PREFACE

The material of this book is the background knowledge that has been useful to various members of the Bell Telephone Laboratories who have been actively interested in ferromagnetism. These staff members fall into three main categories: (1) physicists engaged in research on the nature of ferromagnetic phenomena, (2) those carrying on the development of new magnetic materials, and (3) engineers interested in the properties and behavior of magnetic materials suitable for use in apparatus. The knowledge has been drawn from the fields of metallurgy, chemistry, and electrical engineering, as well as from the field of physics.

The book is divided into two main parts, which describe respectively the properties of magnetic materials and the nature of magnetic phenomena. These two portions of ferromagnetism are brought together in one book in the belief that each part is necessary for the development of the other — the physicist needs the empirical data and the engineer should understand the principles governing the material that he uses. The approach is mainly descriptive and nonmathematical when discussing materials, and the emphasis is on the physical concepts when discussing theory. In many places only the outline and the results of analysis have been given, and the reader may regard these places as problems and fill in the missing steps, if he desires.

The author has believed for some time that expositions of subjects such as this can generally be improved by greater than customary use of figures and appropriate captions. In accordance with this idea the average number of figures per page has been increased to almost 0.9. For the preparation of these figures grateful acknowledgment is made to Miss M. Goertz, who plotted many of the data, and to Mr. S. Lund, who designed the final drawings. The drawing has been done under the able direction of Mr. H. P. Gridley. Mrs. E. M. Sparks has been responsible for the reproduction and collation of the text and figures of the manuscript.

The author has had the advantage of the reading and the criticism of the manuscript by a number of fellow physicists. L. W. McKeehan of Yale University has read the whole manuscript and suggested many valuable changes. In the chapters on materials, especially R. A. Chegwidden and J. A. Ashworth have supplied information and criticism. The second half of the book has been read by C. Kittel, and portions of it by K. K. Darrow and H. J. Williams, all of whom have given able criticism. Chapter 4 on Iron-Silicon Alloys has benefited much from the information

Chapter 9 on Permanent Magnets has benefited from criticism by W. Ruder, A. H. Geisler, and D. L. Martin of the General Electric Company and by E. A. Nesbitt and R. A. Chegwidden of the Bell Laboratories. Comments on the preparation of magnetic material were received from J. H. Scaff, D. H. Wenny, and J. R. Townsend. J. E. Goldman of Carnegie Institute of Technology has read Chapter 12, and S. J. Barnett of the California Institute of Technology, portions of Chapter 10. C. D. Owens and V. E. Legg have commented on Chapter 17, and L. R. Maxwell and F. G. Brockman, on the description of the properties of ferrites. A number of people have kindly supplied me with information which has not previously been published; these are mentioned specifically in the text. Some figures are reproduced from articles published by the author in the Physical Review, Journal of Applied Physics, and Encyclopaedia Britannica, with the kind permission of the publishers.

Extensive use has been made of Ferromagnetismus by Becker and Döring (Springer, Berlin, 1939) and Magnetism and Matter by Stoner (Methuen, London, 1934), and of the useful compilations of von Auwers (1936), Hansen (1936), and others.

Finally, it is a pleasure to acknowledge my indebtedness to Dr. O. E. Buckley and Professor L. W. McKeehan for introducing me to the study of magnetism and directing my early efforts in this field.

In a book of this kind it is inevitable that there should be some errors, and some omissions of work important enough to be included. It is hoped that readers will be tolerant and notify the author of those that they find.

Richard M. Bozorth

Murray Hill, N.J.
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