

APPENDIX.

1. *Wax Bath Used for Low-temperature Annealing.*

This apparatus, which is suitable for treatments at temperatures in the range 200° to 325° C., consists of an electrically-heated bath containing carnauba wax, a thermostatic control and a temperature recorder, together with controlling rheostats, ammeter, etc. The general arrangement is shown in Fig. 20.

Bath.—This is a lagged sheet-steel cylindrical vessel. The heating element consists of two square uralite frames on which nichrome wire

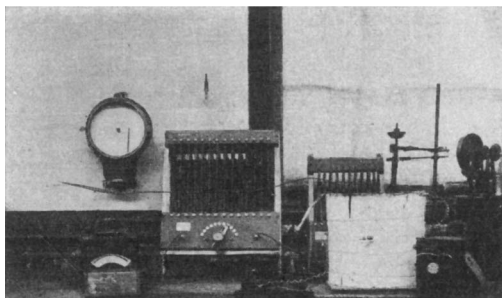


FIG. 20.—General arrangement of annealing bath.

of No. 18 gauge is wound. These frames, connected in series, are fixed horizontally near the bottom of the tank, and are separated from the tank and from each other by suitable insulation. Three inches above the frames a perforated sheet-steel false bottom is fixed. Current is supplied from a 250-volt circuit.

Thermostatic Control.—This is in principle a mercury thermometer, having a large steel bulb and a fine steel tube lined with a closely fitting silica capillary tube. A nickel wire passing into the silica tube is fixed with the lower end at any desired height in the tube. Contact of the mercury with the wire completes an electrical circuit, which by means of a solenoid actuates a mercury switch and breaks the heating circuit. When the temperature falls the solenoid circuit is broken by the mercury leaving the wire and the heating circuit is restored.

Temperature Measurement, etc.—Standard mercury thermometers were used and autographic records were taken by means of a Cambridge thermograph. Throughout all treatments the molten wax was continuously stirred by means of a motor-driven rotating paddle.

The formers to which the strips were attached for the treatments described in the paper were suspended in the molten wax.

BRASS BY THE REMOVAL OF INTERNAL STRESS 191

2. *Extensometer for Use at Raised Temperatures.*

This instrument, constructed in the Research Department, Woolwich, is similar to that described by H. J. French (U.S. Bureau of Standards).¹ The extensometer, a photograph of which is shown in Fig. 22, consists of

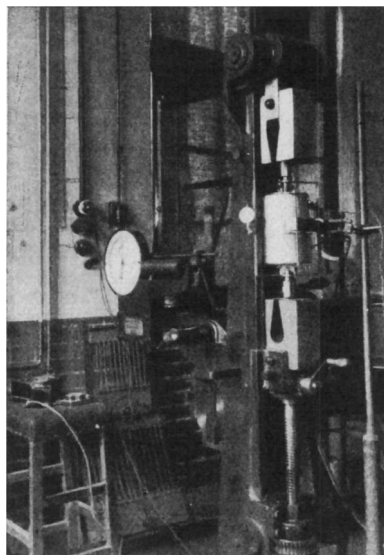


FIG. 21.—General arrangement of testing machine and apparatus for taking load-extension diagrams at raised temperatures.

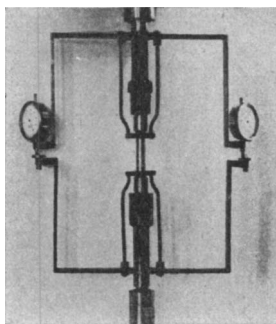


FIG. 22.—Extensometer for use at raised temperatures.

two light steel frames each rigidly fastened to a steel yoke by two rods, adjustable in length for attachment to test-pieces of different length. The yokes are clamped to the specimen by means of four hardened high-speed steel screws.

The flanges on the upper frame carry two Ames dials reading to 0.0001

¹H. J. French, "Tensile properties of boiler plate at elevated temperatures," *Transactions of the American Institute of Mining and Metallurgical Engineers*, 1920; *Mining and Metallurgy*, No. 158, February, 1920, Section 15.

192 THE PREVENTION OF SEASON CRACKING IN BRASS

inch, the pistons of which make contact with two adjustable polished steel platforms carried on the lower frame.

With an extensometer of this type uniform symmetrical stretching of the test-piece causes an equal movement of each platform from its corresponding dial. If the stretching is accompanied by any twisting or bending of the test-piece the dial readings will not be equal, and the reading of one dial may even be negative. Accordingly the extension is taken as half the algebraic sum of the readings of the two dials. It may be noted, however, that in the tests which have so far been made with this instrument the differences between the readings of the two dials have been relatively quite small. As may be noted from the readings given in the paper, satisfactory agreement between this extensometer and the more sensitive and accurate Ewing extensometer has been obtained in tests made on identical test-pieces at atmospheric temperature.

3. *Furnace.*

The electric resistance tube furnace used for the tests at raised temperatures is shown with the testing machine and extensometer in Fig. 21. The test-piece and extensometer yokes occupied the central part of the furnace, the ends of which were loosely plugged with asbestos wool. The arms of the extensometer remained at atmospheric temperature.