ammonium bichromate-phosphoric acid etch would increase from about 3.5 to 4.5 in 1½ minutes on a grained zinc plate.

This increase in the pH of a plate etch on zinc plates explains why plates are sometimes well desensitized in the center areas of the plate and tend to scum around the outer areas. The etch is usually poured in the center of the plate and then wiped out over the plate from there. By the time the etch has reached the outer parts of the plate, its pH has gone up and it is not as good a desensitizing agent. This is the reason why it is suggested that large plates in particular be given two applications of a plate etch. The excess of the first application of etch which is now weaker in acid content should be squeegeed from the plate. The second application of etch does not lose its acid as rapidly due to adsorption of the gum over much of the plate from the first application of etch. In this way it is possible to get the second application of etch of the desired low pH and good desensitizing powers all the way out to the sides and corners of the plate.

Advantage of Drying of the Desensitizing Etch. Many platemakers have the bad habit of applying a desensitizing etch to a plate for a half minute or so, and then turning on the water and washing it off. It has been proved conclusively and many times that an etch which is dried down on a plate results in a plate which is better desensitized than if the same etch is applied to the plate for a short time and then washed off with water.

The reason for this was not known until Joanne Lindgren Heal measured the amount of gum arabic and cellulose gum which remained adsorbed to grained zinc plates. ("A Method for Measuring the Amount of Gum Adsorbed on Zinc Lithographic Plates," *Proceedings of Eighth Annual Meeting,* Technical Association of the Graphic Arts, 1956, pages 189-195.) Her results showed that more gum arabic or cellulose gum was adsorbed to a zinc plate if the desensitizing etch was dried down instead of being washed off.

Many platemakers are afraid of some kind of a continuing chemical reaction if an acid plate etch is dried down on a plate and left there for any length of time. Such fears are apparently groundless. Acid etches were dried down on zinc plates at the LTF research department and left for a month or longer. When these plates were run on the press, they were very well desensitized and no trouble was experienced.

If plate etches are dried down, the procedure must be done carefully so as not to leave any of the acid etch on the image areas of the plate. If this is not watched carefully, the result will be "gum

streaks" in the image areas of the plate. If the platemaker is worried about this, then the next best procedure is to dry the etch on the plate, fan it for a few minutes, then wash the plate with water, and gum it with a plain gum arabic solution. By this procedure, any acid etch which dried on the image areas of the plate will be removed when the plate is washed with water.

Desensitization of Aluminum, Chromium, and Steel. Most rules seem to have their exceptions, and theories often have to be modified as new facts are discovered which do not fit the original theory. Thus the desensitization of aluminum and chromium does not follow all of the rules formulated on the basis of zinc plates.

It is easy to see why this may be true. The process of adsorption of a desensitizing gum involves two things—the desensitizing gum itself and the surface to which it is adsorbed. When a change is made from zinc to aluminum or chromium, the metal surface is quite different.

A good desensitizing etch for aluminum plates is the "1:32" etch which consists of one part by volume of 85% phosphoric acid to 32 parts by volume of gum arabic solution. This etch has a pH of about 1.8 to 2.0 yet a solution with this much acidity is not harmful on aluminum plates. This is probably because an aluminum plate is covered with a film of aluminum oxide which reacts very slowly with such an acid etch.

It was also found that aluminum and chromium can be desensitized with alkaline gum arabic or cellulose gum etches. Satisfactory desensitization has been obtained with etch solutions with a pH as high as 9.0 and 10.0. In such etch solutions the desensitizing gum is entirely in its "salt form." Apparently the mechanism of adsorption of a desensitizing gum to aluminum or chromium is different than to zinc.

Steel offers another exception. A solution containing nothing but phosphoric acid and water can desensitize a steel ink roller on the press so it will repel ink and accept water. To a limited extent phosphoric acid will also desensitize aluminum and chromium. On the other hand, phosphoric acid will sensitize copper so it will accept ink. Some preliminary measurements with phosphoric acid containing a tracer amount of radioactive phosphorus showed that a considerable amount of phosphoric acid remained adsorbed to aluminum and chromium while only a small amount remained adsorbed to copper. But it is not known why an adsorbed film of phosphoric acid on aluminum or chromium is preferentially water-receptive.