Tamarind Technical Papers

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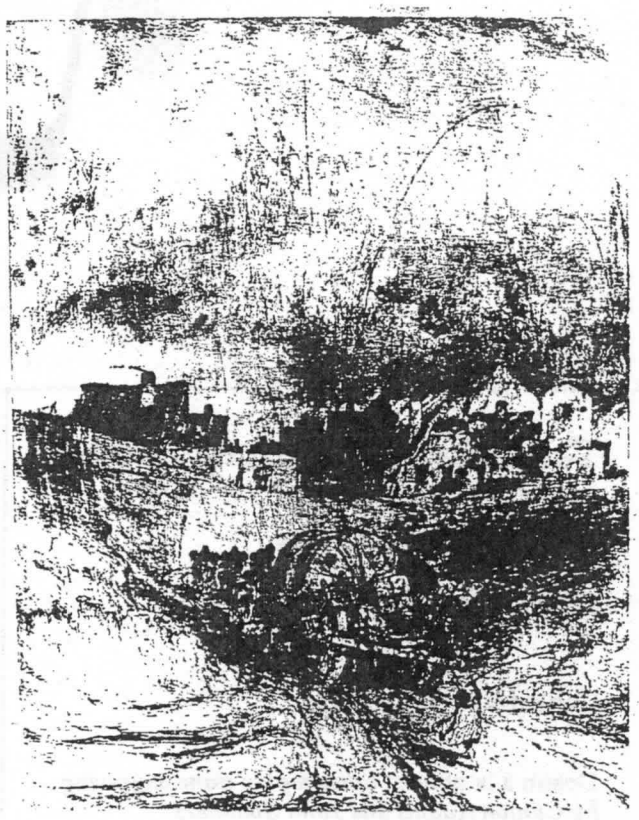
DESSIN A LA POINTE: LITHOGRAPHIC STONE ENGRAVING

by Clinton Adams and John Sommers

In his treatise on lithography Senefelder[1] described many "manners" in which the process might be used. One of these was the "engraved manner." In this manner, he says, "all those lines or parts of the drawing or writing which are to give the impression, are engraved into the surface of the stone by means of a sharp needle, or bitten into it by the action of an acid." The process as Senefelder described it was thus essentially a form of intaglio printmaking rather than true lithography, and the stone was used merely as a substitute for the copper plate. Although widely used in the early years of the 19th century, the stone-intaglio process was soon abandoned.[2]

The process described by Mairet[3] as dessin à la pointe differed from that described by Senefelder in that Mairet's process led to an image which could be printed not by wiping the stone (as an intaglio plate) but as a lithograph. The advantages of Mairet's process, which involved the scratching of lines only through a gum coating rather than into the stone itself, were considerable, permitting a fineness and delicacy of line that could not be achieved in drawings with either pen or crayon on stone. It is unfortunate that despite its great beauty, this process has been little used and that, as a result of disuse, the preferred procedures for processing the stone are not widely known.

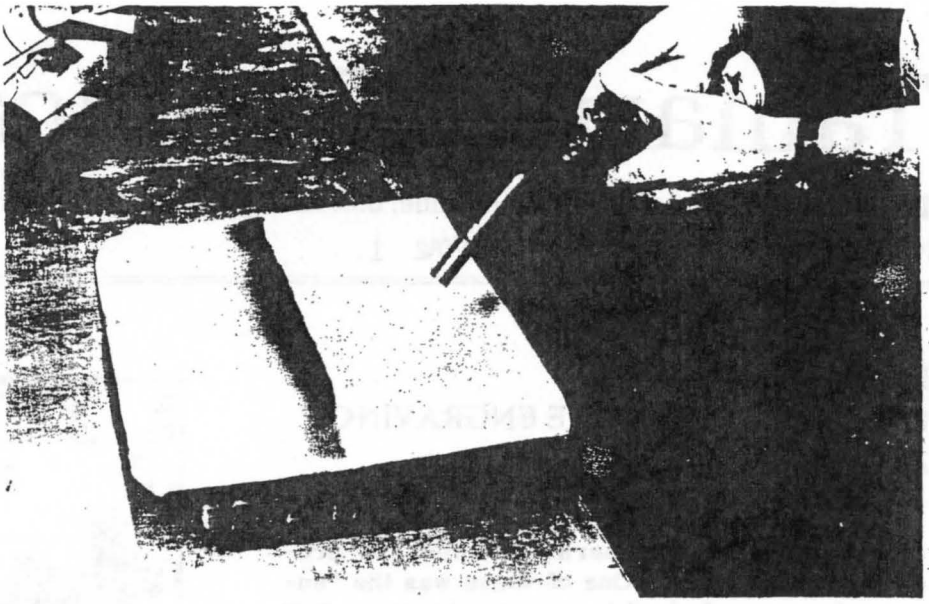
The stone selected for a lithograph to be developed through dessin à la pointe should be of consistent good quality, from hard yellow to grey. It should be free of any infusions or fossils which might interfere with the image. The graining of the stone begins in the normal manner through grits #100 and #180. The final graining of the stone must, however, be done with far more than usual care, for in this technique the very fine surface of the stone must be completely free of even the most minute scratches.



EUGENE ISABEY. Entree de Village. Lithograph, c. 1844. Collection, University of New Mexico Art Museum.

When using the #240 and #320 grits, a smaller stone rather than a levigator should be used as the graining tool. The levigator should be avoided because its use might cause scratches on the prepared stone surface. Care should be taken throughout the graining process to use as much water as the surface of the stone is capable of holding. Only a light sprinkling of graining material is needed, and the moment a slight diffusion of stone can be seen in the water the graining cycle should be ended. Graining beyond this point can cause scratches due to the aggregation of loosened stone particles into clumps that are larger than the fine grit particles. Use of too little water can cause this to happen quickly, thus increasing the chance of scratches. Proper care in the cleaning of graining tools, stone surfaces and edges, and the

1. *Senefelder, Aloys. A Complete Course of Lithography, 1818. (Reprinted, Da Capo Press, New York, 1968).*
2. *Intaglio and relief printing from stone are briefly discussed in TBL (section 15.4, pages 376-7).*
3. *Mairet, F. Notice sur la lithographie, 1818.*



The stone is heated with a moving torch in preparation for application of the ground. Note the visibility of the moisture line.

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graining area will insure against contamination. Careful examination of stone edges will protect against particles chipping into the graining slurry. Careful handling of the smaller stone used as a graining tool will be a further guard against scratches.

Graining should continue as the tooth of the stone is progressively reduced with finer and finer grits, down to the smallest grain available. The finer the grain, the greater the care must be, for even the smallest of scratches may later serve to catch the artist's engraving tool, deflecting its line and impairing the drawing.

The finished stone is now ready for application of a special ground. Preparation and application of this ground is of critical importance. The ground must be thin, even and tight. The thinner and more even the ground, the finer the line the artist may cut into it. The procedure is as follows:

1. Because the stone must be heated, it should be at room temperature. A stone brought directly from a very cold storage area could break as a result of contrasting temperatures. If the torch is not kept in motion during the heating process the overheating of one area might also cause breakage of the stone.

2. Begin heating the stone with the torch in a slow, continually moving pattern at the near side, driving the moisture to the far side ahead of the flame (preferably a bottle gas torch). Move the torch from end to end, just below the visible moisture line. When done, turn the stone 90 degrees and repeat the heating, continuing until heating has been done from all four sides. The final passes should reveal very little moisture being driven from the surface.

3. Prepare the ground by mixing about

six ounces of gum arabic (14° Baumé) with a teaspoon of powdered red iron oxide, stirring thoroughly. The purpose of the red oxide is to give color to the ground, making the artist's work visible.

4. Apply the colored gum to the heated stone, using a sponge and working rapidly. Buff down the gum with clean, soft cheesecloth pads until it is even and streak-free. For thorough and even coverage, repeat the process a second time.

The stone is now ready to receive the artist's work. Although many tools can be used for the drawing, including metal burins, scrapers and razor blades, a diamond point stylus will produce the finest lines.

As noted earlier, no effort should be made in using this technique physically to engrave the stone. The intention is to draw a line which merely cuts through the red gum ground, exposing (but not penetrating) the stone beneath it. The lighter the line cut through the gum, the finer that line will appear when printed. Cuts that penetrate the stone will yield poor results and will interfere with later processing. Wide or heavy lines are better achieved through repeated strokes rather than through use of the stylus with the force required to make a wide line in a single stroke.

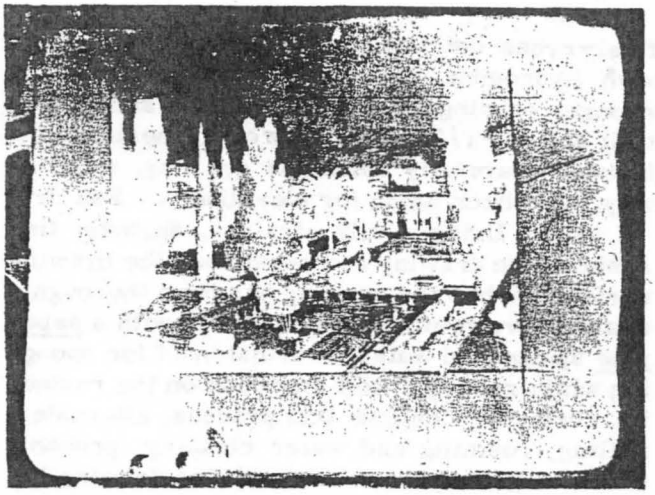
In cross hatching, tightly spaced lines can be used for the richest darks, but care should be taken in the cross cuts. Where two lines cross it is necessary to handle the stylus so as to avoid chipping of the stone or the ground. If the cutting is too deep or if the tool is dull, such chipping is far more likely, resulting in lines that are blurred and fuzzy. An incorrect cut can be corrected by applying gum with a fine brush into the cut. The area can then be redrawn with the stylus.

The artist must at all times use care to ensure that the surface of the gum ground is not softened by moisture. Moisture can easily break through the thin gum film, destroying the clarity of the drawing. The artist's hand should be insulated from the stone surface by a bridge or a clean sheet of heavy paper.

As work proceeds, the drawing will become a visual negative of the final lithograph. The more "white" lines are cut through the mask, the darker that area will be. The artist may find it helpful to have a 10-power glass at hand so that the lines of the drawing may be closely examined. Because additions after processing can never have the look of the initial drawing, the artist must make a firm judgement as to the completion of the work before the etching begins.

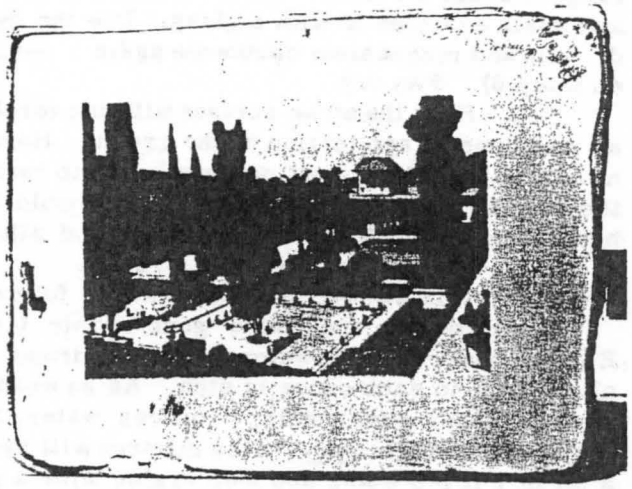
Following is an outline of the procedures developed at Tamarind for the processing of drawings done in this manner:

1. Rub lithotine into the "engraving" with a clean pad. This both cleans the drawing and provides initial grease.



The stone for Garden I by Leonard Lehrer [T 71-186].

The lines of the artist's drawing appear in white against the colored ground on the stone.



The drawing has now been processed and rolled-up.

2. Rub in two coats of asphaltum, fanning the stone dry between them.

3. Roll up the dry stone with black ink. The stone surface must be uniformly black. If the artist has cut too deeply, it will be necessary to pound ink into the grooves thus made. Water must not touch the stone until all cut lines are ink-filled.

4. Begin washing off with water. Continue the roll-up, using rapid "snap" roller movements, until the stone is clean and the drawing is clear.

5. At this point clean the ink slab, lay out fresh ink, and scrape the leather roller. The final roll-up should be done with completely fresh ink, free of the sludge that will have accumulated in step 4.

6. Make several passes with the roller, then carefully check the surface with a magnifying glass to ensure that all areas are clean and that all lines (and intersections) are clear and crisp. This is particularly important in

finely cross-hatched areas. If necessary, clean with hydrogum, magnesium carbonate, and a sponge, pouring on a puddle of gum and adding to it about 1-1/2 tablespoons of magnesium carbonate. Carefully clean the drawing, wash away, and check again for cleanliness. Fan dry.

7. Using a silk strainer, sprinkle fine rosin on the drawing and brush over the drawing surface. When the drawing has been thoroughly rosined, wash off the excess rosin with a separate sponge and water from that used for sponging while rolling. Roll more ink on the rosined ink surface. Continue this process, alternately rolling, rosining and water cleaning, probably three or four times in all, until the drawing has been placed in relief. Care must be taken not to coarsen the image by too much of a build-up of ink or through use of coarse rosin.

8. Apply rosin and talc, polishing carefully to avoid streaks. Wash the surface clean and again examine it with a glass. Use the hydrogum and magnesium carbonate again if needed (step 6). Fan dry.

9. Heat the stone surface with the torch, as was done in application of the ground. Here, however, the flame must not be allowed to touch the surface of the stone. The drawing should be heated only enough to melt the rosin and allow it to fuse with the ink, forming a resist.

10. Mix an engraving etch in the following proportions: one-third gum arabic (14° Baumé), two-thirds water, with 10 drops of nitric acid to each ounce of etch. As an example: 3 ounces gum arabic, 6 ounces water, 90 drops nitric acid. Note: This mixture will have a pH of 1 if tap water and gum arabic with a pH of 4 have been used. Mixtures formulated with gum arabic having a pH of 3 will have a pH lower than 1 and will be more active as etches. The strength of the etch may be controlled by varying the amount of nitric acid used. The engraving etch should be adjusted to suit the quality of the stone and the fineness of the drawing. A gentle etch must necessarily be used on a soft stone.

11. The purpose of this engraving etch is to achieve a lowering of the negative areas of the stone. It should be applied and moved about with an etching brush until it is exhausted and effervescence ceases. The etch should then be wiped off and fresh etch applied, repeating the process until the drawing has been placed in clear relief. A glass should again be used to examine the relief. Note: Engraving etches are formulated with a combination of gum, water and acid. Although a 10-drop etch (in gum arabic alone) would normally be considered a light to medium etch; the addition of water to an etch liberates additional H^+ ions, intensifying the reaction with the calcium carbonate of the stone. The stone is thus dissolved and its surface is lowered. The activity of the engraving etch is so great and the gum arabic concentration so small that no complete adsorbed gum film is formed,[1] thus in step 12 it will be necessary to form such a film by applying further etches.

12. Wash the stone and fan it dry. Apply an etch composed of 6 to 8 drops of nitric acid per ounce of gum arabic (14° Baumé; pH 3.8 to 4.0). Apply the etch for three minutes, then buff down tight with clean cheesecloth.

13. Allow the stone to rest for 30 minutes. Wash out, roll up, and apply a second etch (6 drops of nitric acid per ounce of gum arabic). Application of these successive etches should ensure formation of a strong, thoroughly adsorbed gum film.

We have mentioned above that additions by the artist after processing create special problems. Because the surface of the stone has been altered by the engraving etch, additions of any kind have an appearance quite different from the work done previously. "Engraved" additions are particularly inadvisable because they are placed below the surface of the stone. It would thus be wiser to make a second stone for the printing of essential additions to the image. Deletions create no problem whatsoever. They may be simply made by honing out and etching.

Because printing will be done from a surface that is slightly in relief, some comments may be helpful as to the inking of the stone. Generally, the ink that is used should be heavy bodied with good tack. Several light passes of the roller, briskly applied, are preferable to inking heavily or using an ink that is too soft. As cleanliness and crispness are important to the image, each impression must be examined so as to maintain sharp lines and clear interstitial spaces. The stone surface must not be allowed to dry between impressions.

Modification of the ink with magnesium carbonate will help to alleviate scumming and give the ink better body. If scumming occurs it is likely that either the ink is too soft or that the adsorbed gum film is weak or incomplete. Scum resulting from soft ink will wash away; scum that sticks usually indicates a weak adsorbed gum film. In the latter case, additional etching with a mild etch is indicated. Since the stone surface is so fine, it is of utmost importance that a firm adsorbed film be maintained. As this film is easily abraded by the leather roller in repeated inking, frequent gumming of the surface is desirable both during proofing and during printing of the edition.

1. *See TBL, sections 9.10-12, pages 270-5.*

Clinton Adams is Director of Tamarind Institute and Dean of the College of Fine Arts, The University of New Mexico. **John Sommers**, Tamarind Master Printer, and Associate in Art, UNM, is Tamarind Studio Manager.

DRAWING COLOR SEPARATIONS ON SURFACED MYLAR

by Susan Ellis

When color lithographs have a clear, bold structure—as in the work of Lautrec, Léger or Picasso—or when the precise registration of one color to another is less than critical—as in the work of Bonnard, Miró or Francis—it is relatively easy for the artist to draw color separation plates through the use of tracings from a key drawing.

Complex color lithographs drawn with crayon present a different kind of problem and a very demanding one. In this article Susan Ellis interviews artist Jim Butler about a working method which he developed in his shop at Southern Illinois University and further explored in collaboration with the Tamarind staff while a guest artist at the Institute during the summer of 1973. — Ed.

Butler's impressive new lithographs result from adaptation to the art of hand lithography of an efficient and flexible method for the drawing of color separations, a process formerly used solely in the production of illustrations by offset lithography.

An article by Mel Hunter in the Book Production Industry magazine (October, 1972) entitled "Making Pre-Separation Effective" described the four-color separation process as it was used in offset printing. Reading this article, Butler was impressed by the potential of the process for use in his own work.

"As my images center around the use of the photograph, I decided to apply the procedure to my lithographs and found it perfect for this type of imagery," he said. "It allows for tight registry, a full tonal range, and a form of color separation."

The process involves drawing on a grained Mylar with a grease pencil. Butler uses Herculene, a Mylar film produced by Keuffel & Esser Company. "Architects and engineers use this film as a drafting material," Butler said. "I use Mylar #19-1153, matte on one side, .003 thickness. This is transparent enough to see through, and I use it directly over color separations on a light table. The Mylar has a high tear strength, so that it is virtually impossible to damage.

Jim Butler makes a key drawing on Mylar.
The drawing will later be used to make a photographic negative. The negative will then be used to make the plate for printing.

"It has a matte surface which is finer than a 150-line screen and is similar to drawing on a #17 ball grain aluminum plate. Its grain surface is random, thus the artist will have no problem with moire patterns in overlays." An additional important feature is the fact that Mylar's stability causes minimal expansion or contraction in response to changes in humidity. "Tight color separation is quite easy because of this," Butler concludes.

A china marking pencil (All-Stabilo #8046 black) is used for drawings on the Mylar. "This is the only pencil I have found that will produce reliable halftone dots, although a suitable substitute might be found through further search. It is similar to a litho crayon, though not as waxy.

"Mel Hunter found this pencil to possess two important qualities: it is easily sharpened with a knife or blade and hard enough for fine line work, and it has an intense blackness that produces tiny opaque dots when stroked over the surfaced Mylar." These marks are sufficiently opaque to produce dots equivalent to a 150-line screen.

The drawing on Mylar is then used to make a contact negative on any plastic base film, such as the Kodalith film made by Kodak. Plastic base films are more stable than cellulose base films because they will stay flat after developing. "The thinner the film, the better," Butler said, adding that he has used a film of .004 thickness.

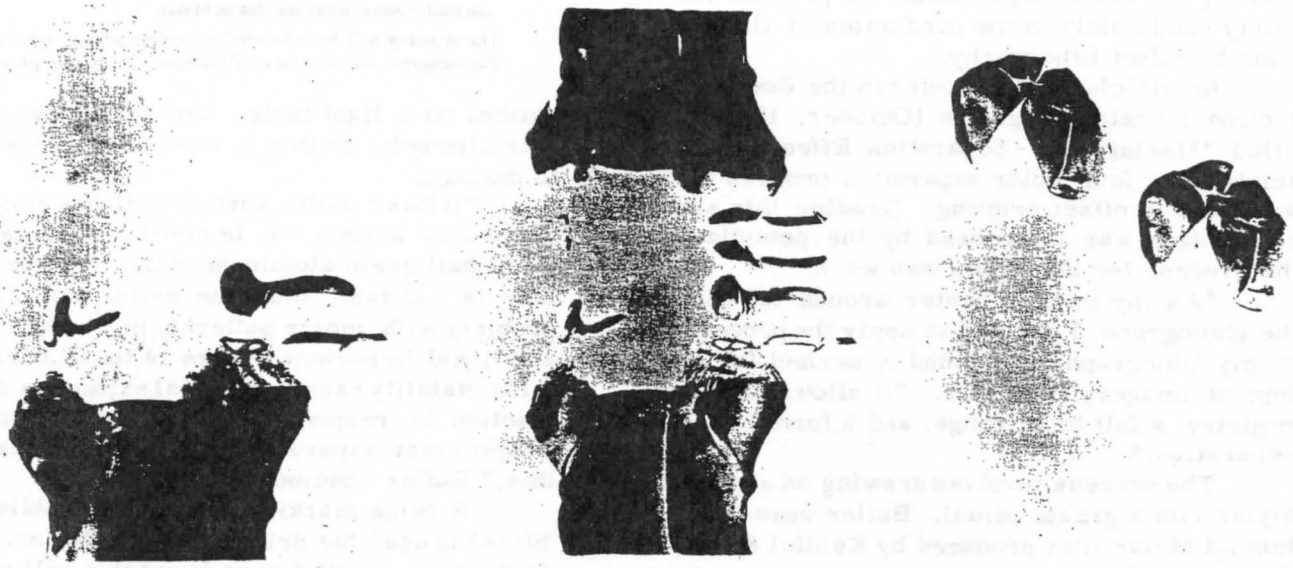
The development of the film is critical and it must be tray developed. Butler's typical development time was two minutes in fresh Kodak litho powder developer. "One will want to experiment with exposure time, but I contacted the Mylar drawing to the Kodalith for four seconds with a 15-watt bulb. This required a two-minute developing time. If a stronger bulb such as a 60-watt bulb were used, the exposure time could stay at four seconds but the developing time would have to be cut to about one minute. One might encounter some difficulty in maintaining control during so short a developing time."

Experience at Tamarind indicates that extensive deletions on Mylar drawings will cause problems, although solvents, scrapers and kneaded erasers can all be used. It is important to remember that this Mylar is similar to a plate in that once its surface grain has been destroyed by scraping or other means, it cannot be reworked except in solid forms.

Butler describes his drawing process as follows: "I use either of two surfaces under the Mylar while drawing. The one I prefer is a sheet of white, matte-finish Formica, either mounted or unmounted on a drawing board. Whatever is underneath the Mylar will affect the tone resulting from the drag of the pencil across its grain. Formica is smooth, it can be cleaned at any time, and it seems to create less static than any other surface. I also use a Static Master 500 brush.[1] This is particularly helpful in holding down the static created by the two surfaces, thus almost eliminating the hazard of clinging dust."

The second surface Butler works on is glass. "Although not as good as Formica, working on glass allows me to read through color separations on a light table and translate the value changes from the half-tone separations to the Mylar." He adds that in some kinds of work the Mylar's sensitivity to the textures beneath it could be a great advantage. "Used over rough surfaces, Mylar could be very useful in frottage.[2] I have transferred all kinds of textures by laying the Mylar over the surface to be transferred and then rubbing it with the pencil. The film can then be contacted directly on a presensitized aluminum plate, exposed, and printed in reverse."

1. *Manufactured by Nuclear Products Co., P.O. Box 1178, El Monte, California 91734.*
2. *See TBL, section 8.6, pages 232-3.*



Impressions on Mylar. Jim Butler's untitled lithograph [T 73-275]. LEFT: Plate 3 alone. CENTER: Plates 2 and 4 superimposed. RIGHT: Plate 6 alone.

All three drawings were made on Mylar with airbrush and opaque acrylic.

Plate 6 of Butler's lithograph is printed. The paper already carries the images of five earlier press-runs. Note register pins at lower left.

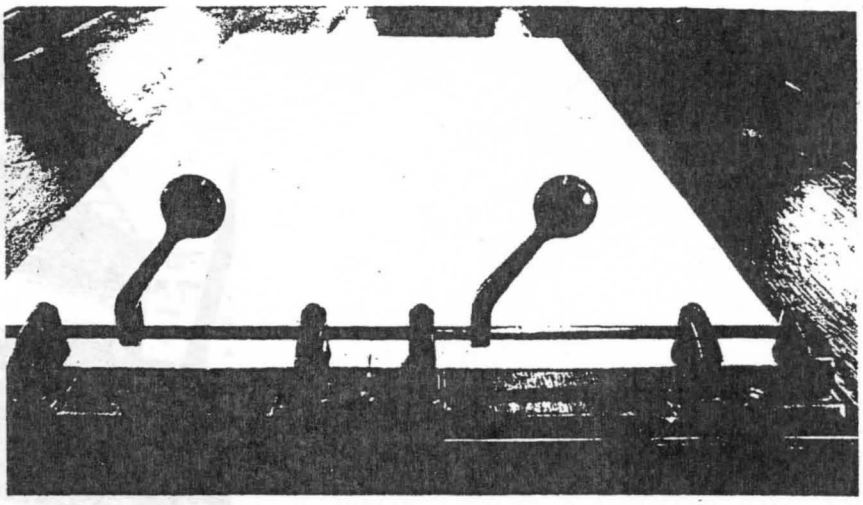
Other methods of drawing, such as air brush or washes, can also be used on Mylar. "Sprayed opaquing materials and tusche washes can be applied to the Mylar and printed in reverse by direct contacting to sensitized plates. Of course, if you want the drawing to print as a positive, you must first make a Kodalith negative of the Mylar drawing, then use the negative to make the plate."

For four-color separation, Butler has found that tones can be translated into Mylar drawings from color photographs that have been separated into red, yellow, blue and black positives. "These positives can be made using any line screen, but I have found the 133 or 150-line screens to be most suitable for hand lithographic work. There is no difficulty in going to a larger dot pattern, but since the Mylar is similar to a 150-line screen, there is little use in employing a finer screen on the four separations."

Butler comments on methods for registration of the Mylars in the article that follows.

In his Tamarind lithographs, Butler also did extensive work on the plates themselves, following initial development of the image in the manner described above. After processing, the plates were often counter-etched to permit direct additions in crayon. Because of the similarity between the grain of the Mylar and that of the plate itself, the newly added crayon work merges well with the original drawing and there is no problem of a visual separation or divorcement.

Jim Butler is Associate Professor of Art at Southern Illinois University, Edwardsville. He was guest artist at Tamarind Institute during the summer of 1973. **Susan Ellis** is staff writer at the University of New Mexico and at Tamarind Institute.



A sheet of edition paper is placed on the board for punching. Note alignment of centermarks.

AN IMPROVED DEVICE FOR CRITICAL COLOR REGISTRATION

by Jim Butler, with Susan Ellis

Over the years Tamarind has customarily used a combination of the centermark and transparent overlay systems in the registration of color lithographs.[1] These two systems, when used together and with precision, are sufficient to ensure accurate registration of most color lithographs. They are economical systems suitable for daily use in professional workshops.

Systems making use of registration pins in combination with holes punched in the paper have been employed for some years in commercial printing, and a variant of these systems has sometimes been used in professional lithographic workshops. Many such systems are either too complex or too costly to permit their common use. Now, however, artist Jim Butler has developed a simple pin system which can be used in any shop and which permits precise registration of even the most demanding images. Butler's system, described in this article, is used as needed at Tamarind. – Ed.

A simple process has been devised whereby proofing and edition paper can be punched for registry prior to printing.

The punch that is used consists of three Wilson-Jones Marvel two-hole punches (#160N) available at most office supply and stationery stores. The punches are then mounted on a 1/4 inch sheet of aluminum to ensure that they be held firmly square one to another. The metal is countersunk on a 3/4 inch sheet of plywood, eight inches wide, and this unit is in turn mounted on a larger sheet of plywood which has been cut to fit around the punches. The bases of the punches are flush with the upper plywood surface.

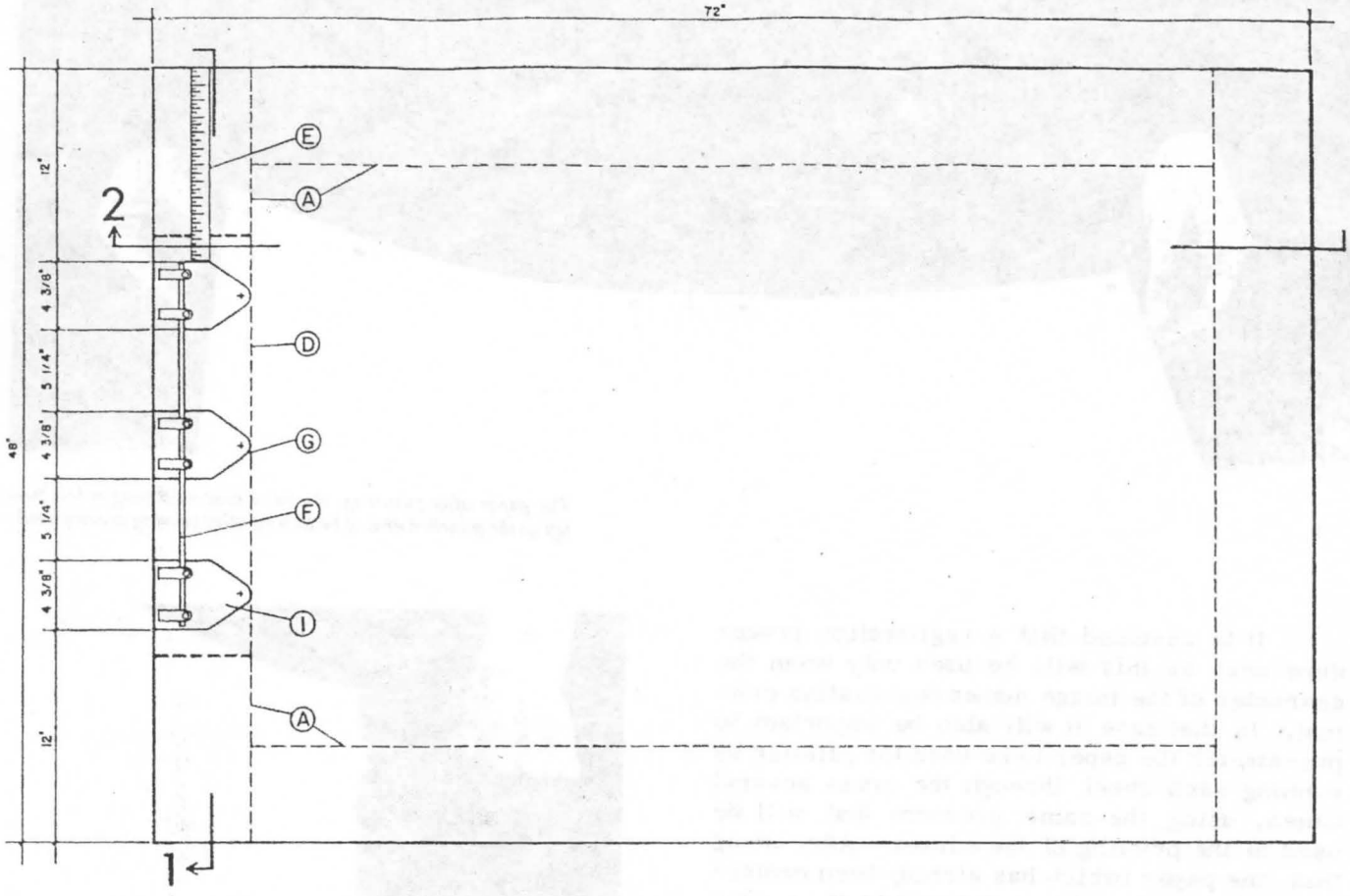
The punch board constructed at Tamarind is large enough (4 feet by 6 feet) to accommodate the largest sheet of paper that might be used in printing. A center line is drawn on the base board running from the center of the center punch to the other end of the base board. The distance between the three two-hole punches may be varied as desired. At Tamarind they are spaced equally within a total width of 22 inches.

After mounting the punches, their horizontal rods are removed and replaced by a single rod connecting all three punches. This rod is milled to match the rods that have been removed; this rod is channelled at each end so as to receive a key. The rod should be polished to fit smoothly into the punch pin assemblies. The final assembly is thus composed of a single rod which has been slipped through each punch pin assembly, with two of the original pressure handles mounted on the bar between the outside and center punches. The whole assembly is locked in place by snapping a key into the channels provided on each end of the bar.

Next, a pin bar is made of .015 gauge stainless steel. This bar is placed in the punch and holes are punched in it. When it is taken from the punch, either Chandler register pins or Hanco brass register pins are placed in these holes. This pin bar is then glued to the plate or stone with a spray adhesive. If preferred, when printing from a metal plate, the plate itself may be punched.

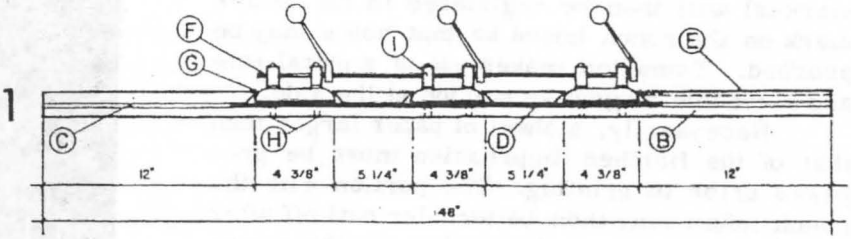
When proofing the plates or stones, Mylar overlays are pulled, normally from the key plate. This Mylar proof is then taped under the punch and each subsequent plate is registered to it for punching.

1. *See TBL, section 7.10, pages 194-5.*



NOTES

A. 3/4" PLYWOOD
B. 1/2" PLYWOOD
C. 1/4" PLYWOOD
D. 6"x3/8"x26" STEEL PLATE
E. RECESS-FLUSH WITH SURFACE 12" STEEL RULER
F. 3/8"ϕx23" STEEL ROD-MACHINE TO FIT WILSON-JONES PUNCH
G. CUT 3/4" PLYWD. TO FIT WILSON-JONES PUNCH
H. DRILL HOLES THRU PLATE AND PLYWD. MATCH PUNCH HOLES-FOR CLEAN OUT
I. WILSON-JONES PUNCH MACHINE



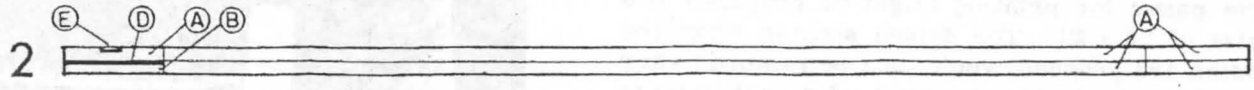
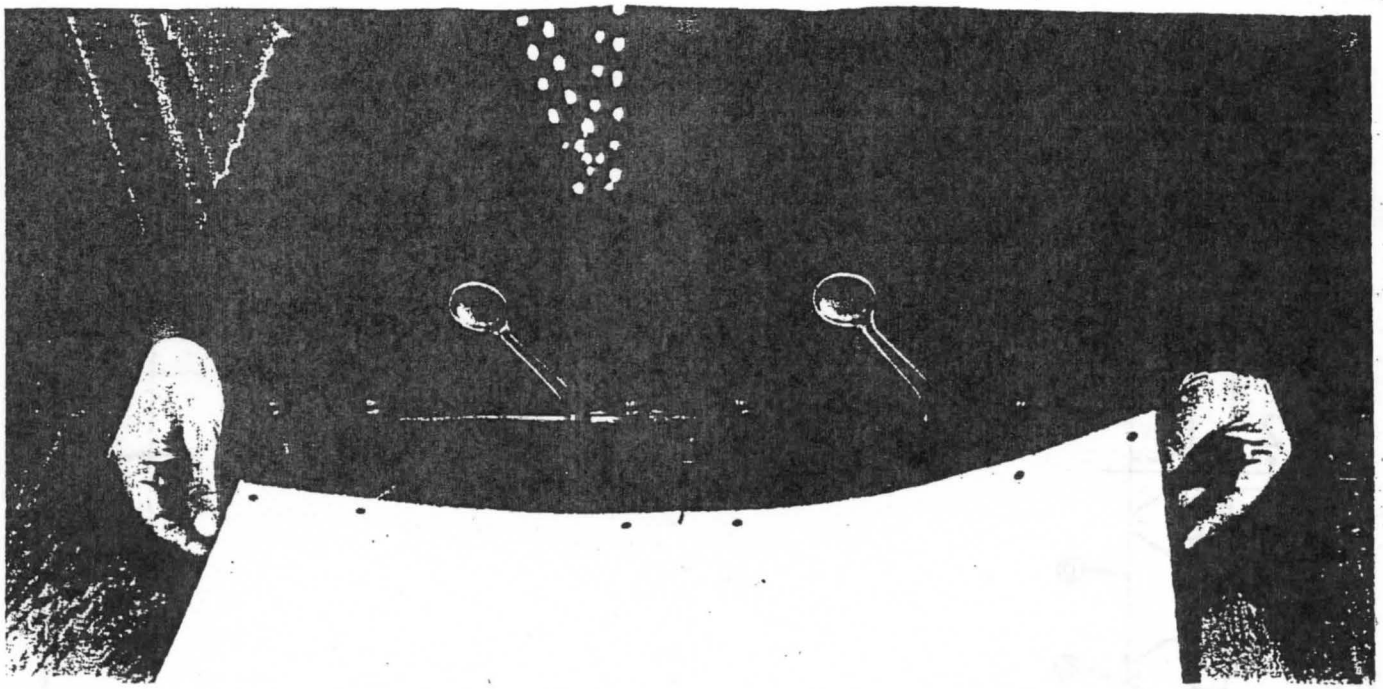


Diagram of the Butler registration device now in use at Tamarind.

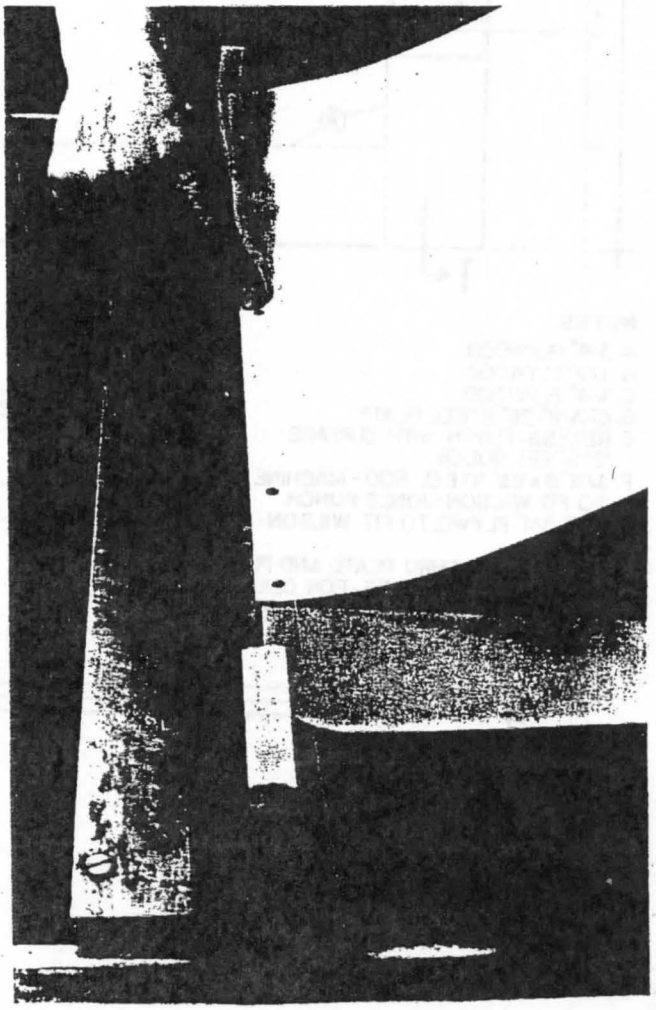


The paper after punching. An extra four-inch margin has been left at the punched end, to be torn off after printing is completed.

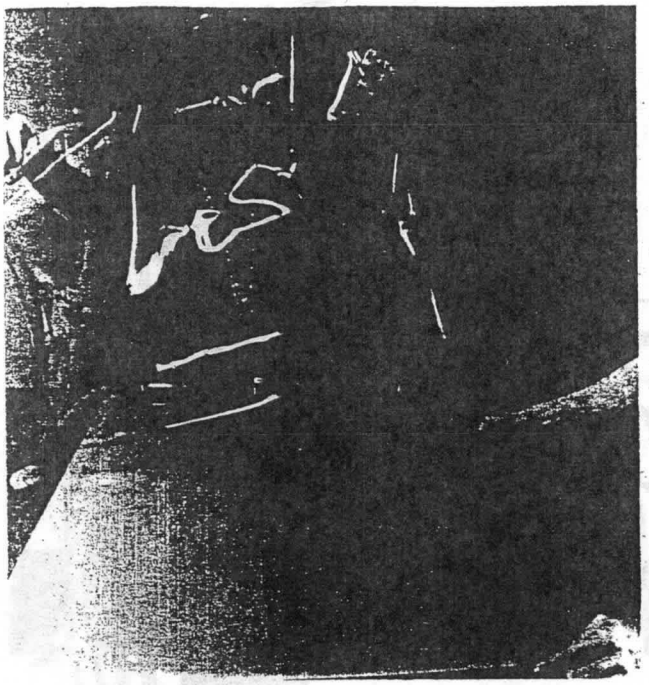
It is assumed that a registration procedure such as this will be used only when the character of the image makes registration critical. In that case it will also be important to pre-stretch the paper to be used for printing by running each sheet through the press several times, using the same pressure that will be used in the printing of the edition. After doing this, the paper (which has already been center-marked) will then be registered to the center mark on the punch board so that holes may be punched. Tamarind makes use of a metal rule and moveable magnet as a guide at the side.

Necessarily, a sheet of paper larger than that of the finished impression must be prepared prior to printing. The portion with the punch-holes may then be torn (or cut) off after printing so that no visible evidence of the registration system will remain. As an example, if the finished lithograph is to be 20 by 20 inches, the paper for printing might be prepared at a size of 24 x 20. The 4-inch strip in which the holes are punched would then be removed after printing has been completed. A 4-inch strip is about the minimum that will be needed for ease in handling.

The more precise the registration, the more valuable this system will be. When using the color separation system described in the previous article (pages 5 through 7) it is indispensable. In, that case, the first step is to cut a master Rubylith through which the exposures on the plates are to be made. A center-mark is then made on the Rubylith and on each of the plates. The center-mark on the Rubylith is lined up to the center-marks on the plates,



A punched sheet of paper is registered to the plate. The register pins may be placed either in holes punched in the plate or on an attached pin-bar.



The previously punched Mylar for run 6 is now registered to the plate for that run.

and the top edge of the Rubylith is registered to the top edge of the plates to be exposed.

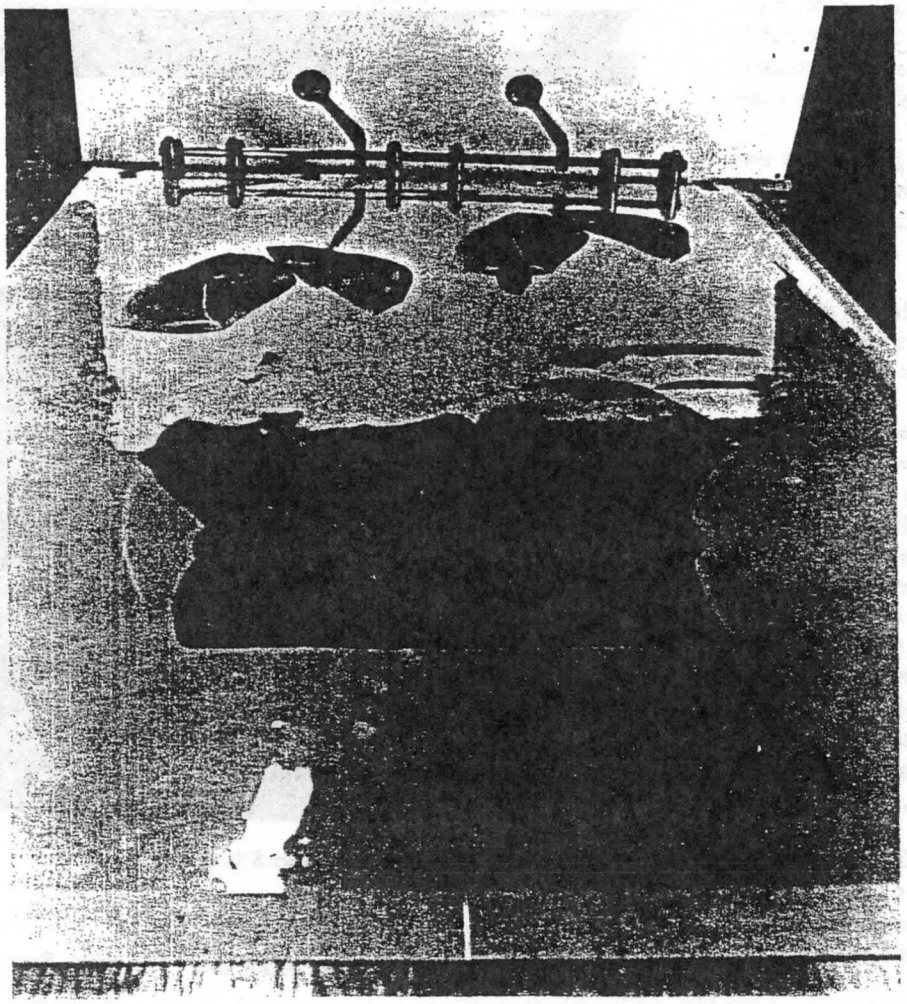
If preferred, one may simply punch the Rubylith and pre-punch the plates before exposure. Using register pins, the pre-punched Rubylith may be used to control placement of the plates during exposure.

The same procedure may be used in preparing plates that are directly drawn (without use of photographic processes). Once a master (or key) drawing has been made and processed, a Mylar may be pulled. This Mylar is punched, and as each subsequent drawing is begun this Mylar is registered to pins set in (or fastened on) the new plate or stone.

As an alternative, the artist could execute a key plate in which the entire image would be developed as a line drawing. This key plate would then be used, much as described above, to pull chalk transfers on the other plates to be drawn.[1]

At current prices a register pin and punch hole device such as that described above can be constructed at a total cost between $60 and $100.

1. *See TBL, section 7.13, pages 204-5.*



Note the registration bars in the foreground where the Mylar, the plate and the punchboard are aligned. The Mylar may now be punched.

THE MERCURY K.U. ROLLER:
a report on Tamarind tests

Tamarind has been testing the Mercury K. U. Roller, produced by the Graphic Chemical & Ink Company, for more than a year. We have found it to be highly satisfactory.

This color roller is built with a special cushioning center and an outer coating of a fibrous material which has many of the desirable characteristics of a grained leather roller. Even so, it may be cleaned as easily as a rubber or composition roller.

The Mercury K. U. Roller performs excellently on crayon work and washes. The nap of the roller aids in keeping open kinds of drawing which an ordinary color roller might tend to clog or close.

The roller would be particularly useful in a school or university shop. Because it can be used both as a black roller and as a color roller, the need for leather rollers would be reduced, thus solving the problem of having students clean and care for leather rollers.

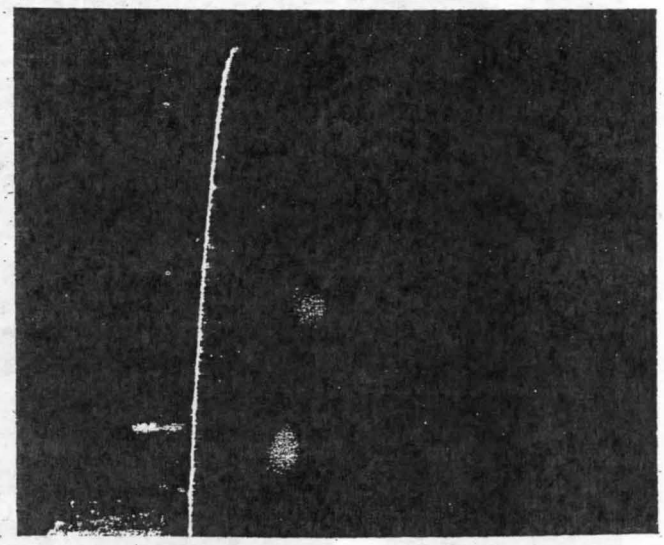
The Mercury K. U. can be cleaned with roller cleaner or with kerosene. It cleans thoroughly, permitting the printer to go from one color to another without risk of contamination.

Tamarind's tests have been conducted with the 14-inch roller. Although this size is suitable for some uses, the 16-inch roller might be preferable. Regardless of size, Tamarind recommends that the roller be purchased with chrome-plated handles. Aluminum handles were found to tarnish the hands, thus creating the risk of stains on the work.

A price listing of rollers from 12-inch to 18-inch, built on a 2-3/4 inch core with a finished diameter of 4-1/4 inches, can be obtained from the Graphic Chemical & Ink Company, 728 North Yale Avenue, Villa Park, Illinois 60181.

The Mercury K.U. roller in shop use.

Because of its textured surface it aids the printer to keep crayon and wash area open when printing in color.



Close-up view of the surface, Mercury K.U. roller

Photographs by Kent Rush and UNM News Bureau.