# A TREATISE ON THE RESISTANCE OF MATERIALS: AND AN APPENDIX ON THE PRESERVATION OF TIMBER, PP. 1-243

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DE VOLSON WOOD

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Trieste

# A TREATISE

ON THE

# RESISTANCE OF MATERIALS,

And an Appendix

ON THE

## PRESERVATION OF TIMBER.

BY

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# PREFACE.

THIS book contains the substance of my lectures to the Senior Class in Civil Engineering, in the University, during the past few years, on the *Resistance of Materials*. The chief aim has been to present the theories as they exist at the present time. The subject is necessarily an experimental one, and any theory which has not the results of experiments for its foundation is valueless. I have therefore presented the results of a few experiments under each head, as they have been obtained in various parts of the world, that the student may judge for himself whether the theory is well founded or not. It is hoped that this part of the work will be valuable to the practical man.

The descriptive parts are given more fully here than they were in the lectures, because they can be consulted more profitably on the printed page than they could in the manuscript, and will be examined more by the general reader than the mathematical part. But, on the other hand, the mathematical part is much more condensed here than it was in the class-room. This was done so as to keep the work in as small a space as possible; and also because a student is supposed to have time for deliberate study, and can take time to overcome his difficulties and secure his results. It is intended, however, in the next edition, to publish an appendix, in order to explain the more difficult mathematical operations of the text.

I have taken special pains to make frequent references to other books and reports from which I have secured information. This will enable any one to verify more fully the positions which have been taken, and will be convenient for those who desire to secure a more thorough knowledge of any particular topic.

I do not deem it necessary to indicate those topics which are wholly original. To the reader who has never before given the subject any attention, all will be new; and the well-informed reader will readily detect what is original.

A large amount of labor and study has been given to this subject in nearly all civilized countries, and yet the theories in regard to resistance from transverse stress are not very satisfactory. In regard to the strength of rectangular beams, the "Common Theory," as I have called it, is sufficiently correct for ordinary practical purposes, especially if the *modulus of rupture*, as determined by direct experiment upon rectangular beams of the same material, be used. Barlow's "Theory of Flexure" appears to be more nearly correct in theory when applied to rectangular beams and beams of the **I** section, or other forms which are symmetrical in reference to the neutral axis. But when the sections are irregular none of the theories can be relied upon for securing correct results. Whatever theory may yet do for us, it is quite evident that no theory will ever be devised, of practical value, which will be applicable to the infinite variety of forms of beams which are or may be used in the mechanic arts. That I may not be misunderstood upon this point, I will be more specific. We know that our present theories do not always give correct results, and that the more irregular the form the greater the discrepancy between the actual and computed strengths of a beam. Now, if a theory is ever devised which will take into account all the conditions of strains in a beam, I think it will be too complicated to be of practical value to the mechanic. I do not desire by this remark to disparage theory. Theories are valuable. Without them we would make little or no progress. Fortunately for the engineer, it is not the mathematically exact result that he desires, but the *reliable* result. He does not so much desire to know that one pound more of load will break his structure, as he does that he may depend upon it to carry from four to six times the load which he intends to put upon it. The theories, as now developed, are safe guides to the mechanic and engineer; still we learn to depend more and more upon direct experiment. The theory also in regard to the deflection of beams under a transverse strain, has recently received a modification, due to a consideration of the effect of transverse shearing; but the modification is sustained both from mathematical and experimental considerations. May not more careful experiments yet teach us that it must be still further modified on account of the longitudinal shearing strain?

The author will be pleased to receive the results of experiments which have been made in this country, so that if this work is revised in the future, it may be made more profitable to the engineering profession.

ANN ARBOR, MICH., *Sept.*, 1871.

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