ated flask (300 cc.) containing four of the rivets. When the latter flask was completely filled, a rubber tube dipping beneath mercury was cut to make a way for hydrogen to escape. A parallel test was made with some of the same acid to which air was admitted.

The writer agrees with Evans that the grooving about the rubber bands is less distinct in the air-free acid than it is when air is present, but he does not find that the effect ceases to exist at all. The fact that the grooves are less distinct is attributed to a more rapid attack of the surface as a whole, rendering the action within the capillary spaces less only by comparison.

It is admitted that differences in oxygen concentration, where such exist, may be a contributing cause, but not the principal cause of the capillary corrosion. There may be electrolytic action due to the lowering of hydrogen concentration in the neighborhood of bubbles resting upon an oxygen-free surface. Further work should be done to find out how important this effect may be.

There is a marked difference in the manner in which the air-free acid acts upon the iron surfaces. The air-free acid attacks the surface smoothly and uniformly, while the aerated acid acts more strongly within the pores of the metal. Measurement was made of the decrease in thickness of the exposed portions of the rivets under the two conditions. The average decrease in the aerated acid was in the two experiments 0.025 mm. and 0.05 mm. In the air-free acid the losses were 0.25 mm. with carbon dioxide, 0.175 mm. and 0.10 mm. with hydrogen. The losses in weight were not concordant, however, for in the first experiment, five rivets in aerated acid lost 1.68 g., and five under hydrogen, 2.59 g., while in the second experiment, four in aerated acid lost 4.14 g., and four in air-free acid 4.03 g. These erratic weights may be explained by variations in structure of the iron, rendering it easier for the acid to attack between the fibers in some pieces than in others. It is plain that there is much room for further work upon these problems.

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An Improvement of the Cobalt Aluminate Test for Aluminum.—When a supposed precipitate of aluminum hydroxide is dissolved in nitric acid, treated with a few drops of cobalt nitrate and then reprecipitated and ignited on a platinum wire according to the method given by Noyes[1] great dexterity is required to prevent the precipitate, which shrinks on ignition, from falling off the wire. The foregoing procedure is a modi-

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[1] Noyes, "Qualitative Chemical Analysis," MacMillan, **1922**, 9th ed., p. 99.

fication of that recommended by Noyes, Bray and Spear[2] in that the hydroxide of aluminum is reprecipitated with cobalt hydroxide adsorbed onto it before ignition instead of a piece of filter paper dipped into a solution of the mixed nitrates being ignited. In each procedure the ignition of the filter paper with the precipitate is specified.

On attempting to surmount the difficulty described above, it has been found that the decrepitation can be prevented by moistening the lump of precipitate with a small drop of concd. sulfuric acid before heating it. The presence of a small amount of filter paper mixed with the precipitate is immaterial, but an attempt should be made to take up as little paper is possible; this eliminates its subsequent oxidation. The drop of acid as added best by means of a stirring rod, not by dipping. The acid dissolves the combined aluminum and cobalt precipitate, forming sulfates which remain on the wire when the water and excess acid are evaporated and, when strongly heated, become a dull, dark blue mass.

Precipitated silicic acid, which is the substance usually mistaken for aluminum hydroxide, does not dissolve readily in the concd. sulfuric acid. When evaporated and strongly heated this yields a fusible, shiny blue mass easily distinguished from the former. When a mixture of approximately equal amounts of silica and aluminum hydroxide is treated in this way the cobalt and aluminum hydroxides dissolve immediately in the acid. The silicic acid, being slow to dissolve, remains segregated and on strong heating gives a bead of fusible cobalt silicate while the rest of the wire is coated with the dull, dark blue of cobalt aluminate.

The delicacy of the test by this procedure is about the same as that by the method of Noyes, but the manipulation is easier for students to execute. It has been tried by a class in qualitative analysis and has given results more satisfactory than the usual method.

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A Boiling-stirring Rod to Prevent Bumping.—The prevention of bumping in boiling liquids has been the subject of much study, and many devices have been suggested to effect it. The one most often advocated is some adaptation of the capillary tube, which functions fairly well in some cases but cannot be used under all conditions, especially in quantitative work, and it has many limitations.

The rod here described possesses all of the advantages and none of the limitations of the capillary tube; it is suitable for quantitative work, functions satisfactorily, even when a precipitate is present, and it is

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[2] Noyes, Bray and Spear, This Journal, 30, 544 (1908).