

**STRESSES IN WIRE-
WRAPPED GUNS AND
IN GUN CARRIAGES**

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Stresses in wire-wrapped guns and in gun carriages by Colden L.H. Ruggles

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COLDEN L'H. RUGGLES

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ENGINEERING BUREAU
GANNON SECTION

STRESSES
IN WIRE-WRAPPED GUNS
AND IN GUN CARRIAGES

BY

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PREFACE TO SECOND EDITION.

This text was originally prepared for the use of the cadets of the United States Military Academy and was printed by the Military Academy Press. On this account it has not hitherto been available to the public. The copies of the original edition being exhausted, a new edition is necessary and to make it available to the public it is now being published by John Wiley & Sons, Inc.

The author desires to acknowledge his indebtedness to Lieut. Col. Wm. H. Tschappat, Ordnance Department, U. S. Army, Professor of Ordnance and Science of Gunnery, U. S. Military Academy for correction of numerical errors in the original text, and for arranging for the present publication; to Capt. R. H. Somers, Ord. Dept., for correction of numerical errors and proof reading; and to Lieut. J. G. Booton C.A.C., and T. J. Hayes, 4th Infantry, for proof reading.

COLDEN L'H. RUGGLES.

MAY 16, 1916.

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PREFACE.

In this text the author has endeavored to explain and illustrate a number of the important engineering principles underlying the design of wire-wrapped guns and of gun carriages, and in its preparation he has made free use of the methods of officers of the Ordnance Department, U. S. Army, who have been engaged on such work and of the various publications on the subject written by them or translated by them from foreign sources.

The deductions of the formulas relating to wire-wrapped guns and their application to a 12-inch gun on which the wire is wrapped under constant tension have been taken from *Notes on the Construction of Ordnance Nos. 38 and 87* written by General William Crozier, Chief of Ordnance, U. S. Army, when a junior officer of the Ordnance Department, the formulas giving the tensions in the wire envelope and the pressures produced by it being, as stated by General Crozier, mainly those of Longridge, an English engineer. Some shortening of the mathematical work involved in the deductions of the formulas has been effected by the author of this text by starting with the assumption that the modulus of elasticity is the same for the steel wire as for the steel tube of the gun, and the formulas have been slightly extended to include the radial stresses in the wire envelope.

In the preparation of Chapter II much assistance was derived from the ordnance pamphlet entitled *A Discussion of the Methods Proposed to Increase the Rapidity of Fire of Field Guns* by Captain (now Lieutenant Colonel) Charles B. Wheeler and Captain (now Major) William H. Tschappat, Ordnance Department; and from the original calculations made in the Office of the Chief of Ordnance in connection with the design of the 3-inch field carriage, model of 1902, and the 5-inch barbette carriage, model of 1903.

Much assistance was likewise derived in the preparation of

Chapter III from the original calculations made in the Office of the Chief of Ordnance in connection with the design of the 6-inch disappearing carriage, model of 1905 M1. The computations relating to the throttling grooves of this carriage given in the text (which are the same in principle as those made for the throttling grooves of a number of earlier models of disappearing carriages) are practically identical with those made for this carriage in the Office of the Chief of Ordnance by Captain James B. Dillard, Ordnance Department, acting under the direction of Major John H. Rice, Ordnance Department, the present chief of the gun-carriage division of that office.

The sources of the formulas used in Chapter IV are given in the text.

In the preparation of Chapter V the author has freely consulted various standard works on applied mechanics and mechanical engineering, the greatest assistance having been derived from the works of the International Library of Technology.

The methods outlined in Chapter VI are largely based upon the practice of the Ordnance Department.

The thanks of the author are due to Major Tracy C. Dickson, Ordnance Department, for advice and information in connection with the preparation of the text; and to Captain Otho V. Kean, Ordnance Department, 1st Lieutenant Ned B. Rehkopf, 2nd Field Artillery, and 1st Lieutenant George R. Allin, 6th Field Artillery, instructors in the Department of Ordnance and Science of Gunnery, U. S. Military Academy, for suggestions tending to add to the clearness of the text, for checking and correcting where necessary the results of the computations, and for reading the proofs.

The author wishes to thank also Sergeant Carl A. Schopper, Detachment of Ordnance, U. S. Military Academy, for the skill and care with which he has prepared the many drawings for the figures appearing in the text.

COLDEN L'H. RUGGLES.

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