

land and water forms of certain amphibious plants.

LaRue and Narayanaswami⁸ state that the gemmæ of liverworts do not germinate within gemma-cups unless they have been detached from the parent body. Audus⁹ suggests that "in this the controlling agent may be a specific inhibitor produced by the parent tissue". In the present experimental conditions germinated gemmæ with or without rhizoids have been found within gemma-cups in control cultures as well as in cultures containing certain growth substances. It is also interesting to note that certain growth substances have inhibited the formation of gemma-cups. The findings also indicate that production of gemma-cups is conditioned by good humid conditions.

These observations will be considered in greater detail elsewhere.

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RESEARCH INTO BOILER CIRCULATION THEORY

A REPORT on an extensive series of experimental investigations of the fundamental factors influencing the circulation process in high pressure boilers was presented to a meeting of the Institution of Mechanical Engineers in London, on 29th March 1961, by Haywood, Knights, Middleton and Thom.

The research project was sponsored by the Water-Tube Boilermakers' Association and was carried out by the authors at Cambridge. The primary object of the research was to establish experimental data relating to the flow conditions and pressure drop of high pressure steam-water mixtures flowing along heated and unheated pipes—in both horizontal and vertical positions. Simple boiler circulation theory is based on the assumption that the steam-water mixture moves as a homogeneous fluid, but there was little existing data on effects of relative velocity between the steam and water phases, a phenomenon which was known to exist under actual flow conditions in a boiler circuit. The paper describes an isotopic technique of determining this relative velocity of the two phases.

This consists in measuring the absorption of gamma-rays in their passage through the two-phase mixture at the outlet from the test section. The results from the gamma-ray equipment—in which the beam was provided by a radioactive isotope of caesium—enabled calculations to be made of the apparent density of the fluid mixture, and consequently the respective velocities of the two phases at that point. Preliminary tests involving scans along a number of chords of the tube cross-section showed that the density distribution of the fluid

was different with horizontal and vertical pipes. The data thus obtained from these and other tests were used to calculate slip correction factors, by means of which the acceleration and gravitational pressure drops—calculated according to homogeneous theory—could be corrected for the effects of slip. The paper presents an analysis of the pressure drop measurements made on the 1-inch and 1½-inch bore pipes in the vertical and horizontal positions, with particular attention to the frictional pressure drops in the horizontal pipes.

In their conclusions the authors state that, over the range of variables covered in the tests, the experimental pressure drops at 2,100 p.s.i. abs. are close to the values predicted by homogeneous theory for both horizontal and vertical pipes. For horizontal pipes at the lower pressure, homogeneous theory gives closer prediction of the pressure drop for heated than for unheated pipes, owing to the opposing effects of two-phase flow conditions on the frictional and acceleration pressure drops in the heated pipes. For vertical pipes at the lower pressures, the experimental pressure drops are significantly greater than the values predicted by homogeneous theory. The gravitational contribution to the total pressure drop is dominant, and it is influenced significantly by the effects of slip.

The results of the work have provided a wealth of information in a field in which there has been previously a scarcity of reliable data. —(Courtesy: The water-Tube Boilermakers' Association, 8 Waterloo Place, London, S.W. 1).