# SYMPOSIUM ON ULTRASONIC TESTING

Presented at the FIFTY-SECOND ANNUAL MEETING AMERICAN SOCIETY FOR TESTING MATERIALS Atlantic City, N. J., June 28, 1949



Special Technical Publication No. 101

Published by the AMERICAN SOCIETY FOR TESTING MATERIALS 1916 Race St., Philadelphia 3, Pa.

## SYMPOSIUM ON ULTRASONIC TESTING

Presented at the FIFTY-SECOND ANNUAL MEETING AMERICAN SOCIETY FOR TESTING MATERIALS Atlantic City, N. J., June 28, 1949



Special Technical Publication No. 101

Published by the AMERICAN SOCIETY FOR TESTING MATERIALS 1916 Race St., Philadelphia 3, Pa.

## SYMPOSIUM ON ULTRASONIC TESTING

Presented at the FIFTY-SECOND ANNUAL MEETING AMERICAN SOCIETY FOR TESTING MATERIALS

Atlantic City, N. J., June 28, 1949



Reg. U.S. Pat. Off.

Special Technical Publication No. 101

Published by the AMERICAN SOCIETY FOR TESTING MATERIALS 1916 Race St., Philadelphia 3, Pa. Copyright, 1951 by the American Society for Testing Materials

\_\_\_\_\_

Printed in Baltimore, Md. January, 1951

#### FOREWORD

The ten papers and discussions included in this volume represent a summary of the history, theoretical aspects, basic principles of practical testing, and practical applications for the ultrasonic testing of materials as presented to the Society from June, 1948 till June, 1950.

Six of the papers and discussions were presented at a session on Ultrasonic Testing at the Fifty-second Annual Meeting of the Society, held in Atlantic City, N. J., June 27–July 1, 1949. This Session under the Chairmanship of H. C. Amtsberg was sponsored by Committee E-7 on Non-Destructive Testing. The papers by Louis Gold on "Ultrasonic Wave Propagation in Materials: A Guide to Theoretical Aspects" and by C. H. Hastings and S. W. Carter entitled "Inspection, Processing, and Manufacturing Control of Metals by Ultrasonic Methods" were presented at the Round Table Discussion on Ultrasonic Testing sponsored by Committee E-7 at the Fifty-first Annual Meeting of the Society, held in Detroit, Mich., June 21–25, 1948.

To complete the publication and bring it up to date the papers by J. R. Leslie on "Pulse Techniques Applied to Dynamic Testing" and A. G. H. Dietz, *et al.*, entitled "The Measurement of Dynamic Modulus in Adhesive Joints at Ultrasonic Frequencies" have been included. These papers were presented at the Fifty-third Annual Meeting of the Society held in Atlantic City, N. J., June 26–30, 1950.

NOTE.—The Society is not responsible, as a body, for the statements and opinions advanced in this publication.

### CONTENTS

\_\_\_\_

1	PAGE
Introduction—H. C. Amtsberg	1
Ultrasonic Wave Propagation in Materials: A Guide to Theoretical Results-Louis	j
Gold	3
Inspection, Processing, and Manufacturing Control of Metals by Ultrasonic Methods	J
-Carlton H. Hastings and Seymour W. Carter	14
Basic Principles of Practical Ultrasonic Testing-John C. Smack	62
Ultrasonics in the Heavy Forging Industry-James C. Hartley	72
The Application of Ultrasonics to the Fabrication of Aluminum-J. V. Carroll	84
Ultrasonic Testing in Railroad Work-E. D. Hall	87
Ultrasonics in the Electrical Industry-D. M. Kelman	- 90
Ultrasonic Testing of Bronze Forgings and Ingots-A. Piltch	102
Pulse Techniques Applied to Dynamic Testing-J. R. Leslie	104
Discussion.	
The Measurement of Dynamic Modulus in Adhesive Joints at Ultrasonic Frequencies	j.
-A. G. H. Dietz, P. J. Closmann, G. M. Kavanagh, and J. N. Rossen	117
Discussion	
General Discussion.	131