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MATERIAL FOR FILLING ETCHED LINES ON THERMOMETERS

The Bureau has from time to time received requests for a formula for a material to be used in filling in the lines and figures on etched thermometers. Until recently no material that would be permanent under various conditions of use, had been found. In fact, one of the least satisfactory features of thermometers of the etched stem type has been that materials used to make the lines and figures visible have not been satisfactorily permanent, since the materials may be burned out at high temperatures or removed by the action of antiseptic solutions such as are used in disinfecting clinical thermometers.

Materials ordinarily used consist of carbon or other pigment suspended in an organic vehicle such as an asphalt varnish, and these materials do not resist the action of high temperatures or antiseptic solutions.

An enamel of low fusing point, which could be fused without softening the glass, has been used to a limited extent. This was permanent but the process was difficult and expensive.

Further experiments have led to the discovery of a material which appears to be much more satisfactory than those previously used. This material is made of a ten per cent



solution of water glass thinned with an equal volume of water and mixed with enough precipitated manganese dioxide to form a stiff paste. Best results have been obtained with paste made shortly before using. The thermometer is cleaned and the paste is rubbed into the lines or characters to be filled, and the excess is quickly removed with tissue paper to prevent its adhering to the unetched parts. Any excess so adhering may be removed with polishing rouge, or other fine abrasive. After the material has been applied, it may be allowed to harden in the air, or may be made more permanent by heating. This color has been found to be durable on thermometers heated to high temperatures either in air or oil or when subjected to steam or boiling water. When hardened only by exposure to air, it has been found to be durable on clinical thermometers immersed in water or in antiseptic solutions for extended periods, and on thermometers immersed in steam, or boiling water or hot oil.

The ten per cent solution of water glass is a commercial product, sold under that name. Its specific gravity is about 1.38 to 1.39. A high silica water glass, rather than one containing excess alkali, is to be preferred. Precipitated manganese dioxide is an artificial product which, as a rule, is finer than the natural mineral.

Numerous finely divided pigments other than manganese dioxide may be used. The carbon blacks produce a more intense black, but although more acid resisting, they are



not as durable at high temperatures as the manganese dioxide. Tetanium oxide or zinc oxide make a white filling which has a surprising amount of contrast when seen against the glass, so that a thermometer treated with this material can be read about as easily as one with black lines. Chromium oxide makes a durable green and lead chromate a yellow. Ultramarine blue and a white pigment, such as blanc fixe, make a blue, the shade depending upon the amount of white pigment used. The ultramarine blue alone did not mix readily with the water glass. Some of the iron oxides yield a rather dark red. A brighter red was obtained with an organic pigment such as toluidine red toner, but these are not as durable as the inorganic pigments. A durable bright red has not yet been made at the Bureau. It is probable that such a material could be prepared although the compounds of lead and mercury are not to be recommended for use on clinical thermometers.

Some experience and skill are required in applying these materials, and in cases where only a few thermometers are to be treated a moderately durable color may be obtained by the use of the rouge paste used by opticians. This is simply rubbed on and the excess removed with tissue paper. It is fairly durable on thermometers heated to high temperatures, or subjected to the action of hot oil, steam, boiling



Water, or antiseptic solutions. It is more easily rubbed off than are the water glass mixtures described above.

The pigment suspended in water glass is to be recommended for original filling of marks on thermometers while the rouge will be found convenient for quickly restoring the color on thermometers which have not retained their pigment.

A patent covering the water glass mixtures has been applied for. This patent is to be dedicated to the public.





