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BUBBLE TRACKS IN A HYDROGEN-FILLED GLASER CHAMBER

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February 15, 1954

Berkeley, California

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Glaser[1] first showed that the boiling of superheated ethyl ether was sensitive to ionizing radiation, and later photographed the bubble tracks in his apparatus. A liquid hydrogen chamber would have a number of attractive features, and it is therefore not surprising that several groups have been working to produce such a device. At Chicago, Hildebrand and Nagle[2], working in cooperation with Glaser, have produced superheated liquid hydrogen, and have shown that it boils sooner in the presence of a γ-ray source. We have taken the next step, but with somewhat different technique, and can report the photography of bubble tracks in hydrogen.

The bulk of the Chicago apparatus was immersed in a bath of hydrogen which was boiling at atmospheric pressure, but the bubble chamber was in the vapor space, and superheated by a coil of resistance wire. This arrangement involves problems of heat transfer and temperature measurement, in addition to some serious problems if photography were to be attempted. We have therefore immersed our bubble chamber in a bath of hydrogen which boils at high pressure; this provides a convenient heat reservoir, whose temperature is easily controlled by a pressure regulator. First, hydrogen is condensed into the bubble chamber at a pressure somewhat higher than that over the bath. After temperature equilibrium has been established, the following cycle in initiated: (1) The pressure in the bubble chamber is suddenly reduced to one atmosphere; (2) At a variable time after the pressure release, an electronic circuit triggers

a stroboscopic lamp, which takes a photograph of the chamber, and (3) pressure is reapplied to the chamber to condense any bubbles that may have formed.

We have been unable to duplicate the long times of superheat reported by the Chicago group, but we have been using considerably higher degrees of superheat. We were discouraged by our inability to attain the long times of superheat, until the track photographs showed that it was not important in the successful operation of a large bubble chamber. Tracks have even been observed in cases where the liquid hydrogen was not completely condensed in the chamber prior to expansion.

I wish to thank Drs. Luis W. Alvarez, Frank S. Crawford, Jr., and M. Lynn Stevenson for their advice and help in these experiments. I am indebted to Mr. A. J. Schwemin for help with the electronic circuits, and to Messrs. H. Powell and T. Robbins for their cooperation with the glass work.

This work has been performed under the auspices of the Atomic Energy Commission.

[1] D. A. Glaser, Phys. Rev. 87, 665 (1952)

[2] R. H. Hildebrand and D. E. Nagle, Phys. Rev. 92, 517 (1953)

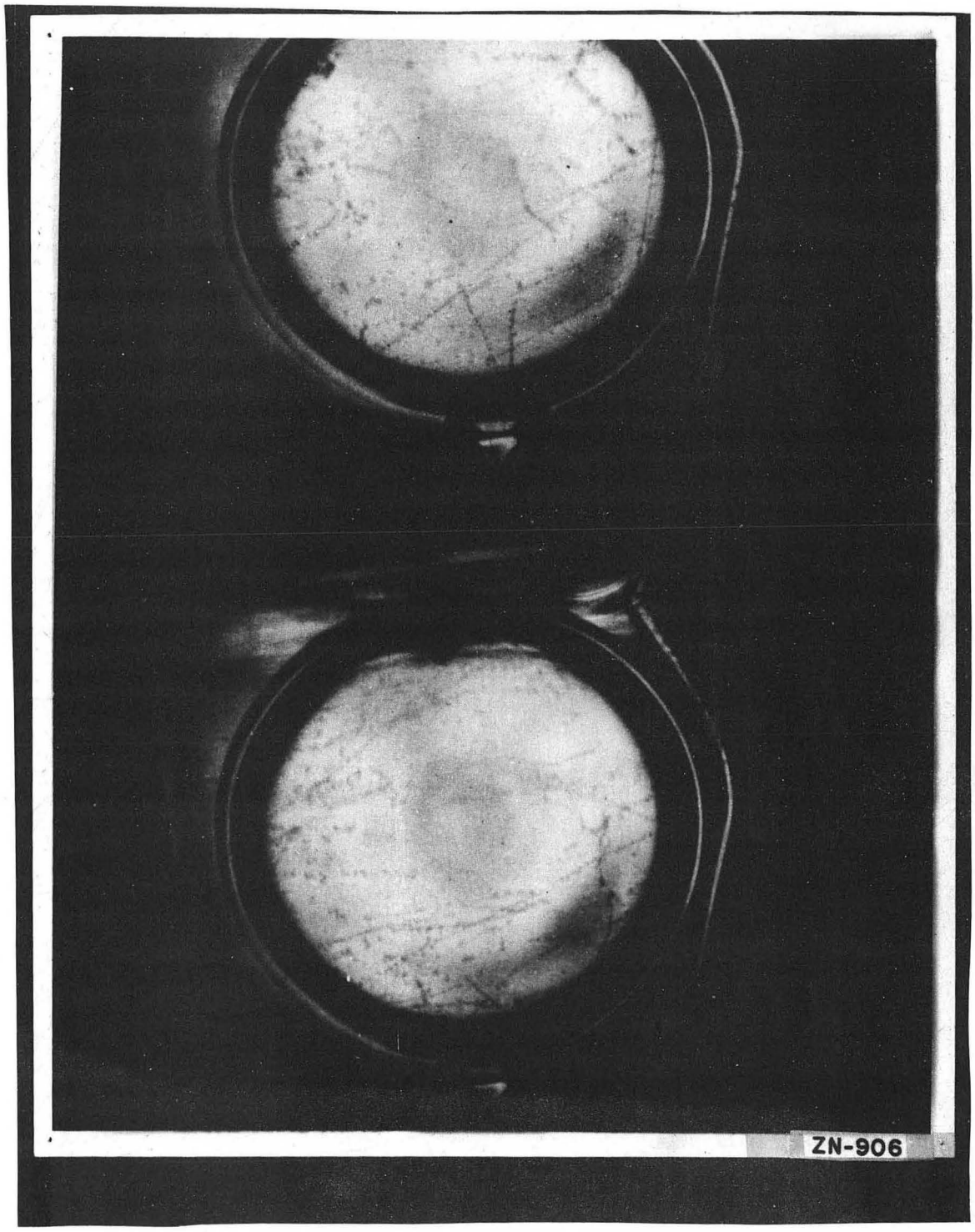

Fig. 1.

1-1/2 Inch Diameter Chamber
Irradiated with a Po-Be Source.