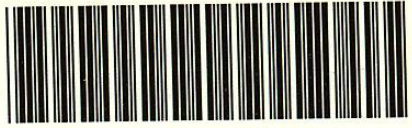


IRON, STEEL
AND
OTHER ALLOYS
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IRON, STEEL, AND OTHER ALLOYS

BY

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in the City of New York

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TO MY FRIEND
PROFESSOR DIMITRY CONSTANTIN TSCHERNOFF
THE FATHER OF THE METALLOGRAPHY OF IRON
As a token of affectionate esteem, this work is dedicated

PREFACE

THE heterogeneousness of this book is due to its being intended for several different though related classes of readers. It was undertaken originally for the use of my students, to supplement the instruction given by lectures and by other books. This it aimed to do by elaborating certain important matters which are not treated at sufficient length if at all in other text-books, and are not well suited to lecture-room exposition. Of these students there are at least three distinct classes: those who are to study metallurgy very superficially, the students in chemistry and civil, electrical, and mechanical engineering; those who are to study it more thoroughly, the students in metallurgy and mining engineering; and those whose work is to go still farther, the advanced students.

But the very fact of writing a book fitted for these classes was an opportunity to go a little farther and meet the needs of practitioners, by giving them a systematic account of the condition of the metallography of iron to-day, and more particularly to expose to them the present or solution theory of that metallography. This seemed very important, both because this theory for the first time permits us to take a comprehensive and consistent view of the whole subject, and because for the majority of English-speaking practitioners an account is needed at once more elementary and fuller than any which is now accessible to them.

These different classes of readers bring to the subject very different kinds of preparation; and it is this difference in preparation which has led to vary the treatment, so as to fit each part to the supposed needs of the particular class, or more often classes, of readers to which it seemed likely to be useful.

My warmest thanks are due to the friends who have aided me with their counsel and knowledge. In particular let me thank most sincerely Professor Margaret E. Maltby for examining the first seven chapters and the tenth, those relating to the genesis of alloys in general and to the phase rule; Mr. Frank Firmstone for examining the chapter on the blast-furnace; and Dr. William Campbell, non-resident lecturer on metallurgy, for much invaluable information, for many of the micrographs, and indeed for the original suggestion to write the book; though as to the last my gratitude is somewhat mingled with reproach.

To the fellow officers of my department I am indebted for much valuable aid, particularly to Messrs. Bradley Stoughton, instructor in metallurgy, and I. C. Bull, assistant.

To nobody am I more indebted than to my assistant, Mr. R. W. Page, for his painstaking and intelligent aid in preparing the work and in passing it through the press.

The reader should have tolerantly in mind the difficulty of preparing a work to-day dealing with the metallography of iron, with our knowledge at once so fragmentary and so rapidly growing. To keep the work fully up to every latest development of this knowledge would mean publishing it on the Greek kalends.

H. M. H.

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK
June 3, 1903

PREFACE TO THE SECOND EDITION

IN preparing this edition, besides making a few minor corrections and other changes, I have added the classification and definitions of iron and steel which Professor Sauveur and I made for the International Association for Testing Materials; I have described and discussed the Roe puddler, the Mond gas-producer (very briefly), and the Gayley dry-blast process; and rewritten the part relating to the transition substances, martensite, troostite, and sorbite. Here a puzzling question arose. In a view of the fact that, of the students for whose use this work is chiefly designed, twenty would hereafter practice civil, mining, mechanical engineering or chemistry, for every one who would practice metallurgy, ought I to complicate further this already very complex subject by insisting on the part played by the still hypothetical *beta* iron, or simplify it by slurring over this allotropic form, and treating these transition substances as simply mechanical mixtures, in varying proportions and varying states of aggregation, of the three known primary substances, austenite, ferrite and cementite? I have followed the latter course, though not without grave misgivings.

H. M. H.

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK
February 12, 1906

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