

BIBLIOGRAPHY ON THE FATIGUE OF MATERIALS, COMPONENTS AND STRUCTURES

1838 — 1950

compiled by

J. Y. MANN

M.E., B.Sc., M.I.E.Aust., A.F.R.Ae.S., F.I.M.

*Senior Research Scientist, Structures Division
Aeronautical Research Laboratories, Melbourne*

published for and on behalf of

THE ROYAL AERONAUTICAL SOCIETY

(Fatigue Committee)

by

PERGAMON PRESS

Oxford • New York • Toronto

Sydney • Braunschweig

Pergamon Press Ltd., Headington Hill Hall, Oxford
Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, New York 10523
Pergamon of Canada Ltd., 207 Queen's Quay West, Toronto 1
Pergamon Press (Aust.) Pty. Ltd., 19a Boundary Street,
Rushcutters Bay, N.S.W. 2011, Australia
Vieweg & Sohn GmbH, Burgplatz 1, Braunschweig

Copyright © 1970 Royal Aeronautical Society

All Rights Reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of Pergamon Press Ltd.

First edition 1970

Library of Congress Catalog Card No. 71-102401

Printed in Hungary

08 006754 9

**BIBLIOGRAPHY ON THE FATIGUE OF
MATERIALS, COMPONENTS AND STRUCTURES**

TO MY WIFE AND FAMILY

whose patience has enabled me to complete this volume

Preface

INVESTIGATIONS relating to the failure of materials and structures under repeated or cyclic loads have been in progress for over one hundred and twenty-five years. During this period much experimental data have been accumulated on the behaviour and performance of materials, mechanical components and structural elements under fatigue loading conditions. However, experience has suggested that, because of the diverse nature of the problem and the range of publication sources, much of the published information will remain generally unnoticed until a reasonably complete and readily accessible bibliography on the subject is available.

In July 1945 a bibliography on *The Fatigue of Materials* was published by the Division of Aeronautics, Council for Scientific and Industrial Research, Australia. This was compiled for the assistance of authors preparing papers for a Symposium on the Failure of Metals by Fatigue which was held at the University of Melbourne in December 1946. It has become increasingly evident that this bibliography, which at the time appeared to be fairly comprehensive, listed only a small portion of the vast amount of information which had been published on fatigue during the preceding one hundred years.

Consequently, in 1952, Mr. H. A. Wills, then Superintendent of the Structures Division at the Aeronautical Research Laboratories, suggested that I prepare a comprehensive bibliography on the fatigue of materials, components and structures for the assistance of students, engineers, metallurgists and research workers. A limited number of copies of the first volume of this bibliography^(a) was issued by the Aeronautical Research Laboratories in 1954, at which stage the Royal Aeronautical Society expressed interest in sponsoring a revised version with a wider circulation. The present volume is based on that published by the A.R.L., amended and enlarged and extended to the year 1950.

In compiling this bibliography, extensive use has been made of abstracting journals and lists of references which have appeared in the numerous papers and several books dealing with the subject. Although it is believed that this volume includes references to most of the published information on fatigue up to the year 1950, there are doubtless a number of omissions and inconsistencies. I would be indebted to any person who can provide other references, information or corrections to those appearing in this volume.

The task of checking the bibliographical data has involved a considerable amount of effort, particularly as the majority of the references included in this work were not available in Australia. Many individual persons, universities, institutes, societies, associations and other organisations in a number of countries have provided assistance in locating and checking these references. Although it is not possible to personally thank all those who have assisted in this way, I would like to record my deep appreciation to the following:

The Librarian and Library staff of the Aeronautical Research Laboratories, Melbourne, in particular Miss Aileen Moore and Miss Annette O'Donovan;

Mr. W. J. Crozier of the Department of Supply, Australia House, London;

Professor Takeo Yokobori, Department of Mechanical Engineering, Tohoku University, Japan;

Mr. A. G. Vannucci, Technical Information Officer, A.G.A.R.D., Paris;

The late Dr. R. Cazaud, I.R.S.I.D., Paris;

The Librarian, the Joint Library of the Iron and Steel Institute and Institute of Metals, London;

The Library of the Verein Deutscher Ingenieure, Düsseldorf, W. Germany;

^(a) J. Y. Mann, *Bibliography on the Fatigue of Materials, Components and Structures, vol. 1, 1843-1938*. Aeronautical Research Laboratories, Australia, August 1954.

The Librarian, the Patent Office Library, London;
The Head, Reference Section, Science and Technology Division, Library of Congress, Washington;
The Librarian, Zentralstelle der Luftfahrt-dokumentation und -Information, München, W. Germany;
The Librarian, Science Museum Library, London;
Superintendent and Librarian, Soprintendenza Bibliografica per il Piemonte, Torino, Italy;
The Librarian, National Lending Library for Science and Technology, Boston Spa, England;
The Editors and Publishers of various journals who have provided information and copies of their publications;

My colleagues at the Aeronautical Research Laboratories: Mr. J. Solvey for his assistance in the translation of information from the German and Russian languages, and Messrs. J. M. Finney and R. Simpson for their patience and thoroughness in checking the manuscript and proofs of this work.

This book is published with the permission of the Chief Scientist, Australian Defence Scientific Service, Department of Supply, Melbourne, Australia.

JOHN Y. MANN

Aeronautical Research Laboratories,
Melbourne

Notes on format and notation adopted

THE references in this bibliography are listed chronologically according to their year of publication and alphabetically in each year according to the name of the first author. Papers without specific authors are listed at the conclusion of the alphabetical section of each year. No attempt was made to segregate the references according to subject matter as it was thought that titles alone could be misleading, and in any case this would result in a much more bulky volume with many references duplicated or even triplicated. In order to provide easy access to particular subject matter the bibliography includes a comprehensive Subject Index (based, however, in many cases on the title of the paper alone), together with an Author Index.

Extensive use has been made of abbreviations for the titles of journals and other publications. Those adopted have been based on the forms suggested in the *World List of Scientific Periodicals*, Third Edition,^(a) but reference has also been made to the Fourth Edition of this publication^(b). The order adopted for the bibliographical data in the various references is that suggested in British Standard 1629: 1950—*Bibliographical References*.

Where possible, the titles of the various papers are given in the language of publication, followed by a translation into English. However, in some instances, and particularly in the case of Russian and some Japanese references where the original characters require transliteration, the title is given in English only followed by a letter to indicate the language of publication. Examples are: Russian [R]; Japanese [J]; Chinese [C]; Polish [P].

In the case of the proceedings or transactions of conferences, symposia, etc., the year of entry mostly corresponds to the date of publication of the proceedings, when given, and not to the year in which the relevant conference was held. The number of pages quoted, in the case of books, reports, etc., refers to the numbered pages and does not include unnumbered pages occupied by diagrams or other illustrations. Columns, where numbered, have been regarded as pages.

^(a) W. A. Smith, F. L. Kent and G. B. Stratton [Editors], *World List of Scientific Periodicals Published in the Years 1900–1950*, Third Edition. London, Butterworths Scientific Publications, 1952.

^(b) P. Brown and G. B. Stratton [Editors], *World List of Scientific Periodicals Published in the Years 1900–1960*. Fourth Edition. London, Butterworths, 1963–1965.

1838

1. ALBERT, W. A. J. Über Treibseile am Harz. [Driving ropes in the Harz.] *Archiv für Mineralogie, Geognosie, Bergbau und Hüttenkunde*, vol. 10, 1838, pp. 215-234.

1842

2. HOOD, C. On some peculiar changes in the internal structure of iron, independent of, and subsequent to, the several processes of its manufacture. *Phil. Mag.*, ser. 3, vol. 21, no. 136, Aug. 1842, pp. 130-137.

1843

3. HODGKINSON, E. Experiments to prove that all bodies are to some degree inelastic and a proposed law for estimating the deficiency. *Rep. Brit. Ass.*, pt. 2, 1843, pp. 23-25.

4. RANKINE, W. J. M. On the causes of the unexpected breakage of the journals of railway axles; and on the means of preventing such accidents by observing the law of continuity in their construction. *Min. Proc. Instn civ. Engrs*, vol. 2, session 1843, 1842-1843, pp. 105-108.

5. YORK, J. O. Account of a series of experiments on the comparative strength of solid and hollow axles. *Min. Proc. Instn civ. Engrs*, vol. 2, session 1843, 1842-1843, pp. 89-94.

1844

6. GLYNN, J. On the causes of fracture of the axles of railway carriages. *Min. Proc. Instn civ. Engrs*, vol. 3, session 1844, 1844, pp. 202-203.

1848

7. STOPFL, P. Achsenbrüche an Lokomotiven, Tender und Wagen, ihre Erklärung und Beseitigung. [Axle failures in locomotives, tenders and wagons—their causes and methods of avoiding.] *Org. Eisenbahnw.*, vol. 3, no. 2, 1848, pp. 55-67.

1849

8. THE LORD WROTTESELEY; WILLIS, R.; JAMES H.; RENNIE, G.; CUBITT, W. and HODGKINSON, E. *Report of the Commissioners appointed to inquire into the application of iron to railway structures*. London, Her Majesty's Stationery Office, Command Paper 1123, 1849, pp. 435.

9. MCCONNELL, J. E. On railway axles. *Proc. Instn mech. Engrs, Lond.*, 1847-1849, Oct. 1849, pp. 13-27.

1850

10. MCCONNELL, J. E. On the deterioration of railway axles. *Proc. Instn mech. Engrs, Lond.*, 1850-1851, Jan. 1850, pp. 5-19 and April 1850, pp. 3-14.

11. THORNEYCROFT, G. B. On the manufacture of malleable iron; with the results of experiments on the strength of railway axles. *Min. Proc. Instn civ. Engrs*, vol. 9, session 1849-1850, 1850, pp. 294-302.

12. THORNEYCROFT, T. On the form of shafts and axles. *Proc. Instn mech. Engrs, Lond.*, 1850-1851, July 1850, pp. 35-41 and Oct. 1850, pp. 4-15.

1853

13. BRAITHWAITE, F. On the fatigue and consequent fracture of metals. *Min. Proc. Instn. civ. Engrs*, vol. 13, 1853-1854, pp. 463-475.

14. MORIN, A. *Leçons de mécanique pratique—résistance des matériaux*. [Studies in practical mechanics—strength of materials.] Paris, Librairie de L. Hachette et Cie, 1853, pp. 456. [See pages 348-354 for notes on the observations of M. Marcoux and M. C. Arnoux.]

1858

15. WÖHLER, A. Bericht über die Versuche, welche auf der Königl. Niederschleesisch-Märkischen Eisenbahn mit Apparaten zum Messen der Biegung und Verdrehung von Eisenbahnwagen-Achsen während der Fahrt, angestellt wurden. [Report on tests of the Königl. Niederschleesisch-Märkischen Eisenbahn made with apparatus for the measurement of the bending and torsion of railway axles in service.] *Z. Bauw.*, vol. 8, 1858, pp. 642-651.

1860

16. WÖHLER, A. Versuche zur Ermittlung der auf die Eisenbahnwagen-Achsen einwirkenden Kräfte und der Widerstandsfähigkeit der Wagen-Achsen. [Tests to determine the forces acting on railway wagon axles, and the capacity of resistance of the axles.] *Z. Bauw.*, vol. 10, 1860, pp. 583-616.

1861

17. FAIRBAIRN, W. On the effects of vibratory action and long continued changes of load upon wrought iron bridges and girders. *Civil Engineer and Architects Journal*, vol. 24, Nov. 1, 1861, pp. 327-329.

1863

18. WÖHLER, A. Über die Versuche zur Ermittlung der Festigkeit von Achsen, welche in

den Werkstätten der Niederschlesisch-Märkischen Eisenbahn zu Frankfurt a.d.O. angestellt sind. [On tests for determining the strength of axles made in the workshops of the Niederschlesisch-Märkischen Eisenbahn at Frankfurt a.d.O.] *Z. Bauw.*, vol. 13, 1863, pp. 233-258.

1864

19. FAIRBAIRN, W. Experiments to determine the effect of impact, vibratory action and long-continued changes of load on wrought iron girders. *Phil. Trans.*, vol. 154, 1864, pp. 311-326.

20. FAIRBAIRN, W. The strength of iron structures. *Engineer, Lond.*, vol. 18, Nov. 11, 1864, pp. 293-294.

1866

21. WÖHLER, A. Resultate der in der Central-Werkstatt der Niederschlesisch-Märkischen Eisenbahn zu Frankfurt a.d.O. angestellten Versuche über die relative Festigkeit von Eisen, Stahl und Kupfer. [Results of tests made in the central workshop of the Niederschlesisch-Märkischen Eisenbahn at Frankfurt a.d.O., on the relative strength of iron, steel and copper.] *Z. Bauw.*, vol. 16, 1866, pp. 67-83.

1867

22. Wöhler's experiments on the strength of metals. *Engineering, Lond.*, vol. 4, Aug. 23, 1867, pp. 160-161.

23. Experiments on the "Fatigue" of Bessemer steel. *Engineering, Lond.*, vol. 4, Nov. 29, 1867, pp. 497-498.

1870

24. PONCELET, J. V. *Introduction à la mécanique industrielle, physique ou expérimentale*. [Intro-

duction to industrial, physical or experimental mechanics.] Troisième édition. Paris, Imprimerie de Gauthier-Villars, 1870, pp. 757. [See particularly pp. 317-318.] [Deuxième édition, 1839.]

25. WÖHLER, A. Über die Festigkeits-Versuche mit Eisen und Stahl. [On strength tests of iron and steel.] *Z. Bauw.*, vol. 20, 1870, pp. 74-106.

26. WÖHLER, A. Über die Festigkeitsversuchen mit Eisen und Stahl. Auf Anordnung des Ministers für Handel, Gewerbe u. öffentl. Arbeiten, Grafen Itzenblitz, angestellt. [On strength tests with iron and steel. Carried out on the instruction of the Minister for Trade, Industry and Public Works, Count Itzenblitz.] Berlin, Ernst und Korn, 1870, pp. 17.

1871

27. Wöhler's experiments on the "Fatigue" of metals. *Engineering, Lond.*, vol. 11, March 24, 1871, pp. 199-200; March 31, 1871, p. 221; April 7, 1871, pp. 243-244; April 14, 1871, p. 261; April 28, 1871, pp. 299-300; May 5, 1871, pp. 326-327; May 19, 1871, pp. 349-350; June 9, 1871, p. 397; and June 23, 1871, pp. 439-441.

1873

28. LAUNHARDT, W. Die Inanspruchnahme des Eisens. [The stressing of iron.] *Zeitschrift des Architekten- und Ingenieur-Vereins zu Hannover*, vol. 19, no. 1, 1873, cols. 139-144.

29. MÜLLER, G. Zulässige Inanspruchnahme des Schmiedeeisens bei Brückenconstructionen. [Allowable strains in wrought iron bridge structures.] *Zeitschrift des Österreichischen Ingenieur- und Architekten Vereins, Wien*, vol. 25, 1873, pp. 197-202.

1874

30. GERBER, H. Bestimmung der zulässigen Spannungen in Eisen-Constructionen. [Cal-

culation of the allowable stresses in iron structures.] *Zeitschrift des Bayerischen Architekten und Ingenieur-Vereins*, vol. 6, no. 6, 1874, pp. 101-110.

31. SCHÄFFER, Bestimmung der zulässigen Spannung für Eisenconstructionen. [Determination of the allowable stress in iron structures.] *Z. Bauw.*, vol. 24, 1874, pp. 398-408.

32. SPANGENBERG, L. Über das Verhalten der Metalle bei wiederholten Anstrengungen. [On the behaviour of metals under repeated strains.] *Z. Bauw.*, vol. 24, 1874, pp. 473-495 and vol. 25, 1875, pp. 78-98.

1875

33. SPANGENBERG, L. Über das Verhalten der Metalle bei wiederholten Anstrengungen. (Fortsetzung der Wöhler'schen Festigkeitsversuche). [On the behaviour of metals under repeated stress—continuation of the Wöhler strength experiments.] Berlin, Ernst und Korn, 1875, pp. 32.

1876

34. WEYRAUCH, J. J. Festigkeit und Dimensionenberechnung der Eisen- und Stahlconstructionen mit Rücksicht auf die neueren Versuche. Ein elementaren Anhang zu allen Lehrbüchern über Eisen- und Stahlconstructionen. [Strength and dimension calculations of iron and steel structures taking into consideration new tests—an elementary appendix to all text books on iron and steel structures.] Leipzig, B. G. Teubner, 1876, pp. 116.

1877

35. METCALF, W. On the resistance of steel to vibration. *The Metallurgical Review*, vol. 1, no. 4, Dec. 1877, pp. 399-404.

36. WEYRAUCH, J. J. (Translation into English by A. J. Du Bois) *Strength and determination*

of the dimensions of structures of iron and steel with reference to the latest investigations. New York, John Wiley and Sons, 1877, pp. 206.

working strength of materials. *Min. Proc. Instn. civ. Engrs*, vol. 63, 1880-1881, pp. 275-296.

1879

37. EGGLESTON, T. The law of fatigue and refreshment of metals. *Trans. Amer. Inst. min. Engrs*, vol. 8, 1879-1880, pp. 398-404.

38. KENT, W. On an apparatus for testing the resistance of metals to repeated shocks. *Trans. Amer. Inst. min. Engrs*, vol. 8, 1879-1880, pp. 76-80.

39. LIPPOLD, H. Die Inanspruchnahme von Eisen und Stahl mit Rücksicht auf bewegte Last. — Im Anschluss an die Wöhler'schen Versuche, und im Vergleich mit den Resultaten der Methoden von Gerber, Launhardt, Weyrauch und Winkler. [The stressing of iron and steel with consideration of moving loads — Wöhler's tests compared with those of Gerber, Launhardt, Weyrauch and Winkler.] *Org. Eisenbahnw.*, vol. 16, no. 1, 1879, pp. 22-34.

40. SPANGENBERG, L. Über Festigkeits-Versuche mit Eisen und Stahl. [On strength tests with iron and steel.] *Glaser's Ann. Gew.*, vol. 5, July 1, 1879, pp. 6-15. English abstr.: *Min. Proc. Instn. civ. Engrs*, vol. 60, 1879-1880, pp. 415-416.

1880

41. BAUSCHINGER, J. Über das Kristallinischwerden und die Festigkeitsverminderung des Eisens durch den Gebrauch. [The crystallization and the reduction of strength of iron in service.] *Dinglers J.*, vol. 235, no. 3, 1880, pp. 169-173.

42. WEYRAUCH, J. J. On the calculation of dimensions as depending on the ultimate

1881

43. MOHR, O. C. Über die Verwerthung der Wöhler'schen Versuche für die Dimensionierung der Eisenconstructions, insbesondere der eisernen Brücken. [On the use of Wöhler's tests for the design of iron structures, particularly of iron bridges.] *Der Civil Ingenieur, Leipzig*, vol. 27, 1881, pp. 1-12.

1882

44. BAKER, B. Steel for tires and axles. *Min. Proc. Instn. civ. Engrs*, vol. 67, 1882, pp. 353-357.

1884

45. KENNEDY, A. B. W. Frequent repetitions of load. *Professional Papers of the Corps of Royal Engineers, Chatam; Royal Engineers Institute Occasional Papers*, vol. 10, 1884, pp. 187-212.

1885

46. CONSIDÈRE, M. L'Emploi du Fer et de l'Acier dans les Constructions. [The application of iron and steel in structures.] *Ann. Ponts Chauss.*, ser. 6, vol. 9, 1885, pp. 574-775. [See particularly pp. 684-714.]

47. HILL, W. Crystallization of wrought iron. *Trans. Amer. Soc. mech. Engrs*, vol. 7, 1885-1886, pp. 241-272.

1886

48. BAUSCHINGER, J. Über die Veränderung der Elasticitätsgrenze und der Festigkeit des Eisens und Stahls durch Strecken und Quetschen, durch Erwärmen und Abkühlen und durch oftmal wiederholte Beanspruchung.

[On the change of the elastic limit and strength of iron and steel by tension and compression, by heating and cooling and by often repeated loading.] *Mitt. mech.-tech. Lab. Münch.*, vol. 13, no. 8, 1886, pp. 1-115. English abstr.: *Min. Proc. Instn. civ. Engrs.*, vol. 87, 1886-1887, pp. 463-465.

49. UNWIN, W. C. A new view of the nature of the resistance of materials to repeated loads. *Engineer, Lond.*, vol. 62, Dec. 10, 1886, p. 457.

1887

50. BAKER, B. Some notes on the working stress of iron and steel. *Trans. Amer. Soc. mech. Engrs.*, vol. 8, 1887, pp. 157-181.

51. BARLOW, W. H.; BRAMWELL, F. J.; THOMSON, J.; GALTON, J.; BAKER, B.; UNWIN, W. C.; KENNEDY, A. B. W.; BARLOW, C.; HELESHAW, H. S.; ROBERTS-AUSTEN, W. C. and ATCHISON, A. T. Report on the endurance of metals under repeated and varying stresses, and the proper working stresses on railway bridges and other structures subject to varying loads. *Rep. Brit. Ass.*, 1887, pp. 424-438.

52. MARTENS, A. Über das Kleingefüge des schmiedbaren Eisens, besonders des Stahles. [On the microstructure of wrought irons, and in particular steels.] *Stahl u. Eisen*, vol. 7, no. 4, April 1887, pp. 235-242.

53. UNWIN, W. C. A new view of the resistance of materials. *Engineer, Lond.*, vol. 63, Jan. 7, 1887, pp. 2-3.

1889

54. EWING, J. A. On hysteresis in the relation of strain to stress. *Rep. Brit. Ass.*, 1889, pp. 502-504.

55. WEYRAUCH, J. J. *Die Festigkeitseigenschaften und die Methoden der Dimensionenberechnung von Eisen- und Stahlkonstruktionen. Ein Anhang zu allen über die statische Berechnung der Eisen- u. Stahlkonstruktionen. [Strength properties and methods of calculating the dimensions of iron and steel structures. Appendix to all books on static calculations of iron and steel structures.]* Leipzig, Verlag B. G. Teubner, 1889, pp. 223.

1890

56. PEARSON, K. On Wöhler's experiments on alternating stress. *Messeng. Math.*, vol. 20, 1890, pp. 21-37.

1892

57. SONDERICKER, J. A description of some repeated stress experiments. *Technol. Quart.*, vol. 5, 1892, pp. 70-80.

1893

58. RUDELOFF, M. Berichte über die im Auftrage des Herrn Ministers für Handel und Gewerbe ausgeführten vergleichenden Untersuchungen von Seilverbindungen für Fahrstuhlbetrieb. Theil II. Ergebnisse der Untersuchungen bei stossweiser Inanspruchnahme. [Report on comparative investigation of rope connections for elevator drives carried out on the instructions of the Minister for Commerce and Trade. No. 2. Results of investigation under impact loading.] *Mitt. tech. VersAnst. Berl.*, vol. 11, 1893, pp. 177-199.

1894

59. KREUZPOINTNER, P. Do iron and steel crystallize in service? *Iron Age*, vol. 54, July 5, 1894, pp. 9-12 and Sept. 27, 1894, pp. 516-517.

60. Does the vibration of stamp-stems change their molecular structure? *Trans. Amer. Inst. min. Engrs.*, vol. 24, 1894, pp. 809-846.

[Continuation of discussion to paper by T. A. RICKARD, *ibid.*, vol. 23, 1893, pp. 137-147. pp. 557, 560-561, 573-577 are relevant.]

1895

61. ANDREWS, T. The effect of strain on railway axles, and a minimum flexion resistance-point in axles. *Trans. Soc. Engrs, Lond.*, 1895, pp. 181-234.

62. KREUZPOINTNER, P. Kristallisieren Eisen und Stahl im Betriebe? [Does iron and steel crystallize in service?] *Stahl u. Eisen*, vol. 15, no. 10, May 15, 1895, pp. 474-483.

63. KREUZPOINTNER, P. Die Übermüdung der Metalle. [The overtiredness of metals.] *Stahl u. Eisen*, vol. 15, no. 18, Sept. 15, 1895, pp. 865-867.

64. MARTENS, A. Einfluss der Gewindeform auf die Festigkeit der Schraubenbolzen. [Influence of thread form on the strength of threaded bolts.] *Z. Ver. dtsh. Ing.*, vol. 39, no. 17, April 27, 1895, pp. 505-508.

65. The influence of vibration on steel. *Railr. Gaz.*, vol. 27, Oct. 4, 1895, p. 655.

1896

66. ANDREWS, T. Microscopic internal flaws in steel rails and propeller shafts. *Engineering, Lond.*, vol. 61, Jan. 17, 1896, pp. 91-92.

67. ANDREWS, T. Microscopic internal flaws inducing fracture in steel. *Engineering, Lond.*, vol. 62, July 10, 1896, pp. 35-37; July 17, 1896, pp. 68-69 and July 24, 1896, pp. 118-120.

68. HOPPE, O. Alberts Versuche und Erfindungen. Zugleich Beiträge zur Frage der Gefüge-

veränderung von Eisen durch wiederholte Stösse und zur Erfindung des Drahtseiles und der Förderung mit Ketten ohne Ende. [Alberts experiments and inventions. Simultaneously, contributions to the problem of structural changes of iron through repeated impact; on the invention of a wire rope; and on transmission through endless chains.] *Stahl u. Eisen*, vol. 16, no. 12, June 15, 1896, pp. 437-441 and no. 13, July 1, 1896, pp. 496-500.

1897

69. AISBITT, M. W. On certain defects found in propeller shafts. *Trans. Inst. Mar. Engrs*, vol. 9, paper no. 72, 1897-1898, pp. 82.

70. ANDREWS, T. Microscopic observations on the deterioration by fatigue in iron and steel. *Engineering, Lond.*, vol. 63, Feb. 26, 1897, pp. 265-266.

71. ANDREWS, T. Microscopic observations on the deterioration by fatigue in steel rails. *Engineering, Lond.*, vol. 63, April 16, 1897, pp. 499-502, 504; June 25, 1897, pp. 840-842; vol. 64, July 23, 1897, pp. 99-102; Aug. 27, 1897, pp. 249-251; Sept. 3, 1897, pp. 298-299; Oct. 15, 1897, pp. 455-456; Dec. 3, 1897, pp. 676-678; vol. 65, Jan. 7, 1898, pp. 7-10; Feb. 18, 1898, pp. 201-204; April 15, 1898, pp. 451-453 and May 20, 1898, pp. 617-619.

72. FÖPPL, A. Dauerversuche von Bauschinger, ausgeführt in den Jahren 1886-1893. [Endurance tests of Bauschinger between the years 1886 and 1893.] *Mitt. mech.-tech. Lab., Münch.*, no. 25, 1897, pp. 3-19.

1898

73. COKER, E. G. Note on the endurance of steel bars subjected to repetitions of torsional stress. *Min. Proc. Instn. civ. Engrs*, vol. 135, 1898-1899, pp. 294-299.

74. PORTER, H. F. J. Fatigue of metal in wrought iron and steel forgings. *J. Franklin Inst.*, vol. 145, no. 4, April 1898, pp. 241-261 and no. 5, May 1898, pp. 321-355.

75. WARREN, W. H. A testing machine for equal alternating stresses. *J. roy. Soc. N.S.W.*, vol. 32, 1898, pp. cxxix-cxxxi.

1899

76. BERGER, K. Beitrag zum Studium des elastischen Verhaltens von Gusseisen bei wiederholter Beanspruchung auf Zug und Druck. [Contribution to the study of the elastic properties of cast iron under repeated tensile and compressive stresses.] *Mitt. technol. GewMus. Wien*, vol. 9, 1899, pp. 13-26. English abstr.: *Min. Proc. Instn civ. Engrs*, vol. 136, 1898-1899, pp. 370-371.

77. SONDERICKER, J. Repeated stresses. *Technol. Quart.*, vol. 12, 1899, pp. 5-22.

78. SONDERICKER, J. Repeated stresses. *Mech. World*, vol. 26, no. 658, Aug. 11, 1899, pp. 67-68; no. 662, Sept. 8, 1899, pp. 115-116; no. 667, Oct. 13, 1899, pp. 174-175 and no. 668, Oct. 20, 1899, p. 185.

1900

79. GILCHRIST, J. On Wöhler's laws. *Engineer, Lond.*, vol. 90, Aug. 31, 1900, pp. 203-204.

80. SCHANZER, R. On mysterious fractures of steel shafts. *Engineering, Lond.*, vol. 69, April 27, 1900, pp. 563-567. *Metallographist*, vol. 3, no. 4, Oct. 1900, pp. 320-329.

1901

81. HOWARD, J. E. On the effects of repeated strains in structures as exemplified in the Brooklyn Bridge fractures. *Iron Age*, vol. 68, Aug. 8, 1901, p. 38.

82. MARTENS, A. Dauerversuche mit nahtlosen Stahlflaschen zur Aufbewahrung von Kohlensäure. [Endurance tests with seamless steel cylinders for carbon dioxide.] *Mitt. tech. VersAnst. Berl.*, vol. 19, 1901, pp. 217-258.

1902

83. ARNOLD, J. O. The dangerous crystallisation of mild steel and wrought iron. *Min. Proc. Instn civ. Engrs*, vol. 154, 1902-1903, pp. 122-124.

84. EWING, J. A. and HUMFREY, J. C. W. The fracture of metals under repeated alternations of stress. *Phil. Trans. (A)*, vol. 200, 1902, pp. 241-250. *Metallographist*, vol. 6, no. 2, April 1903, pp. 96-110.

85. FOSTER, F. A possible explanation of the phenomena caused by repetition of stress. *Mech. Engr*, vol. 10, no. 252, Nov. 22, 1902, pp. 704-706 and no. 253, Nov. 29, 1902, pp. 740-742. Abstr.: *Sci. Abstr.*, vol. 6, 1903, no. 866.

86. REYNOLDS, O. and SMITH, J. H. On a throw testing machine for reversals of mean stress. *Phil. Trans. (A)*, vol. 199, 1902, pp. 265-297. Abstr.: *Proc. roy Soc.*, vol. 70, 1902, pp. 44-46.

87. TURNER, C. A. P. Thermoelectric determination of stress. *Trans. Amer. Soc. civ. Engrs*, vol. 48, 1902, pp. 140-179.

88. Prime movers and their ailments. *Engineering, Lond.*, vol. 74, Oct. 17, 1902, pp. 511-512.

1903

89. FOSTER, F. On phenomena due to repetitions of stress, and on a new testing machine. *Mem. Manchr lit. phil. Soc.*, vol. 48, no. 7, 1903-1904, pp. 1-20.

90. LINDENTHAL, G. Alternate stresses in bridge members. *Proc. Amer. Soc. Test. Mater.*, vol. 3, 1903, pp. 169-174.

91. VAN ORNUM, J. L. The fatigue of cement products. *Trans. Amer. Soc. civ. Engrs*, vol. 51, 1903, pp. 443-451.

92. STEAD, J. E. and RICHARDS, A. W. The restoration of dangerously crystallised steel by heat treatment. *J. Iron St. Inst.*, vol. 64, no. 2, 1903, pp. 119-140.

1904

93. ARNOLD, J. O. The fracture of structural steels under alternating stress. *Engineer, Lond.*, vol. 98, Sept. 2, 1904, p. 227. *Engineering, Lond.*, vol. 78, Sept. 2, 1904, pp. 307-308. *Mech. Engr*, vol. 14, no. 348, Sept. 24, 1904, pp. 446-448. *Iron Steel Mag.*, vol. 8, no. 5, Nov. 1904, pp. 433-438.

94. DUDLEY, C. B. Alternate bending stresses. *Iron Steel Mag.*, vol. 7, no. 2, Feb. 1904, pp. 134-139.

95. OSMOND, F.; FRÉMONT, CH. and CARTAUD, G. Les modes de déformation et de rupture des fers et des aciers doux. [The manner of deformation and of rupture of iron and two steels.] *Rev. Métall.*, vol. 1, 1904, pp. 11-45.

96. SEATON, A. E. and JUDE, A. Impact tests on the wrought steels of commerce. *Proc. Instn mech. Engrs, Lond.*, pts. 3-4, 1904, pp. 1135-1230. *Iron Steel Mag.*, vol. 9, no. 2, Feb. 1905, pp. 135-150.

97. Alternating stress testing machine. *Engineer, Lond.*, vol. 98, Sept. 23, 1904, p. 308.

1905

98. ARNOLD, J. O. Note on the crystallisation of wrought iron. *Engineer, Lond.*, vol. 100, Aug. 18, 1905, p. 158.

99. GARDNER, J. C. Effects caused by the reversal of stresses in steel. *J. Iron St. Inst.*, vol. 67, no. 1, 1905, pp. 481-483.

100. HOUGHTON, S. A. Note on the failure of an iron plate through "fatigue". *J. Iron St. Inst.*, vol. 67, no. 1, 1905, pp. 383-389. *Engineering, Lond.*, vol. 79, June 9, 1905, p. 756. *Iron Steel Mag.*, vol. 10, no. 1, July 1905, pp. 11-17.

101. MILTON, J. T. Fractures in large steel boiler plates. *Trans. Instn nav. Archit., Lond.*, vol. 47, pt. II, July 1905, pp. 359-391. *Engineering, Lond.*, vol. 80, Aug. 4, 1905, pp. 164-166 and Aug. 11, 1905, pp. 195-197.

102. RICHARDS, A. W. and STEAD, J. E. Overheated steel. *J. Iron St. Inst.*, vol. 68, no. 2, 1905, pp. 84-117. *Iron Steel Mag.*, vol. 10, no. 5, Nov. 1905, pp. 386-404.

103. ROGERS, F. (a) Troostite; and (b) Heat treatment and fatigue of steel. *J. Iron St. Inst.*, vol. 67, no. 1, 1905, pp. 484-494.

104. SMITH, J. H. A new testing machine for reversals of stress. *Engineering, Lond.*, vol. 79, March 10, 1905, pp. 307-308.

105. STANTON, T. E. Alternating stress testing machine at the National Physical Laboratory. *Engineering, Lond.*, vol. 79, Feb. 17, 1905, pp. 201-203.

106. STANTON, T. E. and BAIRSTOW, L. On the resistance of iron and steel to reversals of

direct stress. *Min. Proc. Instn. civ. Engrs.*, vol. 166, pt. 4, 1905-1906, pp. 78-134.

107. WAZAU, G. Neuere Dauerversuchsmaschinen. [New fatigue testing machines.] *Dinglers J.*, vol. 320, no. 31, Aug. 5, 1905, pp. 481-486.

108. Sankey's vibratory testing machine. *Mech. Engr.*, vol. 16, no. 407, Nov. 11, 1905, p. 690.

1906

109. BERLINER, S. Über das Verhalten des Gusseisens bei langsamen Belastungswechseln. [The behaviour of cast iron under slow reversals of stress.] *Ann. Phys., Lpz.*, ser. 4, vol. 20, no. 8, 1906, pp. 527-562. English translation: *Brit. cast Iron Res. Ass. Trans.*, No. 1.

110. EDEN, E. M. The endurance of metals under alternating stresses and effect of rate of alternation on endurance. *Proc. Univ. Durham phil. Soc.*, vol. 3-4, 1906-1910, pp. 251-266. Abstr.: *Sci. Abstr.*, vol. 13, 1910, no. 1384.

111. FINLEY, W. H. A case of failure of iron from "fatigue". *Engng News*, vol. 55, no. 18, May 3, 1906, p. 487. Abstr.: *Sci. Abstr.*, vol. 9, 1906, no. 1200.

112. HOWARD, J. E. Methods of testing metals by alternate strains and thermic treatment of steels to increase their resistance. *Engng Rec.*, vol. 54, no. 12, Sept. 22, 1906, pp. 334-336. Abstr.: *Sci. Abstr.*, vol. 9, 1906, no. 1808.

113. PREUSS, E. Zur Geschichte der Dauerversuche mit Metallen. [History of fatigue tests of metals.] *Baumaterialienkunde*, vol. 11, no. 16, Aug. 15, 1906, pp. 245-249.

114. ROGERS, F. Sur quelques effets microscopiques produits sur les métaux par l'action des efforts. [On the microscopic effects produced

by the action of stresses on metals.] *Rev. Métall.*, vol. 3, no. 9, Sept. 1906, pp. 518-527.

115. STANTON, T. E. Repeated impact testing machine at the National Physical Laboratory. *Engineering, Lond.*, vol. 82, July 13, 1906, pp. 33-34.

1907

116. DE FREMINVILLE, CH. Caractères des vibrations accompagnant le choc. Déduts de l'examen des cassures. [Nature of vibrations accompanied by impact. Inferences from examination of the cracks.] *Rev. Métall.*, vol. 4, no. 9, Sept. 1907, pp. 833-884.

117. HOWARD, J. E. Notes on the endurance of steels under repeated alternate stresses. *Proc. Amer. Soc. Test. Mater.*, vol. 7, 1907, pp. 252-257.

118. VAN ORNUM, J. L. The fatigue of concrete. *Trans. Amer. Soc. civ. Engrs.*, vol. 58, 1907, pp. 294-320.

119. PREUSS, E. Ergebnisse neuere Dauerversuche an Metallen. [Results of new endurance tests on metals.] *Dinglers J.*, vol. 322, no. 7, Feb. 16, 1907, pp. 100-102.

120. ROGERS, F. Microscopic studies of strain in metals. *J. R. micr. Soc.*, Feb. 1907, pp. 14-18. Abstr.: *Engineering, Lond.*, vol. 82, Dec. 21, 1906, p. 842.

121. SOUTHER, H. White-Souther endurance test specimen. *Proc. Amer. Soc. Test. Mater.*, vol. 7, 1907, pp. 616-623.

122. STANTON, T. E. A factor in the design of machine details. *Engineering, Lond.*, vol. 83, April 19, 1907, p. 505.