean, and adhered to the silk screen.

Although the pre-sensitized silk screen photofilm has its advantages it requires some special equipment to make quality screens. Commercial necessity has brought new devices into use which greatly add to the efficiency and clarity of the photoscreen process.

One of these is a vacuum board consisting of a smooth surface with 1/32 inch holes placed one half an inch apart over the whole

area. The back of the vacuum board is covered by a solid board placed about 1/16 of an inch away from the perforated area. The sides are closed with wooden strips and sealed with masking tape or any commercial sealer. With the use of a small vacuum pump attached to a 1/4 inch copper tube at the bottom and a clear acetate cover, the vacuum board provides a vertical area which will hold art work, photographic positives and negatives, and photostencils flatly in place while the material is exposed to the arc lamp or is being photographed by the camera.*

The arc lamp used with timing devices now provides the silk screen artist with more control over exposure timing. A photostencil can now be produced in about one half the time required by the wet paper method with photofloods as a light source. Some experience is necessary to properly judge exposure times but this comes with familiarity and knowledge of the timing devices. The dry photofilm permits these experiments to be made with small pieces of film, cut from the roll and processed immediately to determine the exact exposure needed for a particular piece of art work.

The dry method of photographic silk screening outmodes the wet and directly sensitized screen processes. The direct screen method required the artist to keep his screen in a dark room until needed or to spend much time and effort in the preparation of a screen when the need for one arose. The wet method, though superior to the direct method, still required pre-sensitizing and drying

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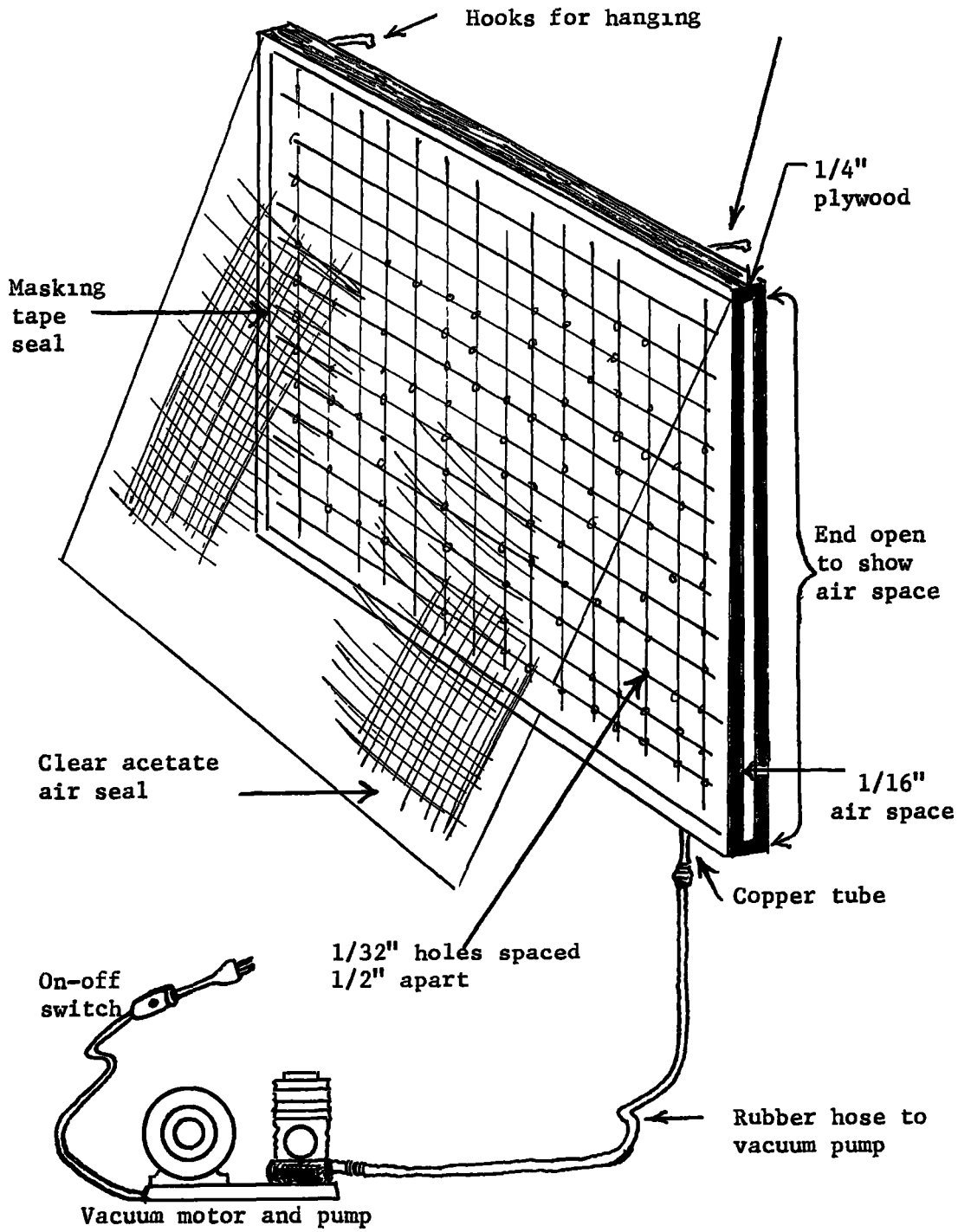
*See illustration on page 13



THE VACUUM BOARD

before the photofilm could be used. With the use of the new dry method films such as Ulano Hi-Fi Green, immediate contact with the photographic positive can be made and processed directly to the screen.[4]

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[4]Eldon Bloom, Owner, Maumee Valley Silk Screen Company Toledo, Ohio, Personal Interview, May 25, 1960.

CHAPTER IV

THE USE OF PHOTOGRAPHIC SERIGRAPHY IN INTAGLIO PRINTMAKING

With a basic understanding of photographic silk screen method one can observe its use as a color medium for intaglio printing. The photographic screen in the commercial field has provided the industry finally, with the fidelity of print already produced by the printing press.

Regardless of mechanization and automation, the silk screen process is basically a hand method of reproduction. This permits the fine artist to make changes in design and texture at any time with little change in the actual printing setup. The intaglio printer would encounter much trouble should he desire to change the metal plate. The screen artist is thus able to change textural qualities not so easily corrected on the metal intaglio plate.

The various silk screen techniques discussed in this paper should not be considered as isolated skills, but as many related possibilities for the creation of textural effects. "It is impossible for any artist or critic to write absolute rules governing form (the plastic techniques of expression) or content (the ideas that are to be expressed) in relation to any medium. Least of all do I wish to indicate any notion of 'musts' and 'must nots.' Any technique and ideas are good if they work. It has been proved again and again in the older graphic arts, etching and lithography, that there is no limitation either to idea or to manner of approach."[5]

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[5]Harry Steinberg, Silk Screen Color Printing. New York: McGraw-Hill Book Company, Inc., 1942, p. 2.

The adaptability of the silk screen to almost limitless surfaces has opened new possibilities for the fine artist. One such area is in combining the fine art of one color intaglio printing with the multicolor silk screen process to produce a combined process print. This combination of processes has endless possibilities. Such a combination print may have the solid areas of the basic silk screen process, the fine line of the burin, and the detailed texture of the photographic silk screen.

A combination silk screen and intaglio print may be produced through the use of man made and natural textures. One such possibility may be demonstrated in the following way: remove a large leaf, such as a catalpa tree leaf (the larger leaf produces a greater area of texture), and place the leaf on an unexposed piece of eight by ten inch Kodalith Ortho number two film (for black and white positives) in a dark room, and place the two against the vacuum area of the vacuum board. Cover the area with the clear acetate and the two will remain vertically flat. Take care that the leaf is completely in the vacuum area or fogging may occur on the print. Expose the film for approximately ten minutes under two 375 watt medium beam reflector photofloods at a distance of thirty-six inches from the actual work. Develop the film in Kodalith Developer until the desired texture occurs. An example of the texture that would result is the vein and cellular structure of the leaf.* Place the film in the hypo bath until the white area becomes transparent and only the negative vein

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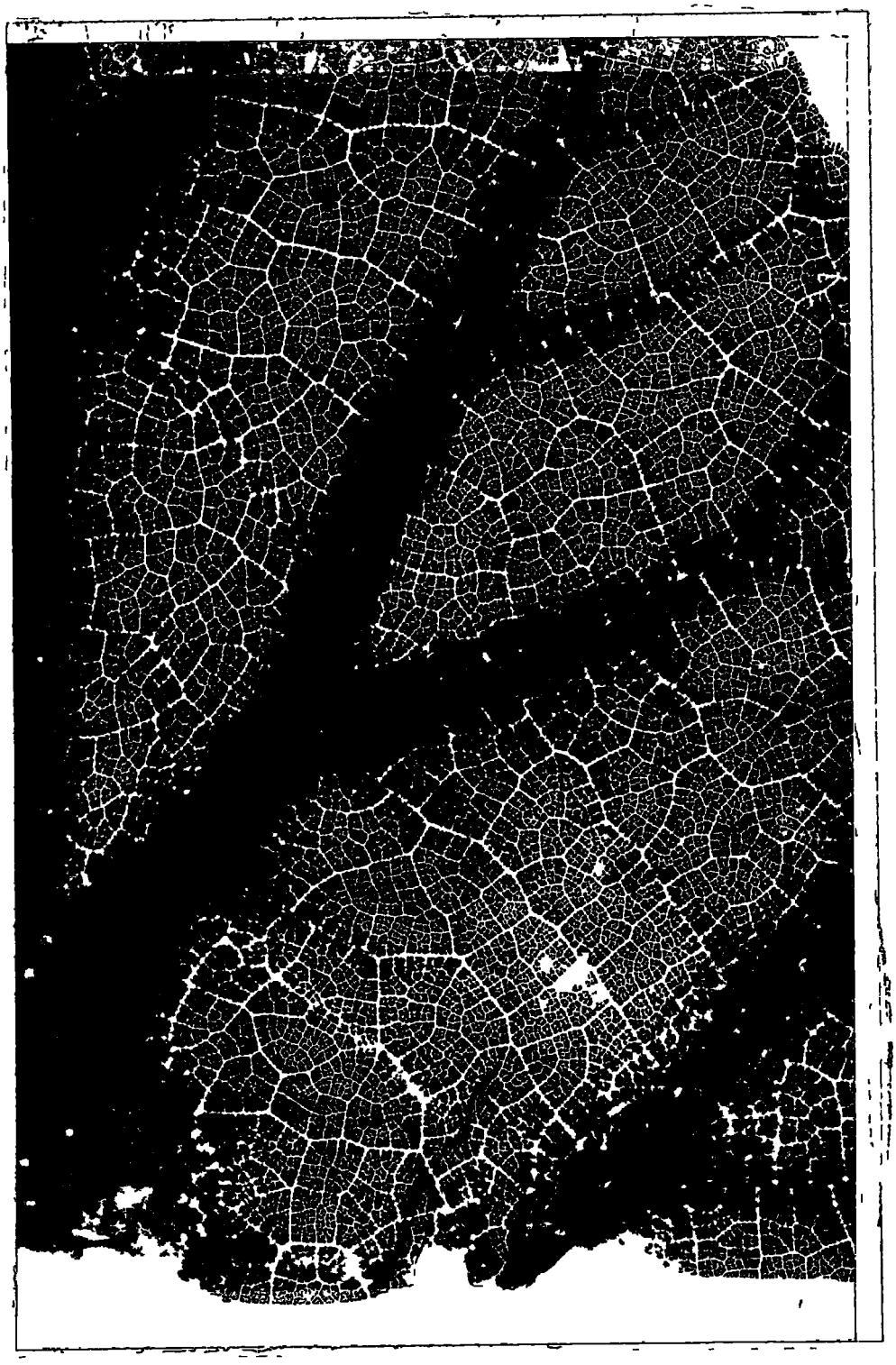
*See photograph on page 17



THE PHOTOGRAPHIC POSITIVE SHOWING THE CATALPA LEAF STRUCTURE

cellular structure remains. Experience with exposure and developing times with film and light conditions will enable one to produce excellent negatives. If the leaf area is great enough or one plans the copper plate to fall within its shape one does not have the problem of enlarging the negative texture. If one desires a larger area, two methods of covering that area can be tried. One method is to project the negative cellular texture from an enlarger to a larger piece of film, producing a positive the size of the copper plate desired. The other method is to use the original negative, expose it to the arc lamp directly and produce the actual leaf size positive. One can make as many positives as he needs to cover the area of his copper plate.

The enlarged projected negative can be reversed to a positive, which may or may not be desirable. The increased film size beyond the standard eight by ten may become financially prohibitive, nullifying the plate savings previously discussed.

Piecing the small positives is more economical. Usually one does not desire a whole background of texture, but rather limited quantity carefully arranged to a predetermined composition plan.

The advantage of the smaller positive is that the cellular structure remains small enough that it will not overpower the textures and lines produced on the copper plate. It is possible to reduce the size of the cellular negative also through the use of the copy camera. This may be desirable when the overall cellular texture may tend to dominate the composite of the two mediums.

With the positive plate complete to the size desired, the

next step is to produce the photographic silk screen stencil. The photofilm must be cut with a border at least one inch greater all around than the original positive. This extra film permits the artist to have some degree of border space in which to block the open screen area without destroying any of the cellular edges. Expose the cellular positive to a sheet of dry photofilm for about three minutes under the arc lamp.

Working under the red lamp the film is then placed in the bleaching solution for three minutes and washed with warm water until all open areas are cleared. Care must be taken with such a delicate structure as cells that the water is not too hot (approximately one hundred and twenty degrees Fahrenheit) or too violent as the small detail lines of the structures will be washed out. Having achieved the desired clarity of line and texture with the warm water, place the wet, soft emulsion side up in a pan of cold water. This will set the emulsion slightly so that the stencil can be handled more readily when preparing to place it upon the silk screen.

The screen must be stretched tightly with a number twelve to fourteen silk. It is necessary to scrub the screen with a soft brush or rag and a small quantity of scouring powder to "rough up" the screen fibers so that the photostencil can mesh and hold on to the silk. The screen must be washed clear of the scouring powder with water. The cellular photostencil can now be adhered to the screen.

If a hinged screen is used, registration is more easily achieved. The original sketch may be scotch taped in place somewhere near the center of the screen area so as to leave at least three inches of

screen around the area to be printed. This permits space for paint and squeegee to move freely over the stencil area. Guides should be placed around a corner and along the horizontal edge of the sketch after it has been centered. The screen and sketch are now in place to receive the photostencil.

Remove the stencil from the cold water tray and place it emulsion side up in its proper position over the original sketch. Although the photofilm stencil is a dark green it is translucent enough to permit adequate vision of the sketch. Drop the screen over the stencil and press the excess water out with the aid of newsprint or blotter paper. The stencil may be air dryed or a small fan may be utilized to hasten the drying process. Too much air from a large fan may cause too rapid a drying and draw the stencil away from the screen. After the stencil has turned a grayed green it is dry and ready for the removal of the acetate backing which the manufacturer has provided as a bed for the emulsion. This backing must be removed by slowly peeling back the acetate close to the screen eliminating as much stress upon the dried emulsion as possible.

The photographic screen is now ready to print.* Several methods may be used in printing the screen. It may be printed upon the paper in color as a background for the intaglio printing of the copper plate or it may be printed on the plate itself or over the intaglio print using transparent colors.

Registration of the screen to the intaglio plate is less of

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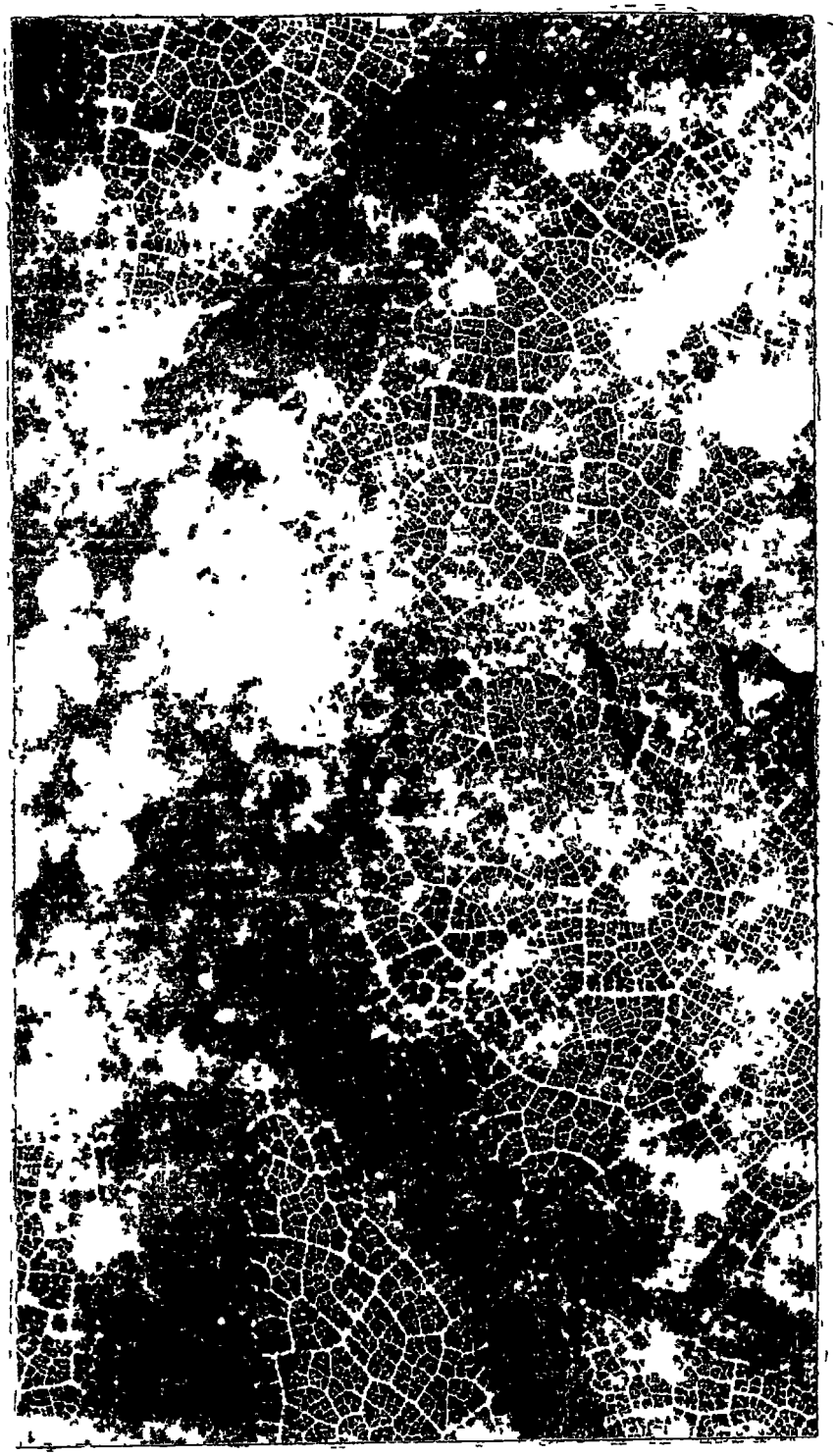
*See Photo Stencil Screen Print on page 21



THE PHOTO STENCIL SCREEN PRINT

a problem than with registration of copper plates. The screen may be run on the paper first but an intaglio print of the same paper should be available so as to check size. Since the intaglio print requires a water soaked paper the photographic silk screen print should be dried four to five days prior to the intaglio printing so as to eliminate the possibility of wet silk screen process inks pulling off onto the intaglio plate in the press.

The water soaking also distorts the size of the intaglio print in relation to the silk screen print. To alleviate many registration problems brought about by the stretching paper fibers one can reduce the limits of his area by permitting colors and textures to generally cover the required space rather than hitting in their exact location. This will produce a freer type print which may be desirable with some subject matter. If a more exact location of color and line are desired much care must be taken with the time required for wetting of the paper, paper grain, and the guides necessary for registration.

Near perfect registration of the silk screen and the intaglio process will require some equipment to achieve a clean print. As previously mentioned, the paper must be observed for stretch characteristics through experimentation and experience with the various types of paper available. If the silk screen prints are to be made over the intaglio print, a glass table with a flood lamp may be used to line up the proper areas to be printed. The screen must be free from hinges and placed by "hand and eye" in the desired area. The printing will require more than one person to control the print properly;

one person to hold the screen frame and one to squeegee the paint.

Registration of an intaglio print to a silk screen print can be achieved by placing the silk screen print face up on a blanket and placing the plate over the whole silk screen edge. If the silk screen printing does not cover the entire area, small, light pencil guide marks may be used to properly place the plate.*

Color combinations through the use of transparent and opaque inks can be numerous. Basically, in the screening and in the fine intaglio process of print making, each color requires a screen. Transparent inks can be used most successfully with the silk screen process thus permitting the artist to overlay several color screens to achieve a third color effect. Textures from the intaglio print and from the screen itself, may increase or decrease the value of the color.**

Commercially it is possible to achieve full color reproduction with the silk screens through "dot screening", utilizing only five screens. This has its disadvantages because one is inhibited by the coarse dot texture and by a very close registration problem. The art produced by this method of screening also becomes very stereotyped and no longer has the individual character found in the less colorful hand intaglio and silk screen print.

Some problems inherent to the silk screen process may prove annoying. Weather can have a moistening effect upon the silk fibers and cause the screen to move slightly and distort registration.

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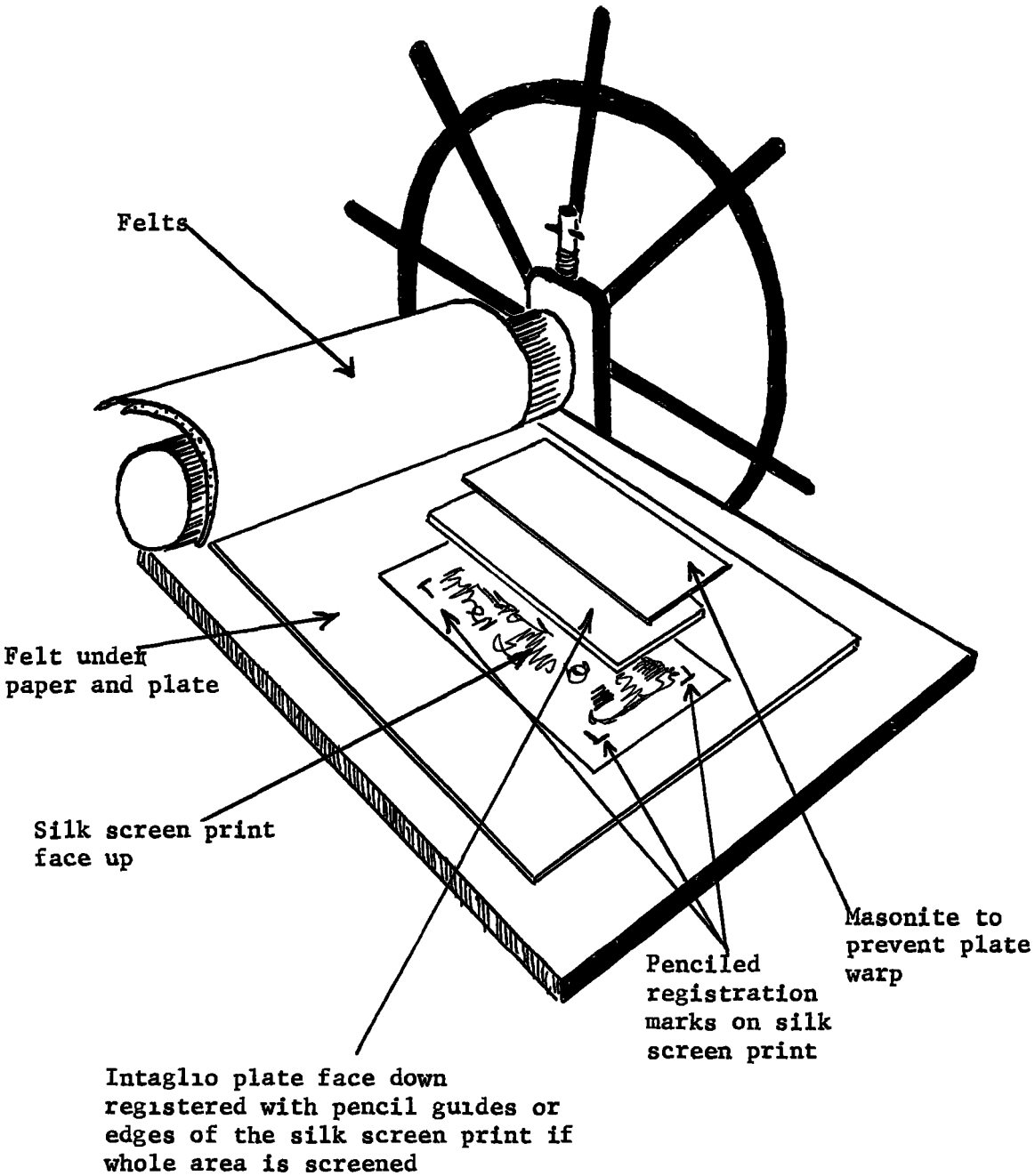
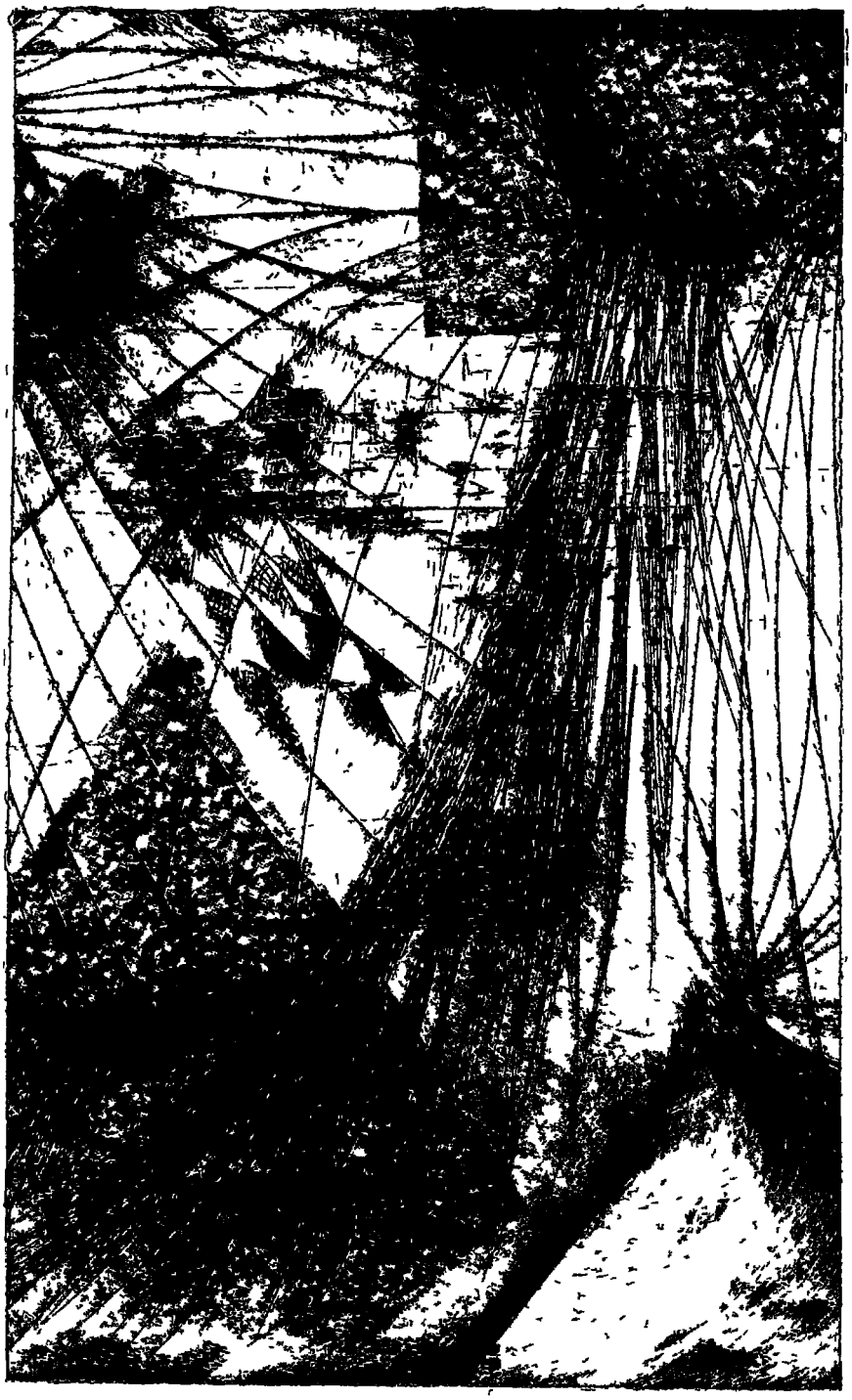
*See illustration on page 24

**See illustration on page 25



REGISTRATION OF SCREEN PRINT TO THE INTAGLIO PLATE



TRANSPARENT SILK SCREEN COFFEE BEAN TEXTURE OVERLAP WITH SUBTLE COLOR CHANGE ON SECOND RUN

Although this condition is unusual it can be troublesome if critical registration is desired. An improperly stretched screen can also produce image movement when the squeegee is drawn from side to side. This can be solved by pulling the squeegee from one direction only.

CHAPTER V

CONCLUSIONS

The combination of silk screen, especially photographic silk screen, and the intaglio printing processes can lead to prints in color and in black and white. Colors can be printed from both mediums. They can be laid over each other and made transparent and opaque where desired.* Combined with texture they produce an illusion of depth. The cost of the copper plate color process can be reduced by doing the color areas with the much less expensive photographic silk screen process. The screens can be washed out (ready for a new image) and re-used many times, whereas ordinarily the copper plate can be used only once on a side.

Textures created with the two processes can take any black and white or color form. Colored opaque textures may be applied with the screen over a fine line burin or etched texture. They can be superimposed over part or all of the area. Transparent texture colors may be placed anywhere to enhance or diffuse an area of intaglio print.

Infinite patterns and textures such as tree bark, stone, coffee bean and internal and external insect and vegetable cells can be found in nature and photographed under natural or magnified conditions by the camera. The artist can create pattern and texture directly on the acetate with brush and stipple tools and place them anywhere he desires.

The photographic silk screen and the intaglio combination

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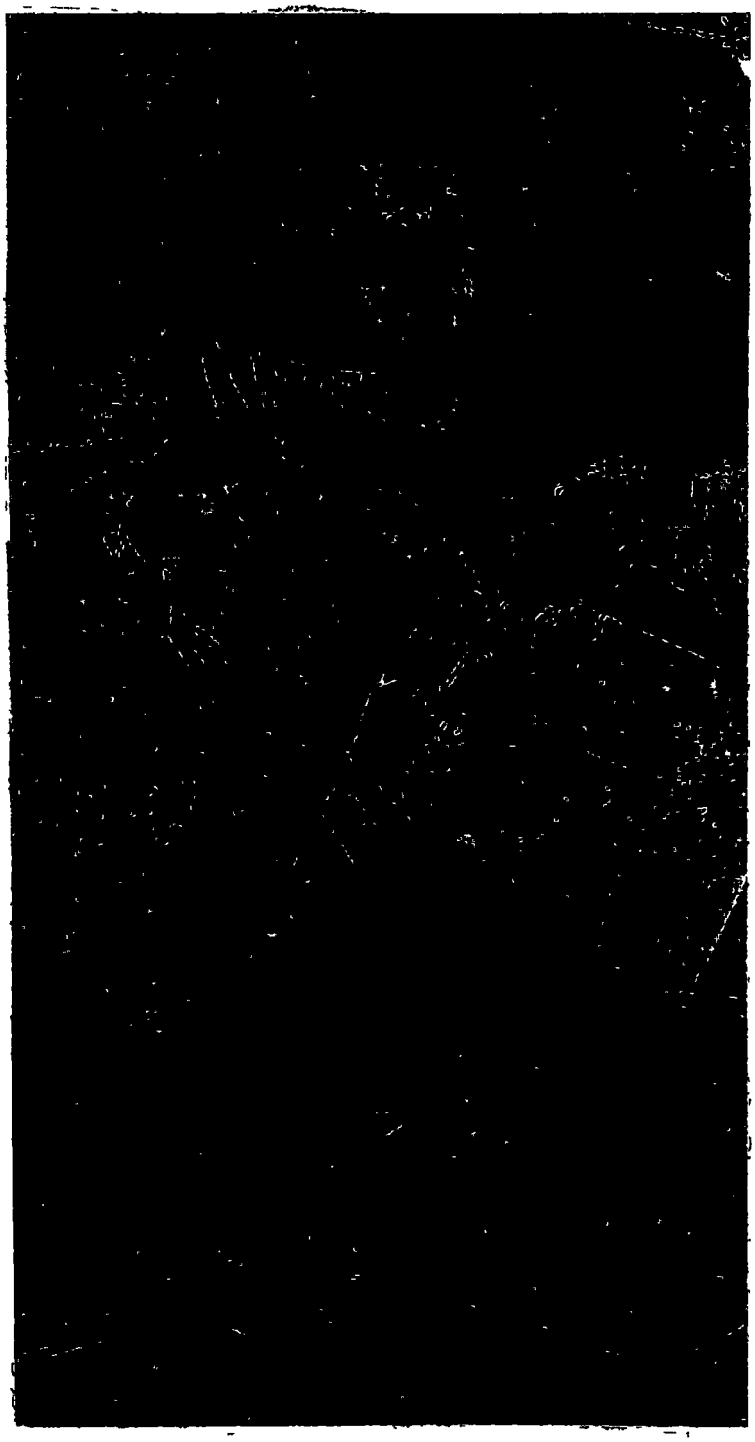
*See illustration on page 28



TRANSPARENT AND OPAQUE INKS APPLIED

OVER INTAGLIO PRINT

print may open a new era to the old art of fine intaglio printing. Color which could be produced only at the cost of many plates and with many registration problems can be easily and inexpensively added to the one color intaglio print by the silk screen process. It can be placed where the artist desires it in any textured, opaque, translucent or transparent form. Color may be intermixed with textures and patterned effects to produce new illusions of space.*

The silk also imparts a texture to the paint that is pressed through it, and thus a new quality is added to the recognized richness of the intaglio print. The photographic dot screen also adds another texture and one need only to observe and touch an intaglio print to enjoy the richness of line and space produced by the burin and the etching processes. In league with the directness and texture inherent in the silk inself, the silk screen and intaglio art mediums combine to add a new color dimension to the fine art field.

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*See illustration on page 30

TRANSPARENT SILK SCREEN APPLIED BEFORE

INTAGLIO PRINT

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THE ADAPTATION

of

PHOTOGRAPHIC SERIGRAPHY TO INTAGLIO PRINTMAKING

Robert L. Notestine

An Abstract of
A Thesis

Submitted in partial fulfillment
of the requirements for the degree
of Master of Arts

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The Adaptation of Photographic Serigraphy to Intaglio Printmaking. (32 pp.)

Faculty Adviser: Dr. Paul Running

The problem was to find a simpler and more economical method of producing multicolor intaglio prints. Techniques were advanced utilizing a number of silk screen processes to be combined with the intaglio printing plate. Emphasis was placed on the photographic silk screen process which produces intricate detailed texture and line. Combinations of photographic screen prints with intaglio overlays, and intaglio prints with opaque and translucent screen overlays were described in detail. Silk screen to intaglio print registration problems were discussed and solutions advanced.

Although the photographic screen process was more expensive than the basic screen processes the increased fidelity of line and texture proved worth the added cost. Close registration of silk screen to the intaglio print was much simpler than the copper plate to paper method utilized in the intaglio process.

The results of these experiments were generally successful. Color and texture can be produced more economically through the use of the serigraphic processes than by the multiple intaglio plate process and can be combined aesthetically with the relief quality of the intaglio print.