of causes or effects* but in the Introduction Dr. Biasutti draws attention to the great reduction in the number and severity of explosions in recent years and attributes this to the substantial reductions in plant inventory that have been brought about by the introduction of new, continuous processes. There is a message here for the rest of the chemical industry. Cannot we find ways of reducing the massive inventories in plants such as the original plant at Flixborough? More knowledge of what has been achieved in the explosives industry may encourage chemical engineers elsewhere to follow their example.

Another factor contributing to increased safety has been the increase in remote control. In some of the individual accounts there is a tendency to blame "human error" without querying whether the opportunity for error could be designed out. For example the last incident but one in the book probably occurred, in France in April 1980, because an operator forgot to close a valve. Plants should be designed so that such simple errors — inevitable from time to time — do not produce such serious consequences.

The book is full of fascinating snippets of information. For example, we learn that Pierre S. du Pont, the founder of the Company, was killed in an explosion in 1817 and that another member of the family, Alexis I. du Pont, was killed in 1857. Alfred Nobel's brother was killed in 1864. Clearly the owners took the same risks as their men.

Perhaps the publication of this book will inspire someone to do the same for vapour cloud explosions. Lists have been published by J.A. Davenport [1] and K. Gugan [2], but these contain little or no descriptive matter. The level of detail required is provided by D.J. Lewis [3], but he describes only 13 incidents. If anyone does produce such a book, let us hope he includes references.

TREVOR A. KLETZ

References

1 J.A. Davenport, Chem. Eng. Progress. 73 (9) (1977) 54.
2 K. Gugan, Unconfined vapour cloud explosions, Inst. Chem. Eng., 1979.
3 D.J. Lewis, Progr. Engrgy Comb. Sci., 6 (1980) 151.

Heavy Gas and Risk Assessment, by Silvius Hartwig (Ed.), D. Reidel Publishing Company, P.O. Box 17, 3300 AA, Dordrecht, Holland, 1980. ISBN 90-277-1108-9, LC 80-14810, viii + 306 pp., cloth back, $37.00.

This book is a collection of papers presented at the Symposium on Heavy Gas held September 3—4, 1979, in Frankfurt, Germany.

*I understand that statistical surveys by the author were reported at the 19th Safety Explosives Seminar, Los Angeles, CA, 10 Sept. 1980 and at the 7th Congress of the International Exchange of Experience on Industry Connected Accidents of the Explosives Industry in Athens, May 1981.

Fourteen papers, of which five are presented in German, are included. About one-half of the papers describe contributions to the development of mathematical models for turbulent dispersion of heavier-than-air gases released into the atmospheric boundary layer at ground level. The remaining papers deal with related but more specific topics such as dispersion of gasoline vapors accidentally released in road tunnels, analysis of the potential explosion effects which may result from the ignition of unconfined vapor clouds, and risk analyses for storage and transport of liquified natural gas. There is also an overview of research activities in the United States up to the date of the symposium.

The papers presented on turbulent dispersion of heavy gases are primarily authored by investigators from the European community, where the development of heavy gas dispersion models for use in hazard assessment appears to have received more attention than in the United States in the past five years. The author has provided an introduction to the book which reviews the main physical processes which occur during the release of heavy gases stored under pressure at ambient temperature and during the release of refrigerated gases stored at near-atmospheric pressure. Attention is properly called to the complications which differentiate the processes occurring in such releases from those treatable by conventional trace-contaminant atmospheric pollutant dispersion modeling techniques.

The book will be of considerable interest to the growing number of people involved in the estimation of risks associated with manufacture, transport, and storage of heavy toxic and/or flammable gases. The potential hazard associated with such activities is a hotly debated subject about which resolution is badly needed. Although most of the controversy in the United States about hazards associated with gas-clouds formed during accidental release has centered on the risks involved in the transport of liquified natural gas, the European research community appears to have attached more importance to the development of an understanding of the hazards which are to be expected from accidental release of a number of potentially hazardous gases stored in large amounts. The availability of this book will hopefully aid in the consolidation of international research efforts toward development of a better understanding of the complex problem of atmospheric turbulence dispersion of dense gases.

J. HAVENS

Handbook of Toxic and Hazardous Chemicals, by Marshall Sittig, Noyes Publications, Park Ridge, New Jersey, 1981, 729 pp., $64.

An understanding of the book's area of coverage can be given best by quoting from the foreword:

"The handbook presents concise chemical, health and safety informa-