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# THE CORROSION OF IRON

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PREVENTIVE MEASURES

BY

L. C. WILSON



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CALIFORNIA

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TO THE  
AMERICAN

## PREFACE

This little volume is the result of an attempt to collect and put in simple form for reading and ready reference some of the more interesting and important facts connected with the corrosion of iron and its protection therefrom.

It requires no argument to prove the widespread nature and serious import of this process of decay, and the volume of literature to be found on this subject is evidence of the increasing attention which is being paid to it. It is only comparatively recently, however, that corrosion has been studied in a scientific manner and something of its true character ascertained, so it naturally follows that the same thing is true in large degree of the measures employed for protection. This is, perhaps, especially the case with paint pigments and vehicles, where careful experiments have brought to light many fundamental truths of the greatest value regarding the nature and action of some of these materials, thus enabling us to use them with much greater intelligence and effectiveness. Much of the published work, however, is scattered throughout many different scientific and technical magazines, consequently is largely inaccessible to one who does not have the time or facilities for such investigation.

It is accordingly hoped that this book, by presenting some of this material in condensed form, may help to give the student or busy engineer a better understanding of the problems involved in the successful preservation of one of our most useful building materials, and point the way to their solution.

Brooklyn, New York.

July 31, 1915.

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## THE CORROSION OF IRON

### CHAPTER I

#### THE RUST PROBLEM

*used in construction*  
**A**MONG the many questions which the architect and builder are called upon to consider, none perhaps, is more important than that relating to the corrosion of iron and steel. This tendency to decay is peculiar to these materials, since none of the ordinary metals exhibits it to any comparable degree, and it is so strong that an unprotected piece is soon reduced to a shapeless mass of rust. It is one thing to design and erect a mighty sky-scraper, but an entirely different matter to protect it from those influences which, if allowed to do their work, would ruin the greatest structure in a short time.

It seems strange, in a way, that unless iron is well protected it is far less resistant to natural agencies than wood or other building materials. It is being used more and more in the fabrication of large buildings and other



structures of a permanent type, and the length of their life, to say nothing of the safety of the people employed in and around them, depends on the success with which corrosion can be prevented.

Painters are constantly employed on such structures as the Brooklyn or Forth bridges, scraping away rust spots and repainting. When serious rusting is once started it is very hard to check, and as it would inevitably lead to the destruction of the framework, a collapse would be certain to occur sooner or later, probably with an appalling loss of life.

The economic side of the question is also of serious import. It is being recognized more and more that the increasing use of materials is depleting our stock of natural resources, and it is evident that when these are irrevocably lost through some form of decay, we have sustained a real and serious loss. The production of pig iron in the United States alone has increased amazingly until now many millions of tons are produced annually. How much of this is wasted for lack of suitable protection, or otherwise, cannot be stated very accurately, but the total is considerable. How long our ore supply will hold out against the steadily increasing de-

mand can only be vaguely guessed, but if present conditions keep up there is certain to come a time when the scarcity and high price of iron will not permit it to be used so prodigally as now. Again, the coal supply is by no means unlimited, and since it requires about four tons of coal, or its equivalent, to produce one ton of steel, it is apparent that when we allow iron to rust or otherwise go to waste we are losing not only iron, but coal, one of our most valuable assets.

I do not mean to imply that the corrosion of iron is a new problem, or that technologists generally do not realize its importance, since the articles and discussions which have been appearing in the technical press for the last few years are evidence of the work that is being done along these lines. This literature, however, is distributed through a large number of publications and is, therefore, not readily accessible to the busy engineer, so in this small volume an attempt will be made to collect some of this information regarding the study of corrosion and its practical application in the protection of iron and steel, and to present it, together with the results of personal observations and tests, in a simple, compact form.

Before taking up any of the theories as to the nature and cause of corrosion, it may be interesting to note a few points about the process in general. It is a matter of common knowledge that iron soon becomes covered with a heavy coating of rust, if it is exposed to moisture without first being protected by paint or other good preservative, and that in time the piece will be entirely honeycombed and will assume a lace-like appearance. It is also known that different pieces of iron and steel exhibit widely varying tendencies in this respect; that is, some are surprisingly resistant and keep in fairly good shape for a long time even under very adverse conditions, while others soon show the most serious rusting when exposed to the same conditions. The manufacturers of wrought and charcoal irons and the various kinds of steel have each contended strenuously that his particular product is most resistant to corrosion, but it is not the province of this chapter to state who is in the right, since it appears that each of these types of metal may vary greatly in rust resistance and that there are good and bad irons as well as good and bad steels.

There is plenty of good evidence to support this view, and it seems worse than useless,