

DIRECTIONS FOR DRY ETCHING OF GLASS

July 1, 1924

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MATERIALS

The etching salt and printing medium were formerly imported but we understand that a similar outfit may be obtained in this country.

This Bureau has been using a good grade of Ammonium fluoride for the etching salt and it has proven very satisfactory. We understand that a suitable stamping medium can be purchased in this country but we have made it according to the following formulae with very good results:

1. About 70% Rosin Oil, 25% Castor Oil, 4.95% Vaseline, and 0.05% Dye (Ultramarine or Prussian blue). The dye must be soluble in oil. Mix the materials and heat gently at 150° C blowing compressed air through the mixture until it is quite thick. If the ink is too thin, add solid rosin, and if too stringy, increase the vaseline. Let it stand for 24 hours. Keep in a tightly covered jar. The ink becomes stringy with age and cold weather produces the same effect. It will be improved by melting and adding a few drops of turpentine and, if available, a small amount of blown castor oil.

2. 45% Rosin, 27% Rosin Oil, 10% Vaseline, 18% Castor Oil, and a small quantity of soluble dye. Heat gently as above and blow compressed air through the mixture.

3. 250 cc blown Castor Oil, 25 cc Turpentine, 115 gms. Rosin, 23 cc Vaseline.

Possibly the gelatin pads may be obtained from some dealer in duplicating materials. They can easily be made, however, by heating together over a water bath, 400 grams of photographic gelatin and 1200 ml of water. When melted, add 640 ml of glycerine and 100 ml of hot molasses, which has previously been skimmed. The glycerine should be poured carefully to prevent the formation of small air bubbles. This quantity will make four gelatin sheets 10 in. by 10 in. by 3/16 in. Skim mixture and heat till free from bubbles. When it is thoroughly blended pour into shallow trays. The bottom of the tray is a plate of ground glass with the ground surface on the inside, which is for the purpose of producing a mat surface on the gelatin sheet. A tray which is fairly durable and easily made consists of a ground glass plate 10 in. by 10 in., or any suitable size, with sides of heavy card-board held securely in place by strips of gummed paper tape.

Before pouring the gelatin, grease the sides of the tray with a little vaseline. Place the tray on a level surface and pour in the gelatin to a thickness of about  $3/16$  in. and allow it to harden. If the gelatin is left undisturbed in the tray until required for use, and is placed in a fairly air-tight box, it will not deteriorate seriously and the mat surface will be kept in good condition. The gelatin pads, which are about 2 in. x 8 in. are cut from the sheet as needed, and only the amount required for immediate use should be separated from contact with the glass.

The pads should be elastic and have a uniform surface. It is possible to renew a pad by dipping it in hot water to slightly soften it; then lay it face downward on a ground-glass surface, pressing out the air bubbles and allow to dry. Another method is to dip the pad in cold water for a minute or two to soften the surface but not sufficiently to make it gummy. The pad is then brushed off with alcohol and can be used at once. The water must not be allowed to stand on the pad in pools or "blistering" will result. It is difficult to obtain good results with pads which have become hard and shiny.

The gelatin roller is made according to the same formula as the pads. It is cast on a core of wood or of 6 mm metal tubing which is left in the roller permanently. A convenient mold is made of thin brass tubing about 2 cm in diameter and 7 cm long, into one end of which is fitted a stopper with a hole in the center; the core is held in place by fitting one end into the stopper. The mold should be slightly oiled to facilitate removal of the roller. The gelatin mixture is cooled slightly before pouring and when it has solidified the outer tubing is slipped off, and the handle is attached to the roller. The pads should be kept under a bell-jar when not in use, to prevent drying out.

The stamp is made of metal. The design is in relief and is not reversed; i. e., it is the same as the etched design. Design should stand in relief  $3/4$  to 1 mm.

#### ETCHING

To obtain good results, the etching salt should be dry and rather fine.

When the salt is very coarse and contains a large amount of moisture, it is melted in a thin iron dish and kept hot for several minutes. Some fumes may pass off but the salt must not become hot enough to break down. When cool the fused mass may be removed from the dish by a blow on the bottom, and it is then ground to a fine powder and sifted through fine metal gauze. When not in use it is kept in a desiccator. To keep it dry while in use, an

inexpensive heater may be constructed by putting two or three electric lights in a heat-insulated box. A hole is cut in the cover of the box and over this is set a shallow metal pan containing the salt, which should be kept warm, but must not become hot enough to vaporize. The temperature can be regulated sufficiently well by turning lights on or off.

The glassware to be stamped should be clean and dry.

By means of the gelatin roller, spread a thin layer of the printing ink on a plane glass plate. Now spread a uniform layer of ink on a gelatin pad, by running the roller, first over the ink on the glass plate and then over the pad until the proper thickness is obtained. The roller should be rolled over the ink-pad occasionally while in use to keep it evenly covered with ink. Put the stamp lightly on the inked pad, then put it on a clean gelatin pad to obtain the ink impression, which is to be transferred to the glassware. The stamp must be reinked before making each impression, for if the impression is too light, sufficient salt will not adhere to it. Transfer the ink impression to the glassware which is to be stamped and sprinkle the etching salt over it by means of a camel's-hair brush, brushing off the excess of salt which does not adhere to the ink. Expose the salted stamp to the action of dry steam for several seconds, until a clear narrow border appears along its edges, with a slight cloudiness outside this border. After steaming, it may be necessary to let stand for a minute or so, but as soon as the stamp appears to be finished, it should be wiped off immediately. A good stamp should be white and clear cut.

The time a salted impression is allowed to steam and other features of the etching process vary with atmospheric conditions and the quality of glass, so that the procedure necessary to obtain good stamps at any time will have to be determined by experiment.

If the glass does not etch readily, the salted stamp should be slightly steamed several times, allowing it to stand for a few minutes between each steaming. It is sometimes advisable, when steaming for the last time, to allow the salted stamp to become very moist so that the salt and ink form a thick paste, but it must not become wet enough to run and must be wiped off immediately.

The harder the glass, the more difficult it is to stamp. Pyrex and other varieties of hard glass often require different treatment. For these, the salted stamp should be held in a low Bunsen flame for a few seconds till it becomes slightly moist and warm, then let it stand for about a minute, and if necessary repeat the operation several times. The warming must be carefully done, for if the stamp becomes too wet it will spread and if there is too much heat the salt breaks down before the etching is complete. When the process is finished the salted stamp should be white. The glass is then allowed to cool and is washed off.