FOSTERCOTE, A DRAFTING MEDIUM ON PLASTIC

Memorandum prepared by Production and Distribution Plant, Aeronautical Chart and Information Center, St. Louis 18, Missouri, read at the Pan American Institute of Geography and History, VIth Pan American Consultation on Cartography, October 1952.

It has long been the practice of some government mapping agencies to use glass negatives for engraving map projections and individual color separated plates because of the inherent dimensional stability of the base material. Although present results are satisfactory, the production methods are time-consuming and expensive. Extreme caution is required in the handling and storage of these negatives and losses due to breakage are unavoidable. In addition, most glass engraving coatings are brittle, and the old-type engraving instruments are not suitable for achieving the presently required drafting speed. Therefore, a need has arisen for a suitable engraving surface which can be applied to a flexible base material having a dimensional stability comparable to that of the glass plates. Thus the problem of breakage would be lessened and the desirable qualities of precision and definition would be retained.

At the same time, due to expedience and the exacting nature of requirements, research has been initiated to develop a substitute for the method of pen and ink drafting on plastic bases, particularly vinylite. This type of work required highly skilled personnel and more time than was available under the accelerated charting program. The recent development of a new type of engraving instrument by the U.S. Coast and Geodetic Survey made rapid engraving a possibility. Vinylite could be substituted for the glass plates as a suitable base material. There remained only the problem of developing a coating which could be applied to the vinylite surface and which would permit the rapid engraving of sharply defined lines.

The USAF Aeronautical Chart and Information Center has developed a solution known as « Fostercote » which has all of the desired properties. This solution is the result of experimentation by the Cartography Division. When applied to the vinylite base this coating remains in a semi-plastic state so that engraving can be performed easily and rapidly, yet it is not « tacky ». Red was selected as a desirable color for the original coating since it has the distinctive photographic property of retarding light. This makes possible a translucent coating which is photographically opaque. It is possible that further study may result in the use of additional colors for various applications of this product.

Chart projections may be plotted and engraved on this coating with extreme accuracy. The same accuracy is obtained in the drafting of contours, drainage, culture and various other separations. Lines .002 inch or finer and .04 inch or wider can be drawn easily. Engraved lines are uniform and even, regardless of pressure applied to the engraving instrument. This quality cannot be obtained with normal pen and ink drafting procedures. Since the coating does not penetrate

Fostercote. — Sample of coated sheet.

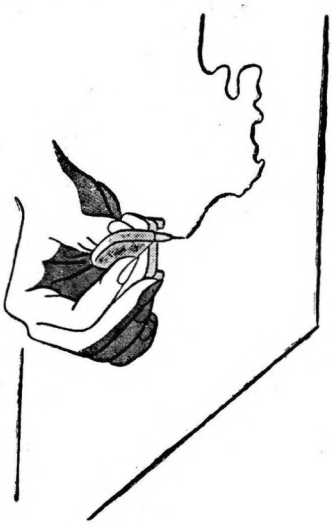

Figure 1

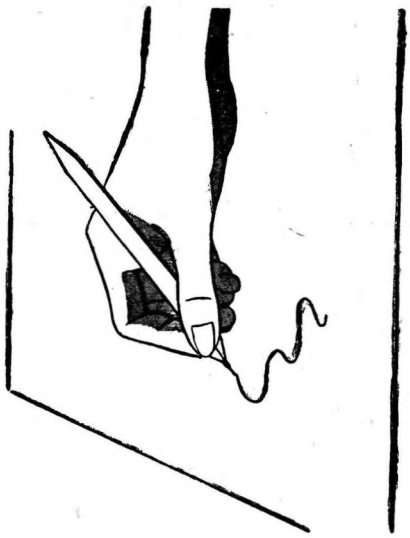

Figure 2

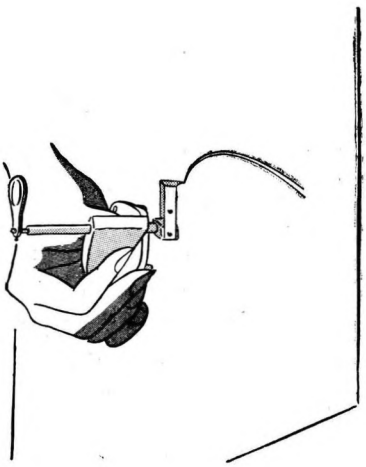

Figure 3

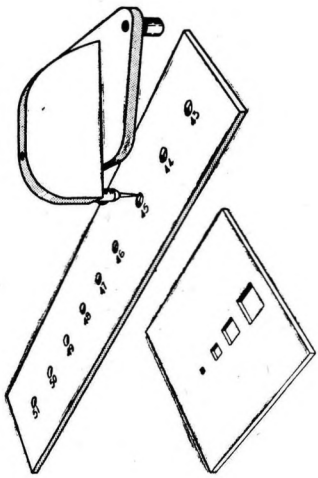

Figure 4

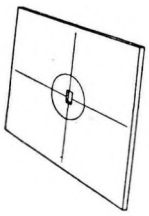

Figure 5

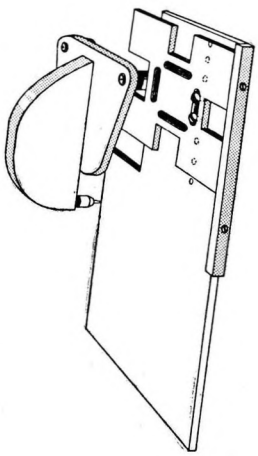

Figure 6

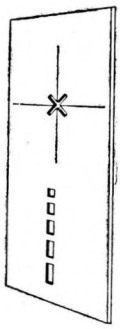

Figure 7

the base material, errors are easily corrected through the application of transparent red opaque and the recutting of engraved detail.

Press polished vinylite sheets are used as base material. The sheets may be polished on both sides, or one side may have a matte surface, but the coating is always applied to the polished surface. Carbon tetrachloride, or any good non-abrasive cleansing agent, may be used to remove grease, finger-prints, and foreign particles from the surface. This procedure is not necessary if the protective tissue paper or slip sheet is left on the vinylite until just before the coating is applied. In order to obtain a smooth, even coating, static must be eliminated by rubbing both surfaces with a suitable anti-static compound.

The « Fostercote » is sprayed on with an air gun under pressure of approximately 60 to 75 pounds per square inch. It is important that no moisture collect in the gun since it will mix with the coating and produce a mottled surface. The high pressure is necessary to prevent the coating from running and forming globules. The individual application results in a thin coating so that 5 to 10 sprayings are needed to obtain the desired translucent effect. If an opaque surface is desired, additional sprayings are necessary. It is possible to vary the formula to obtain variations in density and color intensity for specific purposes. The coated sheet should be allowed to dry 48 hours or more before it is placed in work. If it is to be used before it is thoroughly dry, French chalk may be rubbed on the coating to prevent stickiness. The coating does not harden completely and will retain its soft feel and cutting qualities for an indefinite time. At the time of writing this article, coated sheets have been used successfully after 12 months aging. A sample cut from a coated vinylite sheet on which compilation engraving has been performed is included with this report. Inspection of this sample will reveal the properties of the coating and the quality of the engraving that can be achieved through this medium.

The coated vinylite sheet may be placed over the original compilation base on a light table and the imagery traced in this manner, or the orginal compilation can be printed on the coated sheet by either positive or negative blue line reproduction. The compilation base is exposed in reverse so that a contact print of the engraved sheet will be in positive form. This positive print may be considered the original or the final drafted plate. A film positive contacted from the coated vinylite sheet is also included. It shows the actual results of the method. When negative blue lines are used, a thin translucent coating is preferred, since the deep blue dye will compensate for the loss in opacity in contact printing. When positive blue lines are used, a more opaque coating is desired. The latter method provides a greater accuracy and greater ease in engraving.

The engraving instruments developed by the U.S. Coast and Geodetic Survey and normally used for engraving on « Fostercote » are the subdivider, the rigid engraver, the swivel engraver and the fine contour engraver. Figure 1 shows the rigid engraver, a tripod arrangement with 2 legs set on ball bearings for easy movement and the 3rd leg holding the engraving needle. It is used to engrave streams, contours, railroads or located objects. Figure 3 shows the swivel engraver which is similar in construction, but which is intended for double line engraving. The fine contour engraver, as illustrated by Figure 2, is a bent needle set in a penholder type chuck. It is used to engrave drainage, contours, city outlines, etc. The subdivider (not illustrated) is an instrument that divides latitude and longitude lines into the designated intervals and draws the required tick marks.

Separate engraving needles or points are used in all of these instruments for each desired line weight. They are interchangeable and graduated from .002 inch to .04 inch. For line weights of approximately, .0035 inch to .004 inch, an ordinary phonograph needle (not sharpened) may be used. A chisel style cutting edge is used for line weight greater than .04 inch. Engraving instruments must be held at a 90° angle to the surface for best possible even line weights.

Additional drafting devices which have been designed include the city symbol templet, the building symbol templet, the railroad ticking templet, and the bridge ticking templet. Figure 4 shows the city symbol templet, constructed of clear plastic with standard size circles punched or drilled in it. This is used for engraving city symbols or any other round symbols such as wells, spot elevations, de-facto boundaries and oil or water tanks. The building symbol templet shown in Figure 6 is used for engraving any square or oblong symbols. A chisel-shaped point is used where square corners are desired. The weight of the point determines the width of the symbol. The length of the symbol is determined by setting the slide bar on the templet to the desired distance. Figure 5 shows the railroad ticking templet. This device makes possible uniform length in engraving railroad ticks. The inscribed arc on the under side of the templet insures the proper distance between ticks. Figure 7 shows the bridge ticking templet. Wing tips are engraved after length of bridge is inscribed. All templets are used in conjunction with the rigid engraver. After completion of the engraving of all chart features, Japan dryer can be applied to protect the surface and keep dust particles from settling in the grooves.

Positives are contacted from the engraved vinylite sheets on stable base film. Place names, area symbolization such as swamps, sand, forest, dot patterns and irregular symbols are printed on a transadhesive transparent base and then applied directly to the contact positive as the final step before reproduction. Chart editing corrections are made through additions or deletions to the positives. Reproduction procedures are the same as those used for materials prepared in the normal manner. Negatives for reproduction are contacted from the completed film positives.

Comparison tests of chart production methods have shown the vinylite engraving technique to be superior to pen and ink drafting. One of the favorable aspects of this process is the speed with which draftsmen can be trained to use the engraving instruments. After training has been completed, drafting time can be reduced 30 to 75 per cent. However, the required skill and basic knowledge of drafting is about the same for either method. The following paragraph cites an example of the comparison testing method and the results achieved.

A 1:500 000 scale chart was used as the subject material in this experiment in chart production methods. The personnel who participated in the test were considered to be equal in ability and training. Eigthy (80) manhours were consumed in the engraving procedure compared to 217 manhours for pen and ink drafting. Material costs were the same for both methods. In addition to the number of hours saved, it was proved that the quality of the work obtained by the engraving process was superior to that of pen and ink drafting. Thus the new method combines the quality of the older engraving methods with those properties required because of accelerated production schedules.

Source of Materials :

1. *Fostercote.* — Additional information on this coating may be obtained from the Direct Reproduction Corporation, Brooklyn, N.Y.

2. *Anti-Static Compound.* — A suitable solution is Anti-Static Compound No. 79, manufactured by the Merix Chemical Company, Wrigley Building, Chicago 11, Illinois.

3. *Engraving Instruments.* — Additional information may be obtained from the U.S. Coast and Geodetic Survey, Washington, D.C.