THE SILK-SCREEN PROCESS

A CIRCULAR PRESENTING THE TECHNIQUE OF THE SILK SCREEN AS A MEDIUM FOR THE CREATIVE ARTIST, DESCRIBING THE PRO-FILM AND OTHER METHODS EMPLOYED

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FOREWORD

This manual is issued in response to an increasing number of requests from artists and art teachers employed on State-wide art projects throughout the country for technical information on the silk-screen process as a medium for the creative artist.

Acknowledgment is made to the New York City WPA Art Project, Federal Works Agency, by whom the text was prepared and presented under the title, Technical Problems of the Artist, Technique of the Silk Screen Process, by Anthony Velonis.

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PART I. INTRODUCTION

Section 1. The Artist and the Medium In the broadest sense, the material in this monograph is presented as a key, opening the way to a harmonious use of any medium or technique. Specifically, it is concerned with the manner of handling the medium and materials used in the silk-screen process, and as a guide to the wide possibilities inherent in this process.

Without the proper understanding of its basic characteristics, the hazards for insensitive handling are far greater in the silk screen than in any other reproduction process. This is true both in its fine-art and commercial application. On the whole the commercial use of the silk-screen process in the past has not been of the highest quality artistically. For too long a time designers did not permit the characteristics of the medium to influence sufficiently the idiom of their design.

Printing media must come to be regarded in exactly the same way as the painter esteems his canvas, paints, and brushes. The finished work must convey the feeling that the artist has had a certain amount of intimacy with his printing medium, no matter how mechanical.

In this light, it must be understood that the silk screen is basically a stencil process; that it leaves a pigment layer of a certain thickness on the print; that the surface texture can be varied from gloss to flat; that the pigment layer can be regulated as to transparency or opacity; that chiaroscuro effects are possible in a very limited way; and that various methods can be used to achieve either sharp or rough outlines. Many of these characteristics are in a sense limitations, but a suitable design must boast of them as advantages.

Formerly, the fine artist could not use the screen process as a graphic process to any great extent. The artistic range of the medium was not considered great. It was thought suited only to some branches of commercial art and classified as one of several processes of reproduction. Now, however, as the result of a new experimental approach, which has had great stimulus in the Graphic Workshop of the New York City WPA Art Project, the artist has come to regard silk screen not as a reproduction process but as a creative graphic medium. The mechanics of the medium remain the same, but the attitude of the artist has changed. The essential characteristics have been used to develop the form and color of the final design--the print.

The logic of this approach has its roots in the soundest fundamentals of art. The contemporary artist is trying to establish a firmer base in order to experiment with confidence and spirit. Much of the preciousness and purist tendencies surrounding the graphic arts will continue to disappear as the silk-screen medium progresses toward its fullest development. This is true partly because of the wide applicability of the process. It can print on anything flat--paper, wood, canvas, glass, composition; it can combine color and texture in such a manner that it parallels, in effect, oil painting, gouache, watercolor.

The silk-screen process, or "serigraphy," as it has sometimes been called, will undoubtedly play an important role in the future of the fine arts. It is within the ken and means of the average practicing artist and within the pocketbook range of the average art lover. The artistic merit of these prints will not suffer by mass production if properly handled. Not only will the silk-screen print help to overcome the attitude that prints produced in mass are not fine art, but it will have a significant value as it demonstrates that it can harness the expression of the most sensitive artist.

Section 2. Recent Growth of the Process In spite of the growth of mass-production, printing processes, such as offset, lithography, gravure, four-color copper plate and collatype, the silk-screen process has had a greater proportional growth during the last 5 years than any other modern printing technique. In addition to its basic simplicity, the new technical developments in the process have been successfully applied to new fields and new uses. As a result it is one of the very few handicraft processes that is not only surviving the machine but even displacing it in many instances.

The silk-screen process was first used in this country about the beginning of the twentieth century. It was first limited to rough and simple show cards. Today, show cards are still being done by silk screen, but the other uses of the process overshadow this one. In the West and in the rural districts most of the car-cards in trolleys, railroad trains, and busses are done by silk screen. Department stores are using it more than ever in their sales-promotion material.

Although silk screen cannot approach the chiaroscuro of offset and lithography, it makes up for this by the richness of its pigment layer and the highly valued effect of its "personal touch." Besides this, the silk-screen process has two distinct advantages. First, its initial cost is much less. For runs under several thousand, it will successfully compete with any other process. The second advantage is that, since silk screen is a basic stencil process, it can print on substances that a hard metal plate cannot, such as glass or wood.

In recent years a silk-screen machine has been developed to print on bottles, jars, and drinking glasses. The glass is put through a baking process after printing for permanence. The textile industry applies the silk-screen process in designs for neckties, dress materials, scarfs, curtains, wrappers and it is also used for wall papers.

PART II TECHNIQUE OF THE SILK-SCREEN PROCESS

Section 3. The Silk-Screen A piece of silk bolting cloth or specially made "stencil silk" is stretched tightly on a wooden frame. Organdie is a good medium but it will not wear. The silk has a large mesh in proportion to the thread. This permits the paint to flow through the silk as through a strainer.

After the silk is stretched on a wooden frame with tacks, the edges of the silk and wood are sized with glue or shellac. Then strips of 2-inch gummed tape are pasted snugly on both sides. (See Fig. 1.)

Instead of gummed tape, it is preferable to use strips of wrapping paper, soaked in water until limp and adhered with casein glue, which is waterproof. When the tape is completely dry, apply several coats of pure orange shellac. The tape and wooden frame can also be waterproofed with white lead or enamel. Care must be taken that none of the shellac or enamel drips on the main part of the silk, since any spot or imperfection will print. Cut a piece of 1-inch or 3/4-inch five-ply veneer board a few inches larger than the frame on all sides. Be sure it is straight and smooth. Secure the frame to the "table" or base by means of two

removable-pin brass hinges with 3" x 3" butts. (See Fig. 2). Arrange hinges in same order as in Figure 3 so that other frames will fit on the same table.

Wooden dowels or metal pins made from thick nails are forced into the frame on one or both sides opposite the hinged side (Fig. 4). This is to insure accuracy when the frame is lowered. The pin should fit quite snugly into the corresponding holes in the base or table. A pair of brass pattern-maker's dowels may be found useful.

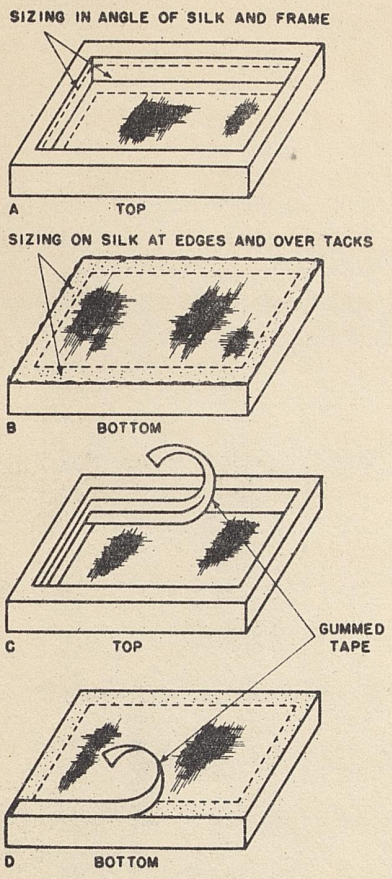

FIG. 1

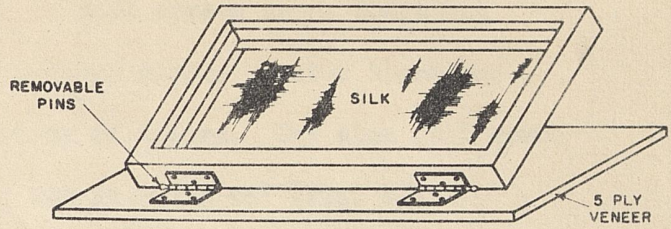

FIG. 2

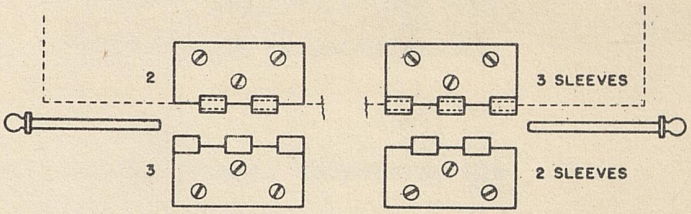

FIG. 3

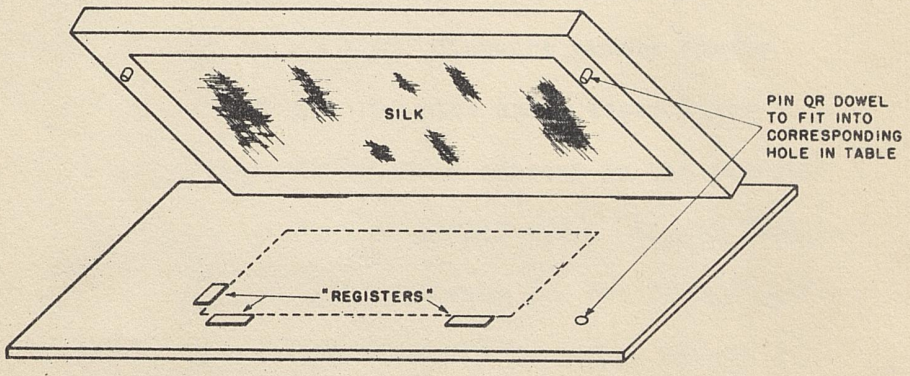

FIG. 4

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Section 4. Stock In most screen shops there are standard sizes of poster-board stock. Poster board can be bought in a wide variety of colors. The size from which all the other sizes are cut is 28" x 44" (Fig. 5).

Practically any good paper of medium or heavy weight will do for fine-arts prints. Unless very exaggerated, any texture will take a successful print. A hand-made all-rag paper is ideal for quality and permanence. Machine-made paper of high rag content should be satisfactory also.

The sizes of the printing frames, therefore, are also standard. Each standard-size printing frame is made to print a standard-size poster.

A convenient size for the fine artist is a frame which is 18" x 30" or 16" x 28" (inside measurement). These sizes are convenient because they can handle 14" x 22" posters or 14" x 26" fine-art prints (maximum size) and, of course, any size under these dimensions. Besides there is an added economy in the stretching of the silk. It comes 40 inches wide. Ripped lengthwise in half, both sides may be used for two frames with a minimum of waste. The 20 inches gives enough margin for pulling.

There should be at least 3 inches between the inside

edges of the frame and the border of the stock to be printed on the A and B sides and at least 2 inches on the C and D sides (Fig. 6).

When the sizes and position of both frame and stock are determined, the paper or poster board must be kept in place by means of "registers" (Fig. 4). If poster board is to be printed, these registers may be cut from the board, since it is desirable to have both registers and stock of the same thickness. The registers should be rectangular and not longer than 1½ inches. Using the stock as a guide, they should be placed accurately and attached by means of glue and carpet tacks.

If the same registers are to be used repeatedly, they should be treated with shellac to make them withstand fraying and wearing. If permanent registers are needed, it is advisable to make them from metal, keeping them in place by flathead screws. When paper is to be printed, the registers will naturally have to be thinner. As paper usually curls a bit, much time and trouble will be saved by using the type of gummed-tape registers illustrated in Figure 7.

Section 5. Preparing The Stencil The printing table is now ready to receive the stencil. Next comes the cutting and preparation of the stencil. A specially prepared transparent, amber-colored sheet is placed over the original design or working drawing. This nu-film or pre-film, as it is called commercially, is fixed on the drawing and drawing board by means of thumb tacks, rubber cement, or Scotch tape. This film is laminated--composed of several layers. The top amber-colored layer is made from a nitro-cellulose or synthetic lacquer base. This will become the stencil proper. The lacquer film is adhered to a "backing" sheet of heavy glassine paper by means of a very thin layer of soft rubber cement. When the stencil is made, only the top layer is cut with a knife. Various knives are available for cutting film. (See Fig. 8.)

It is imperative that the point of the knife be kept at a razor sharpness. It is well to have a sharpening stone handy.

Very little pressure should be used so that only the top layer is cut. The knife markings on the backing sheet should be barely discernible. The blade direction of the knife should always be parallel to the curve or direction of the outline of the design. The knife can be used both freehand and with the T-square and triangle. When the outlines of the first color to be printed are cut, the film within these outlines must be peeled off. This can be done quite easily with a

jeweler's tweezers or sharpened eyebrow tweezers. Some practice is required to get the "feel" of the medium.

The stencil of the first color is now ready to be adhered to the screen. If the board of the original drawing is exactly the same size as the printing stock, place the original against the registers. If the size of the original is not the same, fix the original in place under the screen and secure by thumb tacks. In registering succeeding colors, always place thumb tacks in the same holes in the same position on the printing table. The pro-film should now be placed accurately over the original but not secured to it. Lower the screen.

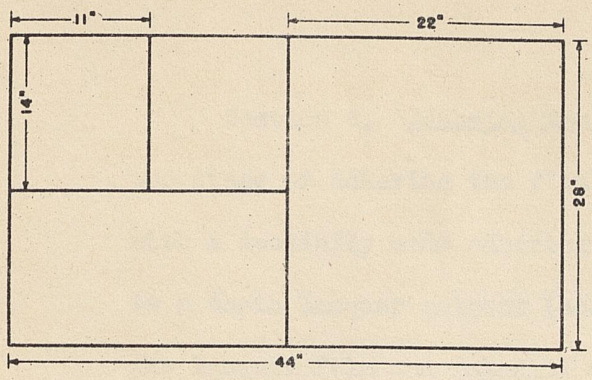
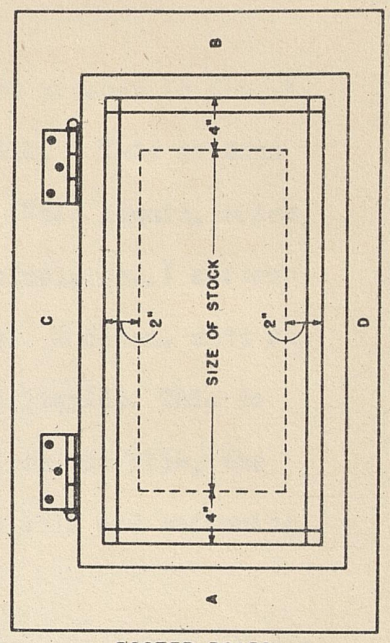
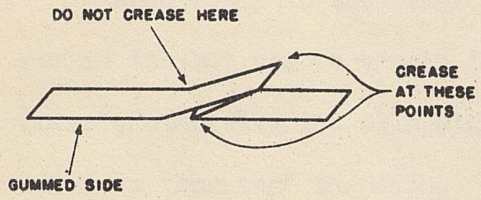


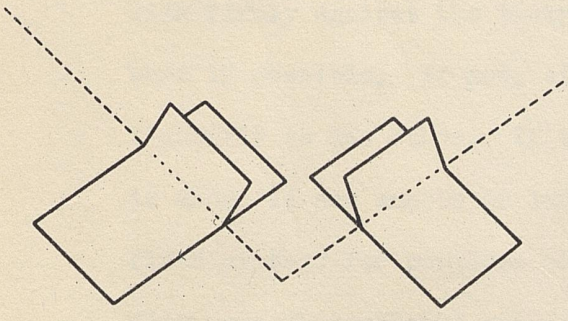
FIG. 5



POSTER BOARD

FIG. 6





GUMMED TAPE REGISTERS

FIG. 7

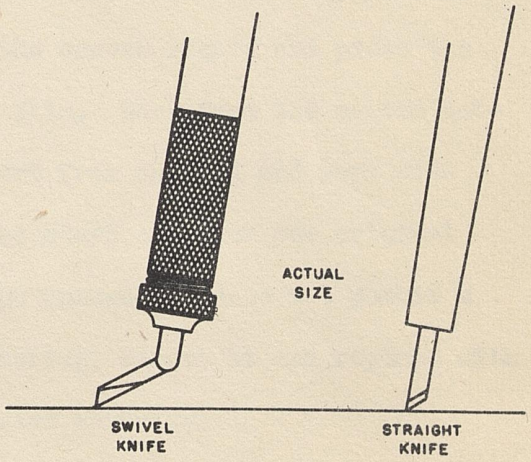


FIG. 8

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Section 6. Adhering The Film The process is now at the stage of adhering the film to the silk. This is done with a specially made adhering liquid. This liquid, which is a basic lacquer solvent (acetates, toluol, etc.) softens the lacquer film and makes it very tacky. A clean, soft rag is folded into a pad and soaked with the liquid. This is applied on the silk, which is flush against the film, the liquid naturally going right through the silk and softening the film.

Have ready in the other hand a dry clean rag. Never permit the wet rag to remain in one spot for more than a moment, otherwise the film might melt completely. This is known as "burning" the film. The dry rag should immediately follow the wet rag to remove the excess liquid and press the silk firmly against the tacky film. Work from the center outward if possible. If not, start from one end and work continuously to the other. If the board on which the original is drawn is not smooth or large enough and does not permit a flush contact for complete adhering, remove it and replace with flat, smooth cardboard and finish adhering.

Let the film dry out for a minute or so. The film will be stuck hard and fast to the silk. The backing paper must now be removed. Carefully pick off one corner of the backing paper and peel slowly. All the film should remain

stuck to the silk. However, if the film is imperfectly adhered in spots, do not peel further. Replace the backing sheet and adhere these spots again in the original way. Allow time for drying and then resume peeling until backing sheet is removed. There should be no trouble if care is exercised in the first place, but experience will teach its own first aids.

The stencil is now adhered. At this point there will usually be large open areas of bare silk between the extremities of the film and the frame. These will obviously print. They are called "leaks" and must be sealed. They are sealed by squeegeeing lacquer filler over these open areas. This is usually done from the under side of the frame. Naturally, the frame will have to be removed from its hinges and turned upside down (Fig. 9).

Let the lacquer dry. Hold the frame against a light source to discover pinholes. If there are any pinholes, apply another coat of lacquer, let dry, and replace frame in hinges. The printing frame is now ready to print the first color. The succeeding colors are prepared on other frames in exactly the same way. If "hairline" color registration is not always possible by the silk-screen process, it can at least be approached by very careful workmanship. When colors border each other, a 1/16-inch overlap is usually allowed in commercial jobs. It stands to reason, of course, that the cutter or technician will have to analyze the design, before cutting, for color-sequence and registration.

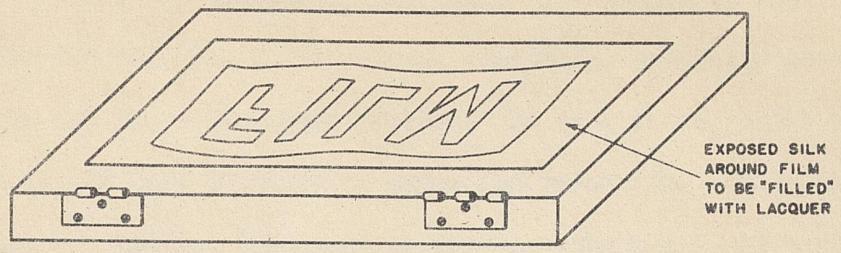

FIG. 9

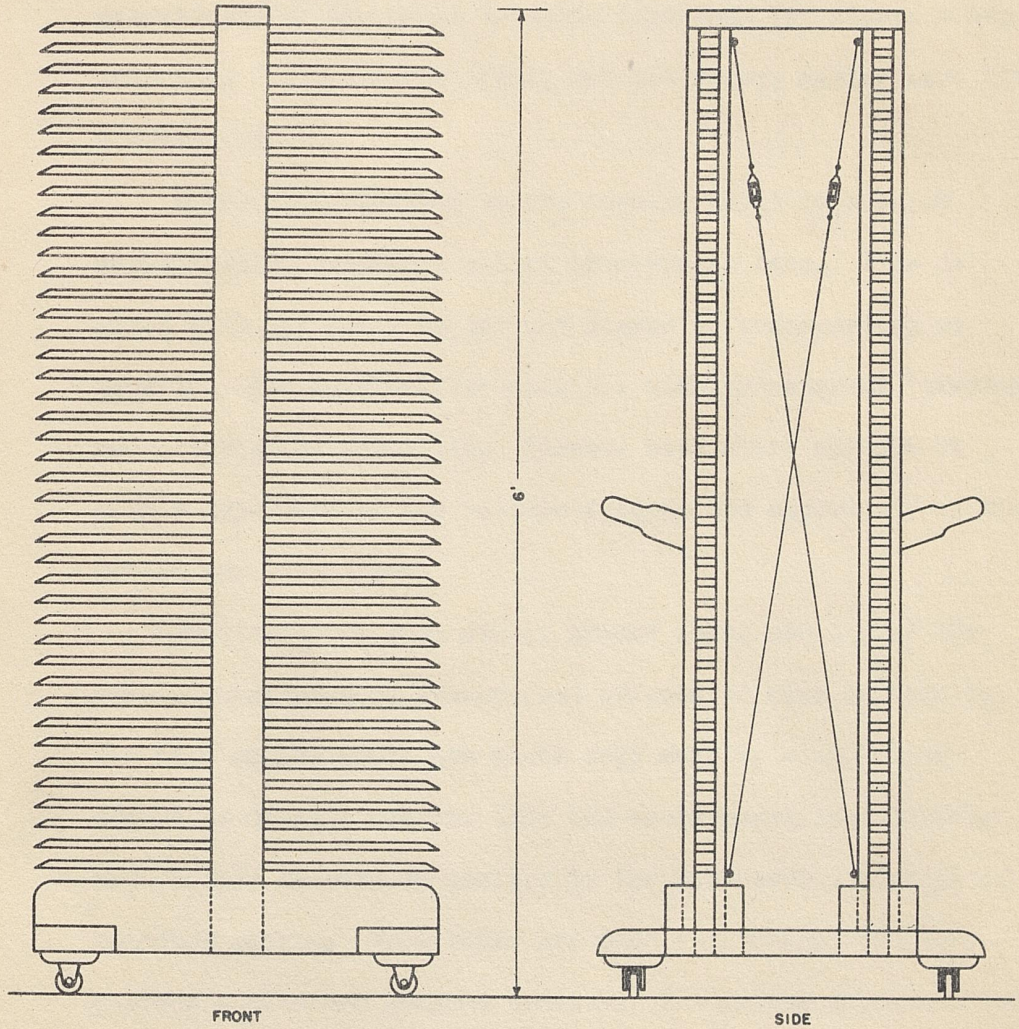

FIG. 10

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Section 7. Preparing The Paint The screen is now ready for the paint. This comes readymade, specially prepared for the silk-screen process. It is a thick, light oil paint. It must be mixed to match the color required in the original design. The paint is usually very thick and must be thinned down with additions of thinning varnish. The final consistency of the paint is quite important for clean, sharp printing. It should be light, but not soupy, rather more like a boiled cereal.

A valuable addition to the regular paint is a thick vaseline-like substance called transparent base. This is mixed with the paint to get any degree of transparency or opacity. The combinations possible with transparent "overlays" are practically unlimited. Success with these effects is mainly dependent on the resourcefulness and experience of the artist and technician.

Manufacturers make finely ground inks, usually of dye bases, which produce transparent effects of high luminosity. The fine artist would use these only rarely, since their effect is usually raw and thin and their permanence questionable. Much richer in surface quality is the full-bodied pigment of the standard paints. When these are made semitransparent they produce a pleasant gouache quality. The artist makes his own rules as to color selection and color sequence, but if there is a choice it is usually preferable to print the warm color first and cold color second.

Very often it is necessary for succeeding colors to be as near to full strength as possible in order to have the greatest covering power. In many designs, however, this may not be necessary. In such instances the sharpness of detail and working ease are improved in direct proportion to the amount of transparent base incorporated in the color. This addition should not exceed the limitations of color-intensity requirements. Even when a transparent or semitransparent effect is not called for, the addition of transparent base immeasurably improves the texture of the paint. Paint "extenders" are also sold to make the pigments go farther. Such economy should be avoided, because the chalk in these extenders sometimes lowers the quality and texture of the paint. If the paint must be "extended," use transparent base.

Paint manufacturers offer a variety of mixing varnishes. The varnishes make the paint flexible, glossy, hard, dull, or soft as required. Some slow down the drying qualities of the paint; others hasten it.

Section 8. Preparation For Printing Before beginning the printing all tools and necessary equipment should be assembled for production.

The printing frame is hinged to the base. This base is tilted slightly upward on another table or on horses (Fig. 13). The height of the screen should be even with the printer's elbow. On one or both sides of the frame are attached springs. Screen-door springs are most commonly used. These springs save labor and improve production. They keep the frame off the base when not being used for printing. The printing stock is piled to one side--usually on the printer's left. Since the paint takes at least an hour to dry, a system of racking the printed stock must be devised.

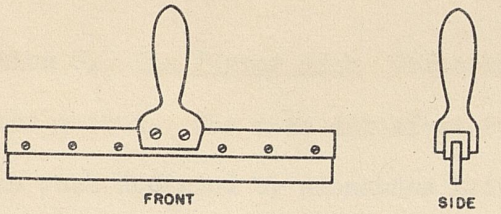


FIG. 11

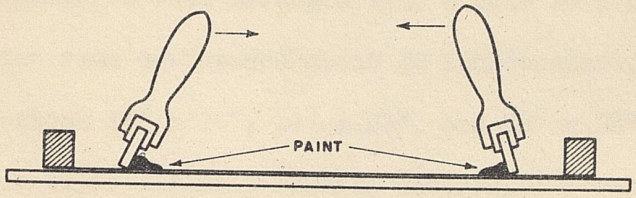


FIG. 12

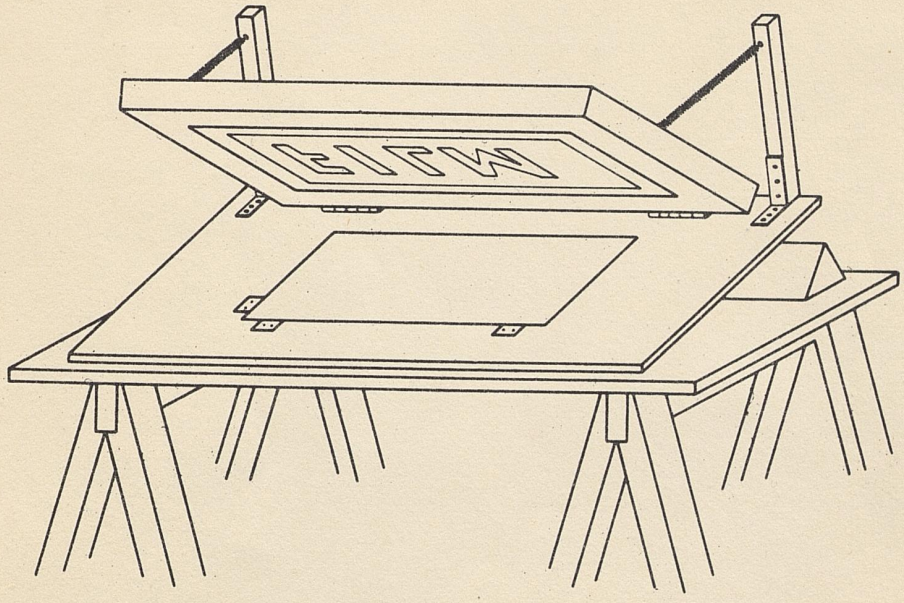


FIG. 13

Section 9. The Poster Rack There are several kinds of racks on the market. The most satisfactory for general poster work is the rack designed by Alexander Driva of the Poster Division of the New York City WPA Art Project (Fig. 10).

This rack is constructed of two rows of 50 half-inch slats of wood arranged like a comb to a center support. The two rows are spaced about 12 inches apart. This rack will hold stock 11" x 14", 14" x 22", and 22" x 28". It is fitted with handles and ball-bearing casters.

Section 10. Printing The stock is on the left, the rack is on the right; the springs are set. The printer stands before the screen and the printer's helper--the "take-off" man--is ready to rack the printed stock. The paint is now poured along the edge of the silk within the printing frame. The printer takes a piece of stock from the pile and sets it carefully against the registers. He lowers the screen and holds it down with his left hand against the pull of the springs. With his right hand he takes the squeegee (Figure 11) and draws the paint over the screen (Figure12). Pressure must be firm.

When the squeegee reaches the other side, let it rest against the frame and lift the screen. The "take-off" man removes the printed stock and racks it. Register a fresh piece and print. This time, hold the screen down with the right hand and draw the squeegee across the screen with the left hand--from left to right.

This method of "ambidextrous" printing is most efficient and will give the greatest production with the greatest ease. Of course, it will take some time to get the knack of it. (See Fig. 13.)

When the printed stock is dry, it is removed from the racks and piled again beside the screen for the next color. Be sure that the paint has dried and is not the least bit tacky, otherwise the stock will stick when piled up.

In printing, fine specks of paper lint or dirt from the stock will remain on the open areas under the silk. They will show in the print. Remove them with a wet kerosene rag and then wipe with a dry rag. Keep the stock clean.

Section 11. Cleaning The Screen When the printing is finished, insert newspapers under the screen. Pick off paint with cardboard squares and save in paint can. (In storing the paint, let skin form on the surface by pouring on a little varnish. The paint can be used again by carefully removing the skin.) Wet rag generously with kerosene. Soak up paint from screen. Wipe with dry rag. Remove top sheet of newspaper under the screen. Wet another rag with kerosene, wipe and dry off with clean rag. Repeat process until screen is thoroughly clean and dry.

To insure the removal of all traces of kerosene, wipe off with a final rag containing benzine. Clean squeegee in a similar manner. In order to be able to use the screen over and over again for various jobs, make absolutely sure that every last trace of paint is removed from the silk when cleaning. If this is not done, the paint will dry into the silk and render it useless.

Section 12. Removing the Film There are some variations as to the method for removing the film from the silk. The one most commonly in use is this: place newspaper or flat sheets of wrapping paper beneath the screen. Soak a rag and the silk with "film remover" or any lacquer solvent. The film will melt and begin to stick to the paper. Remove the top sheet of paper and soak again. Repeat process until film is dissolved. Considerable rubbing is necessary. Finish the cleaning with fresh rags and fresh liquid. Use rubber gloves to protect hands. When all traces of film and lacquer are removed, the screen is ready for the next job.

The uninitiated in the silk-screen process will find themselves caught in many technical traps. Organization and planning must be given very careful consideration. A workmanlike attitude will help to avoid many mistakes. One mistake will ruin a job or negate hours of work.

Section 13. Methods Other Than Pro-Film Since the first part of "Technique of the Silk-Screen Process" deals with film method and the organization of printing, this discussion will be confined to a description of other techniques in the silk-screen process which may or may not be used in combination with one another. The chief difficulty in all these methods is the problem of accurate color registration, since glues and certain other "fillers" that are used contract when dry and are hygroscopic. But this disadvantage can be overcome by design that takes loose registration into consideration and by a greater overlapping of colors.

Section 14. Tusche and Crayon Method Tusche is a black liquid prepared for lithographers. It consists mainly of microscopic wax particles emulsified in water. When tusche is brushed on any surface, the wax particles consolidate as soon as the water has dried out. The dry tusche then resists water, but is easily removed with turpentine or kerosene. Lithographic crayon has about the same formula as tusche, but without the water.

For the tusche method it is better to use a finer mesh of silk--number 12, 14, or 16--since the pattern of the silk creates the tiny zigzag outlines of the printing areas.

The frame and silk are taped, shellacked, and ready for the stencil.

The screen is placed on the original drawing and the color to be printed on the silk is outlined with pencil or with India ink.

If ink is used, the screen will have to be raised so that the silk does not touch the drawing; otherwise the ink will blot on the drawing.

The tusche is applied with a good brush to all the areas that are to print. Toothbrush spatter is quite adaptable to tusche and can be done very successfully. Dry brush is not suitable because it is hard to control. Let the tusche dry. This may take as long as half an hour.

Prepare a mixture of 50 percent liquid glue, 40 percent water, 8 percent vinegar, and 2 percent glycerine. Prop us the screen at the corners, right side up, so that the silk is a few inches above the table. The screen must be horizontal. Have ready a clean printing squeegee. It must have one straight edge. Squeegee a little glue mixture over the silk--over the tusche drawing and all.

When the glue is dry, place the screen against a light source and see if there are any pinholes. If there are pinholes, it will be necessary to give the silk another coat of glue. When this coat has dried, turn the screen bottom side up and impregnate the tusche areas with turpentine or kerosene. Place the screen on some newspapers, right side up, apply turpentine or kerosene liberally, spread with rag and rub gently. The tusche will then begin to dissolve. Remove the top sheet of newspaper. Add more turpentine and continue rubbing. The glue will scale off the dissolved tusche, leaving the printing area open. Repeat the process until the screen is clean. Rubbing the open areas, and especially crayon tones, with a small-bristle nail brush is usually necessary. The screen is now ready to print. Use paint in exactly the same way as in the film method.

In using the crayon method, place stretched silk on the drawing and outline in pencil on the silk the general area to be printed. The finest crayon tone is the texture of the silk itself. For this, work on the silk, raised from any solid surface. For other effects, use a file, engraver's Ben Day plate, Ross board, egg-shell board, or any definitely textured surface to get the effect desired. Place the textured material under the silk in the area wanted and work on the silk with a lithographic crayon. In using sandpaper, separate it from the silk with a piece of cellophane to prevent it from cutting the silk. Keep working up the area unitl it reaches the effect desired, which should look a bit darker than you want it to print. The screen is now ready to print.

Section 15. Simple Negative Method The screen is laid against the drawing, but slightly raised. This time, however, instead of working in "positive" we work in "negative" --that is, the silk around the printing area is filled in and the area is left open. To do this, use either glue or lacquer with a little coloring added. Lacquer makes a more durable stencil, but is hard to work with. When all the non-printing areas are covered, the screen is ready.

Control in drawing is a bit difficult with this method, but it does make it possible to get free, accidental effects that no other stencil will give. When the glue is applied very thin it breaks up on drying, producing a very interesting half-tone. This, combined with succeeding applications, parallels to a limited extent the procedure in aquatint.

After printing, simply wash the glue stencil off with water. If the stencil is made with lacquer, remove with lacquer thinner as in the film method. This method, though highly useful to the fine artist, has been little used by the commercial artist until recently.

Section 16. Glue-shellac Method Prepare the same glue mixture as in the tusche method. Squeegee evenly over the inside of the silk until it is covered. The screen must be lifted off the table a bit so that the silk does not touch anything. When the glue is dry, check for pinholes. If there are only a few pinholes, touch them up carefully with a brush. If there are many pinholes, the screen must be given another coat of glue that is considerably thinner. If there are no pinholes, the screen is ready for the next step.

Place the screen in position flush against the drawing. The screen will be quite transparent, and the design will be easy to follow. All the areas not to be printed are to be covered with a waterproof medium. Black shellac or black lacquer are most commonly used. This "cutting-in" must be done quite carefully. Be sure that the medium has enough body for a good protective coat. Since the glue acts as a sizing, it brushes on quite easily.

Check against a light for errors, thin spots, and pinholes and correct with further application of shellac or lacquer. When dry, place the screen in a horizontal position, propped up on the ends off the table. Be sure that the screen is not tilted in any direction. Have ready a clean, soft rag and a pot of water. Dip the rag in water, fold over, and apply quickly and gently over the inside of the screen. Wring out the rag and pick up excess water over the screen. The glue over the open area will begin to dissolve. Rinse the rag and apply water again on the screen. This time do not load the rag with too much water. Wring out the rag again and pick up excess moisture. Rinse and continue applications until the glue has been removed from open areas. Finish off with a dry rag.

Always work from above the screen. Check again for any pinholes that may have come through and correct only with glue. The screen is now ready to print.

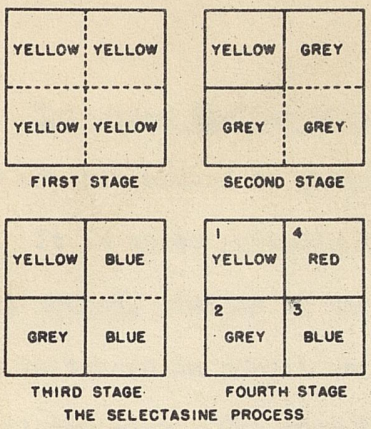
This method produces fairly sharp outlines and can withstand the wear of a long run.

Section 17. "Selectasine" Process This "process" is not so much a technique of preparing a stencil as simply a system of color registration. However, the simple "cut-in" method is the one best adapted for Selectasine. One screen is used for as many colors as the design requires. The design is analyzed for color sequences. Usually light colors are printed first. Exception is made when the light colors do not cover much surface.

The first color stencil is made to include all the other color areas. Assume that there are four squares to be printed; yellow, grey, blue, and red, in order. The first stencil--the yellow--prints in all the areas marked out for the other colors (Figure 14, First Stage). The second stencil--the grey--prints in all the areas except the yellow. The third stencil--blue--prints also in the red area. The fourth stencil--red--prints only in its own area. By the time the red stencil is reached, there are piled up four layers of pigments, so that the effect is almost three dimensional. (See Fig. 14.)

One screen prints all four colors. When the first color is printed and the screen cleaned of paint, the area which is to appear yellow is "stopped out" with filling medium (glue or lacquer). The second color is ready to print. The colors that follow are successively eliminated by this stopping-out method. With a bit of resourcefulness and ingenuity, it is also possible to use the Selectasine process with film. The difficulty here, however, is in proper adhering in sealing overlapping film areas and in not injuring the previous stencils.

As a whole, the application of the Selectasine process is quite limited and it should be used only when the job is suited to it.



THE SELECTASINE PROCESS

FIG. 14

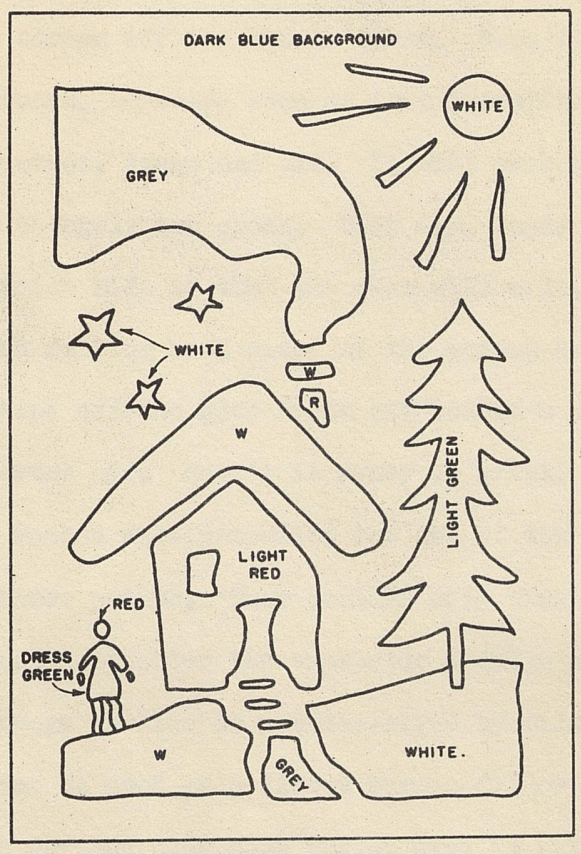


FIG. 15

Section 18. Imitation Shellac Method Although the printing quality of this method is quite poor, it is cheap, quick, and easy. It is quite suitable for school work. It is another resist method, similar to the tusche process.

The drawing is traced in pencil on the silk and filled in with colored glue. The glue is used just as the tusche was. The work is "positive." Let the glue dry. Raise the screen off the bed or table. Keep it horizontal. With cardboard, squeegee some of this imitation shellac over the screen, image and all. It will probably be necessary to apply two coats. When dry, apply some water on the reverse side so that the glue will melt. Keep wetting and rubbing both sides of the screen so that the shellac chips off the glue areas and leaves a clear stencil. Dry the screen off. Now it is ready to print.

This method does not allow the use of the regular screen-process paints. They contain oily varnishes which will gradually dissolve the synthetic shellac stencil. Genuine orange shellac is not dissolved by oils; but it still cannot be used as a direct screen filler, because when it is dry and oils have passed over it neither alcohol nor acetone will completely dissolve it out of the screen. The screen, of course, is rendered useless for further work.

Orange shellac can be used, however, when a permanent screen is to be made. Only in this case can regular screen paint be used. On the other hand, synthetic shellac is quickly washed off the screen with alcohol.

What paint can be used, then, with an imitation shellac stencil? "Showcard" or jar water colors or good-quality dry pigment can be used. They must be prepared for the screen. The paint must be light but thick in order to print well. It must not dry too quickly; otherwise the screen mesh will clog. It must also have a lubricating effect between the squeegee and the silk.

To make the paint thicker, add boiled flour or corn starch. To lubricate it and prevent quick drying, add glucose, corn syrup, or honey. To prevent further quick drying, add glycerine. It is necessary to experiment a bit to get correct proportions; otherwise an excess of any of the ingredients will give trouble.

There are mixtures using a casein medium which are very satisfactory. Good tempera oil emulsions may be used, especially if rye flour is used as the agent.

This prepared paint cannot be used successfully with any other method, because the water in the paint causes expansion and contraction of the silk and throws the image out of registration. However, the synthetic

shellac method particularly fits the use of water paints, since both stencil and paints are cheap. It must also be remembered that the water paints dry out several shades lighter and have a chalky appearance. Taking all these shortcomings into consideration, the synthetic shellac-water-paint method can still be very useful for many purposes.

Section 19. Paper-Cut Stencil This is another method simple enough to be convenient for classroom work. Use almost any kind of thin paper, from tracing paper to newspaper stock. Frisket paper is excellent, and cellophane is good though a little hard to manage. Whatever stencil material is used should be just large enough to overlap the area of the silk. It should be flat and without wrinkles.

If the paper used is rather opaque, trace the design on the paper. If tracing paper is used, lay the paper on the original drawing, tack it down (or use Scotch tape), and cut. The stencil can be cut with any sharp instrument. A single-edge razor blade is good, but a regular film knife is better. Of course, since a simple stencil is being cut, the design must not be too complicated. If there are any "centers" or "islands," cut them out and put them aside for the moment.

Remove the stencil from the drawing and place it in position under the screen. The screen is hinged to the printing bed. Attach the edges of the stencil to the frame at about eight places with bits of Scotch tape. Set the "centers" in place, and put a spot of glue in the middle of each one. Lower the screen and press the silk against these glue spots. Let them dry for a few minutes. Pour the regular silk-screen paint in the screen and print.

The sweep of the squeegee across the silk and the viscosity or tackiness of the paint will cause the stencil to adhere nicely to the silk. When the printing is completed, remove the paint from the screen, rip off the stencil, wash the screen with kerosene in the regular manner, and then remove glue spots from the silk with a little water.

This method is especially adaptable for certain rush sign jobs. The lettering most suitable is a loose, free, simple type; anything from Neuland to Kabel or Futura Black.

In classroom work excellent results can be obtained with semiabstract or conventionalized stencil designs. The design must be simple and colorful. Since good color registration cannot be planned with this method, recognition of and making allowance for this weakness in a loose design will help achieve additional charm. (See Fig. 15.)

The fine artist can make good use of this method; with a little extra care good color registration is possible and even a fair degree of complexity. The economy, speed, and crispness of this method should make it worth mastering.

Section 20. Photographic Stencil Process There are many photographic processes in the field, but as yet they are not foolproof or stable enough to be practical for the average craftsman. Furthermore, fine detail and half-tone effects can be obtained much more easily by photoengraving and offset process. Photographic silk screen would only be an imitation of those other processes, possessing no distinct qualities of its own. The mechanical effect of photographic screen processes does not harmonize artistically with the craft or "handworked" quality of the silk-screen process proper.

First of all it is necessary to have a transparent "positive" of the image to be reproduced. The "positive" can be had in a number of ways. It can be made with a photoengraver's camera by the collodion wet-process on glass or on celluloid. Or it can be drawn directly on frosted celluloid by using a special opaque medium.

The screen must be treated with a sensitizing solution. This is usually a gelatine-glue mixture that has been made sensitive to light by ammonium and potassium bichromate. The screen is then laid in a pressure or vacuum contact frame, with the transparency in place against the treated silk, and is exposed to a strong light, preferably a fan-cooled arc light. After the screen has been exposed a certain length

of time (from 10 to 20 minutes, depending on the strength and distance of light) it should be washed first with cold water for a few minutes and then with warm water until the image is clear. Let the screen dry. It is now ready to print.

There are several variations of this method. The carbon-tissue method produces a very sharp and delicate print, but the method is quite difficult to use. The carbon tissue is manufactured in England and is used in the making of rotogravure. It is a sepia-colored gelatine-base film on a backing paper. It is sensitized with bi-chromates, then exposed in a contact frame with the trans-parency. It is transferred to a ferrotype plate, washed, and adhered to the silk by contact. All in all, the chance for failure in this method is very great unless temperature, quantities, and time exposure are just right.