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Discussion

M. D. HERSEY.³ The author's review, taken in conjunction with the Bibliography by Brombacher and Lashof [reference (5) of the paper], provides access to practically the entire literature of research on flat diaphragms. A hydrostatic dynamometer utilizing such a diaphragm is shown elsewhere.⁴ General methods of calculation proposed for elastic systems⁵ are applicable to diaphragms. Earlier scientific literature not included in the author's reference (5) has been reviewed by H. F. Coward and the writer in an investigation conducted in co-operation with the Safety in Mines Research Board of Great Britain.⁶ A recent study by Roberson⁷ may be added. Could this not be extended to clamped plates by approximate intercomparison of available formulas?

Among the many investigations of lubrication and lubricating appliances, the writer does not recall any theoretical or experimental study of the common oil can. To discover the optimum design, its performance characteristics should be expressed in nondimensional variables representing the geometrical factors, manual operating conditions, elastic properties of the metal, and physical properties of the oil. To get literally to the bottom of the oil-can problem a good understanding of flat diaphragm will be essential.

AUTHOR'S CLOSURE

The author would like to thank Dr. Hersey for his discussion and the additional references cited on the subject of flat diaphragms.

Regarding the oil-can design problem, it may be mentioned that Kaplan and Fung (reference 12 of paper) have presented theoretical and experimental data on the buckling and bending of thin, shallow, spherical shells with clamped edges. Perhaps a similar method of attack could be applied to the related problem of oil-can buckling.

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⁴ "Mine Car Friction," by M. D. Hersey and H. E. Wetzel, Bulletin 13, Coal Mining Investigations, Carnegie Institute of Technology, Pittsburgh, Pa., 1924, figs. 2 and 3.

⁵ "Effect of Small Changes in Temperature on the Properties of Bodies," by M. D. Hersey, *Bureau of Standards Journal of Research*, RP No. 137, vol. 4, 1930, pp. 137-156.

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⁷ "Transverse Vibrations of a Free Circular Plate Carrying Concentrated Mass," by R. E. Roberson, *Journal of Applied Mechanics*, Trans. ASME, vol. 73, 1951, pp. 280-282.