

# **MINING PHYSICS AND CHEMISTRY**

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Mining physics and chemistry by J. W. Whitaker

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**J. W. WHITAKER**

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AND CHEMISTRY**



MINING PHYSICS  
AND  
CHEMISTRY

BY

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## AUTHOR'S PREFACE

IN the following pages there has been no attempt to deal with the more advanced portions of the subject matter, the book being of an introductory nature. For further information on Explosives the reader is referred to *Service Chemistry*, by Lewes and Brame, and for further information on the Chemistry of Coal to Professor Bone's book on *Coal and Its Scientific Uses*. The author's thanks are due to Mr. Bernard Whitaker, his brother, for the preparation of many of the diagrams, and to the following firms, who kindly supplied blocks for some of the figures: Messrs. Baird and Tatlock (London), Ltd.; Messrs. John Davis and Son, Ltd., All Saints Works, Derby; and the Cambridge and Paul Instrument Co., Ltd. In addition, the author has received invaluable assistance from Mr. Hunter, Head of the Mining Department of the Wigan Mining and Technical College, in the correcting of proofs and the suggesting of modifications, for which he wishes here to express his sincere gratitude.

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## INTRODUCTION

By PROFESSOR W. H. McMILLAN

It is no exaggeration to state that the high position which we attained during the last century in the industrial world was built essentially on the foundation of an abundant supply of cheap coal; and to-day coal still remains by far the most important raw material of industry. To quote the eloquent words of one of our leading statesmen: "Coal is the most important element in our industrial life; the blood which flows through the veins of industry is made of distilled coal. King Coal is the paramount Lord of Industry. It enters into every article of consumption and utility. It is our real international coinage. We buy goods, food, and raw material abroad. We pay not in gold, but in coal. It not merely fetches and carries for us, but it makes the machinery and the material it transports."

The great strides made within recent years in the iron and steel industry, and the corresponding increase in the demand for fuel, compelled the mining engineer to effect many remarkable changes both on the surface and in the underground workings of his colliery. The modifications, indeed, were so numerous and of such a scientific nature that mining must now be reckoned among the foremost of the practical sciences. The future, moreover, will call for still greater developments. In the past there has been a tendency to work first that coal which is most easily and cheaply obtained, with the result that it is principally the deeper and thinner seams that have to be attacked in the future. Under these circumstances the cost of production will tend to rise unless all our skill and knowledge be brought to bear on the problems which confront



us. This is absolutely essential; for any marked rise in price here will produce a serious setback to British industries in competition with those of other countries, especially where the latter are favoured with easily workable and therefore cheap coal.

To retain our industrial position, therefore, we must direct our attention to thorough investigation of the scientific aspects of the many difficult problems involved; and such attention must be given by *all* connected with the industry. The owner, manager, and underground worker must each take his proper share of the responsibility in the competitive fight. The mining industry is different from most other industries in that, no matter how much scientific skill be brought to its aid, there will always remain a considerable amount of danger. The attention which it has received from the Legislature has undoubtedly done much to reduce the number of accidents, but these are still frequent, and it is now recognised that greater immunity from danger can only be attained by raising the standard of education and training of the underground worker. Every individual descending a mine is responsible for the safety of all his co-workers, and it is therefore absolutely necessary that all should possess an intelligent knowledge of the physical and chemical conditions which prevail in the underground workings. No boy, for example, should be allowed to descend a safety-lamp mine without having previously been instructed in the principle of the lamp which he carries, and the great dangers which attend its ill-usage. Every underground worker should possess at least an elementary knowledge of the dangers which surround him—the occurrence and nature of the inflammable and noxious gases which may be present, the importance of efficient ventilation of the workings, the spontaneous ignition of coal, the explosibility of coal dust, and so forth. Rules and regulations may go some way to reduce the number of accidents, but the best results can only be obtained when the workers and minor officials understand

the reasons for their introduction, and are able to utilise that knowledge efficiently in their daily duties.

The colliery manager has still greater responsibilities. While directing his attention to present conditions, he must at the same time give some thought to the future. Coal mining at greater depths, and the consequent increase in temperature of the workings, will call for more and more scientific knowledge. Methods of keeping the workings cool, of combating the greatly increased tendency to spontaneous ignition and explosions, and of dealing with the enormous pressures of the strata which may be experienced—all must sooner or later require his serious thought. Further, in order to enable him to control more efficiently the ventilation of the various districts underground and to obtain timely indication of any undue heating which may be taking place, periodic analyses of the mine air will become necessary.

Keen competition and economic pressure will also compel him to introduce methods of dealing efficiently and economically with the coal when raised to the surface. More attention must be devoted to the economical production of power. Water-softening and coal-washing plants, and methods of testing the coal for calorific value and other important qualities will become the rule rather than the exception.

Having read through the following pages in the light of many years' experience in the training of all types of mining students, I feel the book fills a great gap in modern coal-mining literature, and will be found invaluable to all engaged in the industry. It contains all the physical and chemical knowledge required of an efficient underground worker or official, and forms an excellent introduction to the many scientific problems which confront the colliery manager.

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