One has then to evaluate the net value of the surface integral of the displacement and equate it to the enclosed charge. Problems in hydrodynamics and heat flow may be solved by this method.

The method developed here is generally applicable to field problems which are

(*a*) not "curl free," where Stokes' theorem applies,
(*b*) not "source free," where Gauss' theorem applies.

Acknowledgements

The author wishes to acknowledge his sincere thanks to Dr. E. A. Erdelyi, Professor of Electrical Engineering at the University of Colorado, for numerous technical discussions and great assistance in writing this paper. The findings of this paper are an outcome of research for contract No. DA-44-009-ENG-4830 granted by the U.S. Army Engineering Research and Development Laboratories, Fort Belvoir, Virginia.

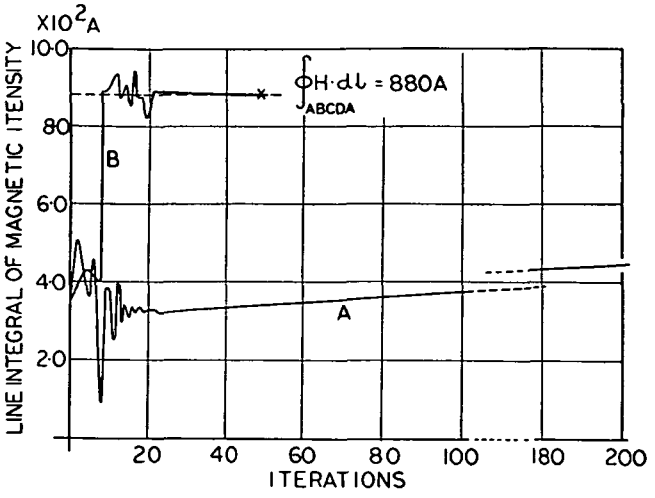

Fig. 4.—Comparison of convergence for a non-linear Poissonian field in iron regions of Fig. 3(a)

References

ALLEN, D. N. DE G. (1954). *Relaxation Methods*, New York: McGraw-Hill Book Company.

ARMS, R. J., GATES, L. D., and ZONDECK, B. (1956). "A Method of Block Iteration," *Journal of the Society for Industrial Applied Mathematics*, Vol. 4, pp. 220–229.

MAMAK, R. S., and LAITHWAITE, E. L. (1960). "Numerical Evaluation of Inductances and A.C. Resistances," *Proc. IEE*, Part C, Vol. 108, pp. 240–246.

SOUTHWELL, R. V. (1946). *Relaxation Methods in Engineering and Science*, Oxford: The Clarendon Press.

Book Reviews (*Continued from p. 20*)

Whilst the author does not claim to have covered every possible application, the coverage is nevertheless comprehensive, and the material proceeds in a logical way. Many references are given on specific topics for the specialized reader.

Altogether a very readable and informative book which should be an asset to the circuit engineer.

J. C. VICKERY

Reliable Computation in the Presence of Noise, by S. WINOGRAD and J. D. COWAN, 1964; 96 pages. (Cambridge, Massachusetts: *M.I.T. press*, 38s.)

This is one of the series of *Research Monographs* issued by the *M.I.T. Press*. These monographs permit the presentation of research in a more detailed way than is reasonably possible in a scientific journal whilst, at the same time, obtaining earlier publication than would be possible in a standard text-book.

The purpose of this particular publication is to extend Shannon's noisy-channel coding theorem to include the case of computation with noisy modules rather than communication. It then continues to show how error-correcting codes may be employed in the construction of reliable automata from less reliable modules.

The first two chapters give, in eighteen pages, an introduction to the relevant aspects of information theory and the theory of automata. This is followed by a discussion of the work of Von Neumann and others on the reliability of automata, which is then extended in the next chapter to computation with noisy modules. It is shown that such a system may be decomposed into an error-free computation module and a noisy communication channel.

Chapters 6 and 7 contain various arguments leading to the conclusion that it is wrong to consider module networks as separable into encoding, computing and decoding networks in which encoding and decoding are free from error. Chapter 8 therefore considers only noisy modules at each stage, and describes the construction of networks of varying degrees of reliability. These designs depend on the assumption that the probability of modular malfunction is independent of modular complexity.

The final chapter shows that synaptic errors may be incorporated, the effect of such errors being controlled by the use of networks of still greater redundancy. This chapter also discusses the effect of errors of connection in the redundant networks. There is a short appendix followed by a list of about fifty references.

The formal arguments are set out very clearly and they are well illustrated by numerous network diagrams which are beautifully reproduced. Whilst the detailed sections of the book are for the specialist, the general arguments and conclusions are of interest to anyone working in the field of computers.

F. H. SUMNER