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An Equation of State for Gases at High Pressures and Temperatures from the Hydrodynamic Theory of Detonation

MELVIN A. COOK
Department of Metallurgy, University of Utah, Salt Lake City, Utah
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IN regard to the criticisms of my paper[1,2] by Dr. Stewart Paterson[3,4] I find, after looking more carefully into my method (a) solution of the equations of the hydrodynamic theory, that Dr. Paterson is correct in pointing out that method (a) is an unsatisfactory solution. In carrying out the solutions by method (a), I was including, rather naively, a step which had been introduced as a convenient short cut in earlier studies by method (b) which, although I failed to realize it, actually did depend on the nature of the solutions of method (b). The data reported in my paper,[1] while calculated by the procedure in question (although not as described in reference 1) are actually identical with those which would be obtained by the direct application of method (b). The slight difference between the two curves of Fig. 1 of my paper was due to the use of slightly different detonation velocities. This was, in fact, mentioned in the paper of reference 1. As far as I am concerned, Dr. Paterson and I are now in agreement on all essential points of discussion. As a matter of fact, the recent work of Paterson[5] together with the arguments in reference 1, I believe, present strong evidence for the validity of the equation of state

$$pv = nRT + \alpha(v)p$$

for gases under the conditions encountered in the detonation of solid and liquid explosives.

[1] Melvin A. Cook, J. Chem. Phys. **15**, 518 (1947).
[2] Melvin A. Cook, J. Chem. Phys. **16**, 554 (1948).
[3] Stewart Paterson, J. Chem. Phys. **16**, 159 (1948).
[4] Stewart Paterson, J. Chem. Phys. **16**, 847 (1948).
[5] Stewart Paterson, Research **1**, 221 (1948).